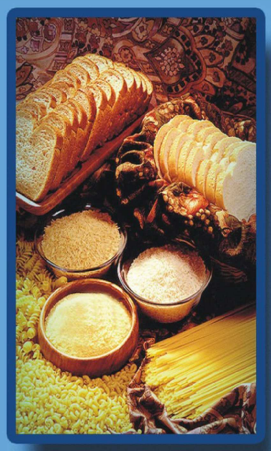




ESSENTIALS OF PERINATAL AND NEONATAL MEDICINE

Mohammed S. Akhter MD
Mohammed W. Akhter MD
Natasha S. Akhter MD
Kamran Mahmood MD

ESSENTIALS OF PREINATAL AND NEONATAL MEDICINE

M. S. AKHTER MD.
Former Vice Chancellor, Dean & Professor
MRCOG, FRCOG, FRCS (C), FACOG, FCPS, Ph.D.

M. W. AKHTER MD.
N. S. AKHTER MD.
K. MAHMOOD MD.

Sponsored by,
Pakistan Academy of Sciences Islamabad and
Shadman Education Trust, Lahore.

HMR- Publishing Company,725-Shadman Colony, Lahore-54000, Pakistan
I S B N 969-8019-01-8

ISBN: 969-8019-01-8

First Edition: 2011

Copies Printed: 1000

Published by: HMR Publishing Company Shadman House, 725, Main Bulevard Lahore 54000, Pakistan.

Preface

It is extremely difficult to define precise borders between different branches of medical science. The number of specialties and subspecialties which are emerging and increasing every year with new development and knowledge is in some ways restricting the primary care physicians from learning essential things without which the best available care to the mother and to her baby is becoming difficult. It is the primary care provider irrespective of the level or position which may be a midwife LHV, MO, general physician, family physician or obstetrician, who will have to detect the problems and refer the baby to the appropriate Neonatologist or Specialist. If we expect all the problems to be detected by the specialists or neonatologists, then a number of neonatal problems can either go unnoted or get delayed in receiving special care in time. Timely recognition and treatment holds key to avoid serious complications in the baby both immediately after birth and later on in life.

This book has been written with this mission in sight to acquaint all personnel involved in delivery and care of the newborn with essentials of common neonatal problems. It is hoped that by making this part of neonatal medicine essential learning for those attending the delivery of the newborn we can greatly improve the care of pregnant mother and her newborn baby.

Mohammed. S. Akhter MD

Foreword

It is with profound love and admiration that I carry in my heart for development in Science that I look at the scientific work in Medical Science relating to the relatively new field of perinatology and neonatology. I am not a Medical Scientist but I am a grandfather who has been blessed with grand children, I understand the importance of care of the new born baby. All maters related to the best possible care most definitely interest me.

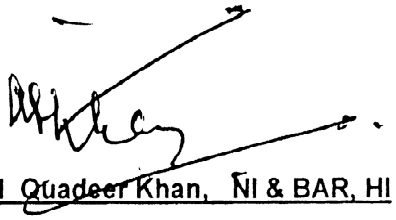
The author is a serious and seasoned scientist, who has been elected to the Pakistan Academy of Sciences in his own right as a fellow where only a few medical scientists make their way.

The subject covered in the book provides scholarly insight into the problems of the mother vis a vis her nutrition, medication and use of drugs, along with most of problems of the newborn, covering first evaluation to breathing difficulties, jaundice, bleeding problems, congenital abnormalities and sequential developmental milestones.

It is unusual to see chapters on circumcision and breast feeding in such a book, but Dr. Akhter has rightly chosen to discuss all essential problems amicably.

As the author writes in the preface, all concerned with care of newborn such as midwife, LHV, M.O, WMO, family doctor, the obstetrician and the mother herself will benefit from this book.

I wish the author, who has attained the top academic positions in university setups, as Professor, Dean of Science and Vice Chancellor, good luck in all his academic activities.



DR. Abdul Quadeer Khan, NI & BAR, HI

Dedication

This manuscript is dedicated to my father Haji Mohammed Raffi who was more than a conventional father. He was a friend, a colleague, a companion and best of all a great motivator. My youngest son who is equally a close. Friend and motivator encouraged me to continue to read and learn. It is this habit which made me improve my knowledge and ultimately resulted in the compilation of this book. I have my special gratitude to my father and thanks to my son Murad. My other two children Prof Dr Mohammed Waseem Akhter and Dr Natasha Kamran are both specialists in their fields of interest one is a cardiologist and the other is an endocrinologist, have also contributed in preparation of this book. My son in law, Dr. Kamran Mahmood, equally deserves my appreciation for contritruting in his field of interest (Pulmonology). The driving force, which kept me going and revising various chapters of this book, has been my wife Dr. Ismat Salim Akhter and grand children whom. I adore and love. I am therefore dedicating this book to all of them too along with every newborn. This book describes a number of important subjects and procedures most of which if practiced wisely can ensure a healthy and better life for the newborn.

Mohammed. S. Akhter MD

Acknowledgement

My appreciation and thanks are due to my entire senior and junior colleagues who have contributed in more than one way in completing various chapters of this book. The names of contributors with their specialties have been separately mentioned in this book. I have my special thanks to my staff officer and incharge Shadman Hospital and Shadman Education Trust affairs Miss Kausar Chaudhry. I must also thank a number of colleagues to mention a few, Prof Dr. Zafar Ullah Chaudhry, Dr. Humaira Durani , Dr. Mahliqa Fawad , Dr. Col. Perveen Akhter, Dr. M. Zia, Dr. Ali Miraj Shami, Dr. Diyyali Gul Dr. Yasmin Sardar and Prof. M. Aslam, who motivated me to complete this book. My personal staff officers Miss Farah Sarwer, Mr. Hassan Jameel and Miss Mahwish Hummayun who composed this manuscript with great patience and dedication, must be thanked. I am most grateful to Dr. A.Q Khan for writing the Foreword for, this book. It will be appropriate and binding for me to acknowledge help and support of Pakistan Academy of Sciences Islamabad, Higher Education Commission of Pakistan and Shadman Education Trust for sponsoring publication and distribution of this book. The encouragement and help, I received from Prof. Dr. Atta- Ur - Rahman, Prof. Dr. M.D. Shami and Prof. Dr. G.A. Miana, deserves special gratitude and thanks.

Mohammed. S. Akhter MD

LIST OF CONTRIBUTORS

Uri. Elkayam MD
Professor of Cardiology
University of Southern California
Los Angles, USA

M. Wasem Akhter. MD
Assistant Professor of Medicine
Department of Medicine Division of Cardiovascular
Medicine University of Massachusetts Medical
School Boston USA

Natasha S. Akhter MD
Consultant Endocrinologist and Metabolism
Riverside ILL Chicago USA

Dr.Kamran Mahmood MD
Section Chief, Pulmonary & Critical Care
Director, Medical & Surgical Intensive Care Unit
Mercy Hospital and Medical Centre
University of ILL Chicago USA

LIST OF CONTENTS

Foreword
Preface

1.	**PERINATOLOGY**	**Page-01**
2.	**VITAL STATISTICS**	**Page-04**
3.	**PLACENTAL MORPHOLOGY AND FUNCTIONS**	**Page-15**
4.	**FETAL PHYSIOLOGY**	**Page-24**
5.	**PRENATAL CARE**	**Page-28**
6.	**DRUGS IN PREGNANCY**	**Page-39**
7.	**NUTRITION IN PREGNANCY**	**Page-46**
8.	**BREAST FEEDING**	**Page-56**
9.	**THE NEW BORN**	**Page-65**
10.	**RESUSCITATION OF THE NEWBORN**	**Page-72**
11.	**DETAILED EVALUATION OF THE NEONATE**	**Page-76**
12.	**COMMON RESPIRATORY DISORDERS OF THE NEWBORN**	**Page-84**
13.	**SCREENING OF THE HIGH RISK NEONATE**	**Page-91**
14.	**HAEMORRHAGIC DISEASE OF THE NEWBORN**	**Page-95**
15.	**HYPERBILIRUBINEMIA**	**Page-100**
16.	**NEUROLOGIC EXAMINATION**	**Page-111**
17.	**DEVELOPMENTAL MILESTONES**	**Page-116**
18.	**NEONATAL CIRCUMCISION**	**Page-118**

Chapter Outline

Definition:

Perinatal illness:

PERINATOLOGY

Definition – The perinatal period is defined in diverse ways. Depending on the definition, it starts at the 20th to 28th week of gestation and ends 1 to 4 weeks after birth. The care of the mother and the newborn falls under such person who is called a perinatologist he can be either a neonatologist with interest in maternal care along with neonatal care or an obstetrician with special interest in neonatology.

In recent years both neonatology and high risk obstetrical care have become highly sub specialized. The need for close cooperation between the obstetrician and the neonatologist has become increasingly clear.

Fig 1.1: showing modern perinatal unit

The goals of perinatal/neonatal medicine are identical, both work to decrease the perinatal and neonatal mortality and morbidity, therefore a team approach which includes obstetrician and a neonatologist is understandable. A perinatologist is an ideal person to take care of high risk neonate.

This concept is new and hard to accept for many developing countries, where there is desperate lack of trained obstetricians and neonatologist. Perinatal care is being delivered by the midwife, general physician, pediatrician and general obstetrician. We are noticing emergence of intensive care cardiac units in all major cities because adults are affected by heart disease, the policy makers and financiers in society are directly affected by heart disease. The development of such units will definitely increase the number of trained cardiac physicians and surgeons. There is need to place the horse before the cart in case of perinatology.

Development of intensive care nurseries and obstetrical units in all teaching hospitals will definitely help in increasing trained personals in perinatology and neonatology in this country. The sooner it is done the quicker there will be increase in these specialties. This is because the heart disease generally effects the adult population of our society which includes both the financiers and the policy makers. Unlike the adults, the poor neonate can not lobby for better care for himself.

The excuse of non availability for trained neonatologist will have to be dispensed with. In advance countries neonatal services have already been divided into 3 levels of infant care, low-risk care, (level 1), intermediate care, (level 2), and intensive care, (level 3), obstetrical services have also been divided into two levels of care, a regular or low-risk service and a high-risk service in a developing nation such. This unfortunately is not the case as Pakistan. Majority of teaching hospitals have no separate neonatology or perinatology departments. Most maternity centers are without properly equipped and staffed (level 1) nursery. On obstetric side the high risk service is limited to provision of an eclampsia room and an odd fetal monitor. The main emphasis in obstetrical teaching as well as in practice is focused on prevention and treatment of few major complications such as anemia, toxemia, diabetes and antepartum hemorrhage. The neonate especially the full term is generally

left to the complete supervision and mercy of mother and her relatives. The time for screening these babies for infection, congenital abnormalities, and medical disorders is therefore lost, and when the baby becomes sick and is seen by the physician, permanent damage is already done.

The low risk level 1 nurseries are for care of full term infants. The infant is carefully monitored and noted for how he is adjusting to extrauterine life. Various screening tests for congenital problems such as hypoglycemia, phenylketonuria, and hypothyroidism are initiated at this level.

The level 2 nurseries should care for sick and convalescent newborn infants, which include preterm infants, above 32 weeks of gestation or 1500 g in birth weight. Infants with intrauterine growth retardation and diabetic can be looked after in these units. Level 3 nurseries are for very sick infants, regardless of their weight size and gestational age. These nurseries should be equipped with monitors, respirators, and instruments for intravenous alimentation and exchange transfusion.

Each country must review their morbidity and mortality statistics regularly and make decisions about up grading obstetrical and neonatal care facilities. Our perinatal and neonatal mortality rates are alarmingly high and clearly point towards urgent need for improvement in our existing obstetrical and neonatal care systems.

The specialty of neonatology is so closely linked with obstetrics that it just can not be practiced without full involvement of the obstetricians. The events of prenatal period have direct or indirect bearing on the problems of neonatal period; therefore the physician taking care of the fetus in utero must join hands with the neonatologist for continuation of care in this most crucial period of extrauterine development. This team of specialists must be captained by perinatologist who should be knowledgeable about obstetrical and neonatal problems. Until such time that a perinatologist is available, all obstetrical units must have a neonatologist included in the list of their essential staff, the preceding chapters on the care and evaluation of the newborn will clearly emphasize the need for such a team

Perinatal illness - Acute chorioamnionitis is the largest contributor to the poor pregnancy outcomes of black women. Low socioeconomic status is the most common cause of preterm labor.

Chorioamnionitis is the general term for infection of the amniotic membranes (the chorion, amnion, and placenta, and sometimes also the umbilical cord) by bacteria, mycoplasmas and urea plasmas during pregnancy. The infection weakens the membranes which results in their premature rupture. Inflammation causes swelling around the placental villa which reduces the flow of blood and causes hypoxia in the fetus, and by-products of

bacteria and/or of fetal distress initiate preterm labor.

"Infants who are born preterm as the result of acute chorioamnionitis are often ill because their lungs, brains, and intestinal tracts are immature and because placental edema made them hypoxic before birth. Most of the morbidity associated with acute chorioamnionitis in preterm-born infants presents with signs of acute antenatal hypoxia (i.e., low Apgar scores, the need to resuscitate vigorously at birth, neonatal respiratory distress syndrome, and recurrent apneic episodes). These findings usually correlate much more strongly with the severity and extent of placental villous edema than with the severity and stage of chorioamnionitis."

Pneumonia in newborns is nearly always caused by chorioamnionitis. Exposed neonates are also at greater risk of septicemia and more rarely, of neonatal otitis media, meningitis, and septic arthritis.

Pathological examination of the placenta is necessary to determine the presence of chorioamnionitis in epidemiological studies, because there is sufficient clinical evidence to diagnose the infection in only about 10% of affected pregnancies.

REFERENCES

1. Guidelines for Perinatal Care, 5th ed. Elk Grove Village, IL/Washington, DC: American Academy of Pediatrics/American College of Obstetricians and Gynecologists; 2002.

2. White, R, Martin, G & Graven, S. Newborn ICU design: scientific and practical considerations. In: Avery GB, Fletcher MA, MacDonald MG, editors. Neonatology: Pathophysiology and Management of the Newborn, 5th ed. Philadelphia: JB Lippincott; (1999). p. 49–60.

3. Alfredi Z, Neilson JP. Doppler ultrasonography in high-risk pregnancies: Systematic review with meta-analysis. Am J Obstetrics and Gynecology 1995;172: 1379-87. (Level II evidence).

4. Ostrea EM, Welch RA, et.al.: Detection of prenatal drug exposure in the pregnant woman and her newborn infant. Clinics in Perinatology September 1991;18:629-645

Chapter Outline

Introduction:

Population Size:

Methods Employed:

VITAL STATISTICS

Introduction - The specialty of obstetrics is concerned with almost all social factors which influence our quantity as well as quality. No economic planning is possible without taking into consideration the rate and problems of population growth.

The completion of Vital Statistics of the nation which form the basis of any economic planning fall in the domain of this specialty. The objectives of agencies such as population planning, and mother and child welfare association cannot be achieved without close cooperation with different allied agencies, most important of which are the institutions which deal with the care of the obstetric patient. Cooperation of Provincial, Municipal and Town hall health departments can all help to achieve the desired goals. The guidance of the practicing physicians in this specialty is indispensable, as regards collection of Vital Statistics.

Methods Employed - In order to collect reliable and accurate statistics most agencies rely on epidemiological studies which must be based upon accurate and systematic obser-vation and recording of clearly definable facts in a known population or a representative sample of it. This unfortunately is not possible in a developing country such as Pakistan accurate Statistics such as maternal and perinatal mortality are not available, therefore it is impossible to discover about the correct incidence of complications responsible for morbidity or mortality.

Population Size:

International statistics for maternal and infant mortality rates are based on live births. The definition of viability of the foetus and of live birth has an important bearing on the results. The WHO definition for live and stillbirth is not used by all countries, which makes international comparisons further difficult. The statistical results are also influenced by the size of the populations studied. In countries with small populations

and consequently few maternal deaths, the results are more likely to be affected by chance. The variation which can occur from year to year can sometime provide an estimate of the variation due to chance.

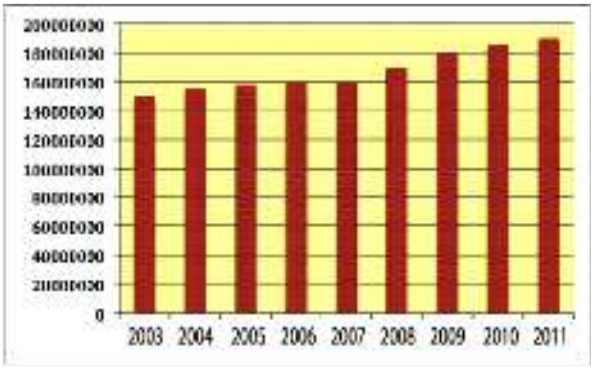


Fig 2.1: Shows trend in Pakistan Population growth

It will be unfair to compare mortality statistics of Pakistan with a population of 180 million with that of other country such as Libya with its small population of 56 millions.

Assignment of Cause of death - How a death is assigned to pregnancy and to childbirth or to associated cause is also likely to affect the mortality rates. In some countries, a specific question may be asked on the death certificate as to whether the patient had been pregnant or not. In most countries it is left to the certifying doctor to decide whether he considers the pregnancy is relevant to the cause of death. In Pakistan the death certificate is filled with briefest possible information, and the doctor who fills the certificate is also not familiar with the importance of this vital information.
In any case, the death certificates are issued only in cases of hospital deaths. According to (2009) census, out of 45% female population 72% per cent lived in the rural areas. The statistics obtained from such areas are not very reliable and accurate. Another pitfall which sometimes occurs is, in assigning a death to a single cause. If, for example,

a patient suffering from diabetes has an antepartum hemorrhage and is delivered by caesarean section and develops a fatal pulmonary embolism on 9th day post delivery what should be the cause of death here. Most will assign this death to pulmonary embolism, but sometimes it poses a difficult problem. Unless such assignment is uniform the comparison of causes of death will be in-accurate.

Reliability of Data for Comparison:

The statistical criteria which are necessary to ensure a reasonable comparability include countries which have reached a high state of development in the collection of statistics and use similar definitions. It will be meaningless to compare statistics of Pakistan with that of Canada, USA or Sweden, but these can be easily compared with countries such as India and Nigeria which have more or less similar situations.

Due to comparable development stage international mortality statistics can be a guide to monitor the standard of health care of mothers and children which are being achieved in different countries, but they are of little value in the study of the racial and epidemiological patterns of disease. Statistics from Pakistan as well as from most other countries are collected from hospital in-patients. These statistics are of little help since they do not reflect the actual situation of the country as whole.

Definitions:

Gravida - This refers to the total number of previous pregnancies

including ectopic, hydatidiform mole, abortion and normal intrauterine pregnancy. (A woman who has had one abortion, one ectopic pregnancy and viable twins is designated as gravida 3 para 1). Parous - A woman is said to be parous if she has given birth (regardless of whether vaginally or by ceasarean section) to a baby at or beyond the 20th week of pregnancy, and her parity refers to the number of such deliveries she has had (live births or still births, single or multiple, vaginal or operative).

Nullipara - A woman who has had no deliveries of more than 20 weeks gestation is called nullipara.

Primipara - A woman who has had one delivery of more than 20 weeks gestation.

Multipara - A woman who has had more than one delivery of 20 weeks gestation or more.

Birth - Birth is the complete expulsion or extraction from its mother of a fetus weighing 500 G or more, irrespective of period of gestation.

Live Birth – Live birth is the birth of a fetus, irrespective of gestational age, weighing 500 G or more that after its complete expulsion or extraction breathes or shows any other evidence of life such as beating of the heart,

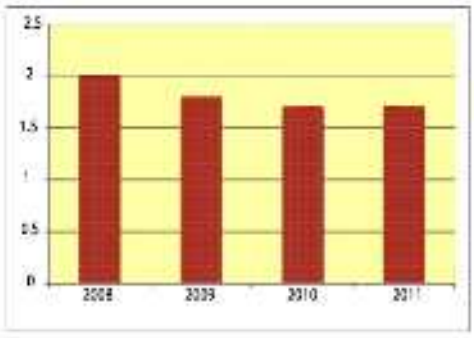


Fig 2.2 Shows Population growth rate trends

pulsation of the umbilical cord, or definite movement of the voluntary muscles. Abortion - Abortion is the complete expulsion or extraction from its mother of a fetus or embryo weighing less than 500 G; irrespective of gestational age, whether there is evidence of life or not, and whether the abortion was spontaneous or induced.

Incidence –
It is the proportion of cases or manifestation in a defined population at a specific period of time.

Prevalence –
It is the proportion of cases or manifestation in a defined population at a particular point of time.

Infant Mortality Rate –
It is the number of deaths in infants' up to the age of one year or less divided by total live births in a year in that area multiplied by one thousand.

Early Neonatal Mortality Rate –
It is the number of early neonatal death per 1000 live births over a given period.

Late Neonatal Mortality Rate –
It is the number of late neonatal deaths per 1000 live births over a given period.

Still birth Rate (Fetal Death Rate) –
It is the number of stillborn infants per 1000 total births (stillbirths plus Live births) over a given period

Crude Death Rate –
It is the number of deaths in a year divided by number of total population in the country and multiplied by one thousand. Crude death Rate in Pakistan was 13.8 in (1972 to 76) while this is 10.5 in 1982, 8 in (2007) and 7.06 in (2010)

Perinatal Mortality Rate –
It is the number of stillborn infants and early neonatal death per 1000 total births (stillbirths plus live births) over a given period.

Perinatal Death –
It is the stillborn and liveborn infant weighing 500 G or more at birth who died before birth, at birth, or during the first seven completed days of life.

Stillbirth (Fetal Death) –

Stillbirth is the birth of fetus weighing 500 G or more, irrespective of gestational age, who shows no sign of life after birth.

Early Neonatal Death - It is the death of a live born infant weighing 500 G or more at birth during the first seven completed days of life.

Late Neonatal Death - It is the death of a liveborn infant weighing 500 G or more at birth after seven but before twenty-eight completed days of life.

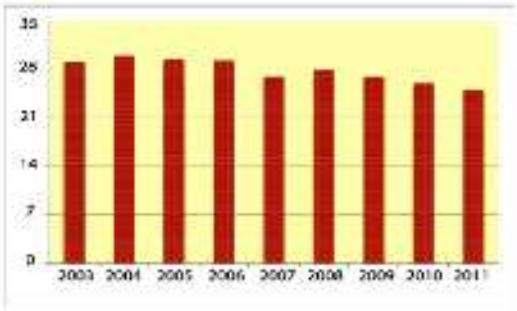


Fig 2.3: Shows birth rate: 24.81 births/1,000 population

Birth Rate - It is the number of live births in a year divided by number of total population in the country and multiplied by one thousand (Fig 1.3) shows crude birth rate in Pakistan. The crude birth rate in Pakistan at present is around 24.81 per 1000. In a population of nearby 180 million people, there are 25.1 million births every year.

Infant Mortality - At present this is 63.26 per 1000 live births, in 2003 infant mortality rate in Pakistan was 29.60. The future target set for next 5 years are to decrease this figure. These rates are alarmingly high when compared with figures available from the developed nations as shown in Table Perinatal and Infant Mortality
Infant Mortality rate in Pakistan.

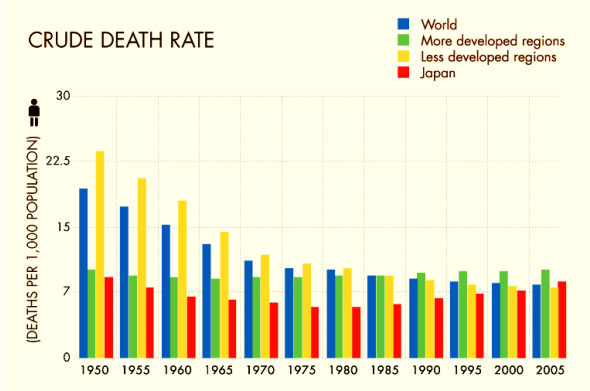


Fig 2.4: Shows crude Death Rate of the world

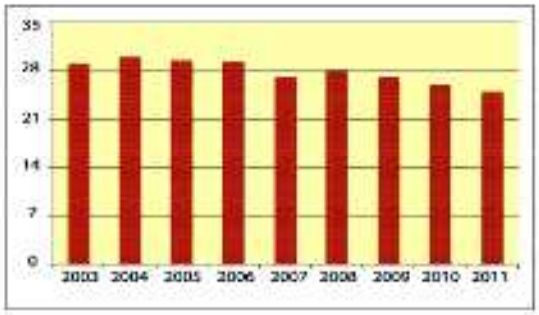


Fig 2.5 Shows Infant Mortality Rate

Infant Mortality rate: 63.26
Male: 66.52 deaths/1,000 population
Female: 59.85 deaths/1,000 population

It is generally agreed now that as maternal deaths are so rare events in childbirth perinatal and infant mortality rates are of greater significance than maternal mortality rates in assessing the standards of care. Most countries vary in the extent to which they comply with the WHO

definitions of live and stillbirth. (WHO refers Live birth as the complete expulsion or extraction from its mother of a product of conception,
irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born)

WHO in Pakistan there is no text or reference manuscript at Government or private level, which could provide accepted definitions of these important subjects? A couple of publications pro-duced by some physicians in this country have also failed to deal with this subject. Unfortunately most of the leading obstetricians practicing in this country are British trained where there is still no agreement on the definition of live birth, In the United States, however, we count any infant exhibiting any sign of life as alive, no matter the month of gestation or the size of the fetus. In other European countries, they define the month of gestation and the size of the fetus before they count it as a live birth therefore their, training from

England has not helped much on this particular subject. The effect of this deficiency is very damaging as regards collection of vital statistics. A baby may not be considered to be born alive unless it is still living at the time of the registration of the birth.

The Soviet Union classification, any infant that is born before 28 weeks gestation and weighs less than 1,000 grams and is less than 35 centimeters long is not considered a live birth unless the infant lives for seven days and then dies. In France, Czech Republic, Ireland, Netherlands and Poland, the fetus must be at least 22 weeks and/or weigh 500 grams, if not, it is not a live birth and not counted as a part of the infant mortality rate.

I suggest that in Pakistan we accept all babies born after 20 weeks and weighing more than 500 grms as live births, as this is now accepted by whom as correct definition.

Pakistan perinatal and infant mortality statistics: The high mortality rates in Pakistan are greatly due to poor standards of obstetrical care but other factors such as definitions, methods and inaccuracy of collection of data are also responsible for this increase. In England and Wales the only national morbidity statistics available are those based on hospital admissions, the same is the case in Pakistan. Unfortunately they are of limited value as the regional morbidity ratios can be affected by the varying hospital confinement rates, along with factors such as Medical Standards, Social Standards, and Biological factors in the population structure eg, the age and parity of the mother.

Causes of Death in General Population –Two-thirds of the world's neonatal deaths occur in just 10 countries, mostly in Asia. Pakistan is number three among these countries. With an estimated 298 000 neonatal deaths annually and a reported neonatal mortality rate of 49 per 1000 live births, Pakistan accounts for 7% of global neonatal deaths. Infection (36%), preterm birth (28%) and birth asphyxia (23%) account for 87% of neonatal deaths worldwide. Appendix V provides list of causes of death-in Pakistan. Complication of pregnancy and child birth constitute 7% of total deaths, while congenital anomaly, birth

injuries, difficult labor and perinatal mortality. Constitute 7.3 per cent of total deaths. These statistics are misleading to the health planner as well as to the general population because it gives the impression as deaths due to child birth and its related problems constitute less than 10 per cent as causes of total deaths in the community and fail to emphasize the alarmingly high maternal, perinatal and infant mortality rates. These should be reported separately if any national planning to reduce these figures has to succeed.

Year of study	Maternal Mortality	Infant Mortality	Total Fertility	Life expectancy at birth
	Rate 1000	Rate 1000	Rate 1000	Rate 1000
1970	180.4	105	7	54
1990	130.4	101	6.1	61
2009	89.1	71	3.9	67

Fig 2.6 Shows trends in mortality rates

Since women constitute almost 50 per cent of our population, improvement of their health would mean better health for the nation.
There is urgent need for dissemination of health information and health education to our policy makers, leaders, administrators and public, in general. Improvement in mother and child health services to reduce these alarmingly high mortality rates needs to be dealt with on top priority basis.

In Pakistan nearly 23.6 per cent women are marriageable, as compared to the west where marriages are contracted at relatively younger age. This Society in general is very conservative and religious; therefore contraceptive methods are not accepted and practiced by great majority. These women acquire high parity status with shorter interval between pregnancies, their nutritional stores and general health is taxed adversely by the demands of child bearing and mother hood.
The risks associated with pregnancy and deliveries are considerably increased in women of younger age and high parity. Woman under the age of twenty and parity five or more are particularly susceptible to statistical complication.

Maternal deaths:

A maternal death is "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental cause. They are classified into three broad etiological groupings.

Direct Maternal Death - This is a death resulting from obstetric complications of the pregnant state, labor, or Puerperium or from intervention, omission of necessary treatment, incorrect treatment, or combination of these causes.

Indirect Maternal Death - This is an obstetric death resulting from previously existing disease or disease that developed during pregnancy, labor or the Puerperium. It is not directly due to obstetric causes.

Non maternal death - This is an obstetric death resulting from accidental or incidental causes not related to the pregnancy or its management.

The maternal death rate is the number of maternal deaths (direct, indirect or non maternal) 280 per 100,000 births for any specified period. The current obstetric (direct maternal) mortality rate in the USA is approximately 6.06

per 100,000 births. Individuals of lower socio-economic status who receive less than adequate prenatal care have a consistently higher mortality rate. The mortality hazard rises steadily after 30 years, and for those over age 45 it is approximately 9 times that of women 20-24 years of age. Increasing parity is also associated with increased risk. The present maternal mortality rate in Pakistan is around 276 per 100,000 births (2011).

Crude Birth Rate: 29.1 General Fertility Rate: 127.6, Total Fertility Rate: 3.9 Births at Non-Medical places 76.2 Infant Mortality: Rate 63.26, Neonatal Mortality Rate: 42 Post Neonatal Mortality Rate: 28.

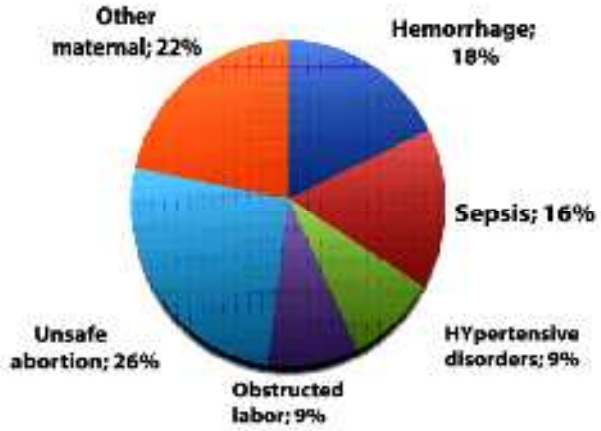


Fig 2.7 Shows Maternal Morbidity in different complications

Maternal Morbidity - Maternal morbidity may be defined as an elevation of body temperature, after the first 24 hours following delivery, above 380 (1000) on two occasions 24 hours apart, within 10 days postoperatively or postpartum. This usually is expressed as a percentage of total patients in each group and may be used to compare operative problems or puerperal infection in different institutions, or in the same institution, over a period of time.

Morbidity may occur from many causes such as hemorrhage, atelectasis, embolization, or nervous system damage. Puerperal infection is most often due to anaerobic infections (in at least three-fourth of cases) most common of these is streptococcal infection. Other common organisms include Escherichia coli, staphylococci. The puerperal morbidity rate should not exceed 2 per cent. In Lahore General hospital the puerperal morbidity rate over the past three years has ranged between 12 to 16 per cent, this is alarmingly high but the population dealt at this hospital comes from low socio-economic groups, are anemic and less motivated to take antibiotics.

Maternal Mortality Rates - A maternal death is the death of any woman, from any cause, while pregnant or within a certain interval after termination of pregnancy, irrespective of the duration or site of the pregnancy. Although the interval after termination of pregnancy may be variously defined by different states and countries, the majority accept 42 days. These mothers died during their stay in hospital, what happened to them in the next week or month is never known.

There is considerable variation in mortality statistics in different hospitals of this country, even statistics of various hospitals in one single city such as Lahore and Karachi. The figure may give the impression that hospitals where maternal mortality is low have better standards of care, this impression may not be true, as there is complete lack of uniformity in recording of the statistics in these institutions, the same case can be made regarding data collected from other countries of this region. The other important aspect of these statistics is

the usefulness in comparing standards of obstetrical care of this country with other countries of the region. Since the data reported is not based on the information obtained on uniformly agreed parameters, their comparison can not be meaningful, most figures are from institutions only and do not clearly reflect the standards of health care delivery in the whole country.

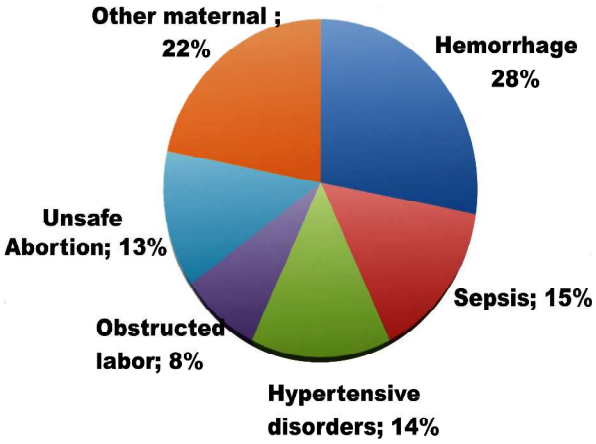


Fig 2.8 Shows Maternal Mortality in Different conditions

In my opinion the importance of this crude data lies in emphasizing the urgent need for nation wide survey of maternal deaths, by adopting a uniform national protocol. I am certain that overall maternal mortality rates in this country will be higher than 6.8 per 1000 as reported by the Pakistan Planning Division Islamabad as and even higher than the one reported by recent UNICEF report.

Similar case can be made regarding perinatal mortality in this country. There is again wide variation in these rates, the highest rate of 85 per 1000 total birth reported from our hospital are not really comparable with other two hospitals as there is no nursery, or neonatal coverage in our hospital, while the other two hospitals have fully equipped nurseries. The data obtained from rural hospitals which is recorded and reported by different agencies with no agreement in recording, and analysis is again not comparable. When the statistics collected by Planning Division of our country are collected with so many deficiencies, their authenticity and reliability must be a matter of great concern for the policy makers.

According to the last UNICEF report 30,000 women die every year in Pakistan as a result of child birth. This gives a maternal mortality rate of 2.6 per 1000 births or 260 per 100,000 births.

The need for reducing this alarmingly high maternal mortality rate urgently can not be stressed more strongly.

Unfortunately our next five year plan which includes in its target to half the death rate for infants, eliminate the worst malnutrition in children and reduce the communicable diseases to a negligible level has no urgency for reducing maternal mortality rates.

Fertility Rate - The fertility rate is the number of births per 1000 women between the ages of 15 and 44 years (inclusive), calculated on a yearly basis.

It is a more accurate means of comparing the reproductive behaviour of different population groups than the birth rate (number of births per 1000 total population). The latest fertility rate in USA is 2.06.

It may be useful to have data available concerning a given population for purposes of planning obstetric and neonatal care facilities and personnel training and for making informed decisions concerning the practice of obstetrics, Pediatrics, or neonatology. The fertility rate in Pakistan was 67 per

thousand in 1978. The future target in the 5th An estimated 276 Pakistani women die for every 100,000 live births. More than 65 percent of women in Pakistan deliver their babies at home; less than 2 in 5 women deliver with an SBA. Only 22 percent of married women received professional postnatal care for the last birth within 24 hours. The U5MR is 94 deaths per 1,000 live births. The 2007 Pakistan Demographic and Health Survey show little change in mortality over time. At 4 to 5 months of age, only 23 percent of infants are exclusively breastfed. In the Federally Administered Tribal Areas (FATA), an estimated 135 out of every 1,000 children under the age of 5 die, often from treatable ailments. Pakistan's TFR of 4.1 children born per woman (4.5 TFR in rural areas) is one of the highest in South Asia

Average Life Expectancy - The life expectancy at birth is a useful indicator of health status of the people in a country; this is also commonly used for international comparison. The present average life expectancy in Pakistani woman is around 67.9 years.

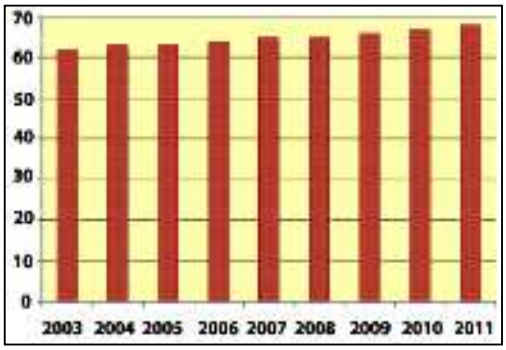


Fig 2.9: Shows Average Life Expectancy ratio

The life expectancy in female of Pakistan in the peak reproductive years is improved; it was 61 years, few years ago as compared to 69.9 years. At 35 to 39 years of age both male and female have a similar life expectancy. This is considerably low when compared with figures available from the advanced countries.

Maternal and child health care:

The students and planners of our health care delivery system that our maternal mortality and infant mortality rates have risen considerably since 1961. One can easily speculate that this is partly the result of deterioration in standards of our obstetrical and neonatal care.

The mother in this country plays a special and pivotal role in the family on her physical and mental health depends on the regular and proper feeding, vaccination and education of the children? If she dies and leaves behind a bunch of orphans, no close relative or agency in this country can provide these services to those most needy children.

According to one estimate (UNICEF report, majority of women in Pakistan are anemic. More than quarter of babies has less than 2.5 kg weight at birth. It has also been reported that the causes of malnutrition and death are probably more closely related to the educational levels of mothers than to poverty. This clearly brings out the need for introducing urgent educational measures for expectant mothers. This problem can not be solved by mere improvement and advancement in our formal educational Programmers. The urgency of the problem demands a short term and a long term plan. The short term plan must start with prenatal classes in all hospitals, nursing homes and medical colleges. A model prenatal class should be regularly shown on the television every day at the week, similarly radio, news paper and pamphlets can be utilized for

propagating need for adequate nutrition, exercise and medical help during pregnancy and motherhood. The long term plan must include a close revision of our standards for obstetrical care. The questions such as, "who should deliver this service, the midwife, the TBA, the primary physician or the obstetrician. Where this service should be provided. How standards of such care be monitored" need to be answered. Some of these problems are common and therefore equally important for other developing countries of this region.

The student of obstetrics should know that the status of maternal and child health along with standard of health care delivery system in community has been traditionally assessed by measurement of morbidity & mortality statistics. It is most unfortunate to note that in many countries of the world negative health indices such as mortality rate are the only source of information available. Their main limitation lies in their relative insensitivity especially if comparison has to be made between effluent areas/ countries where health criteria are of higher standard. There is no doubt that when comparisons are made on the basis of positive health indicator mortality statistics are found to be highly misleading and useless.

In many developing countries of the world mortality statistics are not available.

In general standardization of mortality data is poor and vaguely quantified. In countries where health statistics are well developed, comparison of the health indicator such as mortality and morbidity will be useless unless uniform standards in recording and quantifying are instituted. The growth and development of the child during pregnancy and after child birth can be and should be used as positive health indicator as regards outcome of pregnancy. Collection, interpretation and dissemination of data based on growth and development of child is currently in use as positive health indicator in many countries of the world, therefore infant morbidity and mortality rates are widely used for international comparison.

Some of most important health problems facing mothers and infants are related to cumulative1e effects of malnutrition, infection, unregulated fertility, poor socio-economic conditions, poor health and social services for which there are no short term solutions available. The emphasis on maternal education is not a part on any development plan of Pakistan. This is most unfortunate. There is urgent need to review this plan and introduce teaching of social, nutritional and -preventive aspects of infant care to all the child bearing women.

The introduction of home based mother's card like identity card in this country and social security card in developed countries can serve a very useful purpose at the primary health care level. The education can start at the school level as an essential part of the syllabus; continue through the prenatal period in the form of prenatal classes conducted by the midwives, house surgeons and registrars or residents in training and the Gynecologist. A woman is most receptive to medical advice while she is pregnant.

Birth Certificate - The completion of this document should be made mandatory by law in this country. Its completion at present is far from satisfactory. The information recorded on this certificate is sketchy. The document is filled by personal with varying background and knowledge.

The reasons for complete and accurate registration of births are many. The Certificate provides information regarding facts of birth. It is needed as evidence of age, citizenship and family relationships. All agencies (social public health, demographic and obstetric) which deal with human reproduction require this information. Since this certificate plays such a vital role in documentation, identification and planning, there is needed to make this uniform throughout the country. The rules for completing this document should also be uniform. It should be made mandatory for the medical officers to fill all basic information which can be used for planning various services.

Registration of Births and Deaths in Pakistan –

Pakistan contains Urban and Rural areas, therefore births and deaths are carried out separately. In rural areas, the registration of births and deaths is completed under the basic Democracies Order 1959, under this order head of the house hold is required to get the birth or death registered within 4 days of its occurrence at Union Council or to report it to the Chowkidar who will get it registered at the Office of the Union Council, and send a copy of record every month to District Health Officer concerned.

In Urban areas, the registration of birth and deaths is carried out under the Municipal Administration order 1960. The event is reported for its registration by the head of the household. In case of births the midwife is also required to report the birth to the registration office. Under this system the District Health Officer receives a copy of entries in the birth and death register from the Municipal Committee, Town Committees and Cantonment Boards every week and from Union Councils every month. These copies are sent to the Divisional Health Directorates of the provinces. The monthly birth and death returns are compiled for Urban and Rural areas in their statistical sections. In each province as a whole a statement is prepared in Provincial Health Directorates annually. The final statements are then forwarded by Provincial Health Directorates to the Director General Health, Government of Pakistan.

The student should realize that there are a number of maternal and fetal factors which are avoidable as regards mortality and morbidity. Regular medical audit and review of these avoidable factors should be carried out in all institutions, as it will help in improving standards of obstetrical and neonatal care in this country.

REFERENCES

1. Report on confidential enquiries into maternal deaths in England and Wales, 1964·1966 London H.M. S.D. 1969

.

2. Report of the Maternity Services Committee, London, H.M.S.O. (1959).

3. Butler, N.R. and Alberman, "Perinatal Problems" E & S Livingstone, London. Ed. (1969).

4. Maternity care in the world report of joint study group of FIGO & leM Pergamon Press Newyork. Ed. (1966).

5. Philipp, E. Barnes, J. & Newton, M. Scientific Foundations of Obstetrics & Gynaecology William Henimenn. Medical Books Limited London. Ed. (1970).

6. Awan, A.K. And Awan. T. Text Book o.f Midwifery (Urdu), Muzzafar Medical Publications Gulberg Lahore, 1981.

7. Bulletien S.O.G.C. 1980.

8. Fifth Five Year Plan, Planning Commission Government of Pakistan, June 1978.

9 Health and health related statistics of Pakistan Edition 2nd Planning Commission Government of Pakistan Islamabad Sept. 1978.

10 Pakistan Journal of Medical Research M R Centre Lahore P. 218.

Chapter Outline

Placental Physiology:

Functions of the placenta:

Respiratory Function;

Excretory Function:

Nutritive Function:

Barrier Function:

Endocrine Function:

PLACENTAL Morphology and Functions

Introduction:

The word placenta is derived from the Greek word which means flat cake. During that 9 month period it provides nutrition, gas exchange, waste removal, endocrine and immune support for the developing fetus.

Embryology of placenta:

During the first trimester, the cytotrophoblast (CTB) layer that is subjacent to the syncytiotrophoblast (STB) and supported by a basal lamina is nearly complete, but later, it becomes discontinuous. In full-term placenta, the cell surface of the CTB layer spreads over the basal lamina but is not interrupted. Morphometric analysis shows that throughout the villous tree, 80% of the continuity of the CTB layer of full-term placenta and 90% of that of first-trimester placenta ere preserved. The initially cuboidal-shaped CTB cells ere transformed to flat cells with many cellular processes that, together with those of the adjacent STB, eventually cover the trophoblast basal lamina in a complex network of interdigitation.

The embryo can be seen enclosed in the amniotic membrane with the umbilical cord to the left. Within the cord the placental blood vessels are visible and branching into finer vessels before they enter the fetal side of the main placental structure. The fetal side of the placenta is relatively smooth and is continuous with the chorionononic membrane.

Structure of placenta:

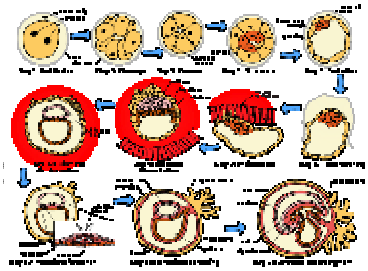


Fig 3.1: Shows Developmental stages of placenta

There are three different types of placenta: Hemochorial - placenta where the chorion comes in direct contact with maternal blood (human), Endotheliochorial - maternal endometrial blood vessels are bare to their endothelium and these comes in contact with the chorion. (Dogs, cats) and Epitheliochorial - maternal epithelium of the uterus comes in contact with the chorion considered as primitive (pigs, cows),

Placental Morphology:

Placenta is discoid in shape and its diameter is 20cm. It is 3 cm thick at term. It weighs 500-600 gm. In accessory placenta it can be, Bi discoid, diffuse and horseshoe shaped. It has maternal and embryonic surface. It is delivered at parturition retention may cause uterine hemorrhage. Maternal Surface shows Cotyledons and forms cobblestone appearance; originally placental septa are formed grooves into. It is covered with maternal decidua basalis. Fetal Surface, umbilical cord attachment, cord 1-2 cm diameter, 30-90cm long, covered with amniotic attached to chorionic plate, umbilical vessels branch into chorionic vessels which anastomose.

Fig3.2: Shows shape and both outer and inner surfaces of placenta

Chorionic Villi-Primary Villi week 2, trophoblastic shell cells, syncitiotrophoblast, cytotrophoblast, form finger-like extensions. Chorionic Villi- Secondary Villi, week 3, extraembryonic mesoderm grows into villi, covers entire surface of chorionic sac.

Chorionic Villi- Tertiary Villi, mesenchyme differentiates into blood vessels and cells, forms arteriocapillary network fuse with placental vessels, developing in connecting stalk.

Chorionic Villi Stem, or anchoring villi, cytotrophoblast cells attached to maternal tissue, Branched or terminal villi, grow from sides of stem villi, region of main exchange, surrounded by maternal blood in intervillous spaces, maternal sinusoids,

Chorionic Villi originally cover entire chorionic surface, become restricted to decidua basalis region Frondosum, Capsularis.

Maternal Decidua basalis reaction, deposition of glycogen proliferation of blood vessels, artery dilatation, due to extra villous trophoblast cells invading uterine wall and maternal spiral arteries replacing both smooth muscle with fibrinoid material and part of vessel endothelium, Layers which separate maternal and fetal blood include syncitiotrophoblast, cytotrophoblast villi, connective tissue and fetal capillary endothelium. The 3 main functions of the placenta are metabolism transport, endocrine.
Placental Metabolism: It synthesizes, glycogen, cholesterol fatty acids, provides nutrient and energy.

Placental Transport, gases and nutrition oxygen, carbon dioxide, carbon monoxide, water, glucose, vitamins, hormones, mainly steroid not protein, electrolytes, maternal antibodies, waste products, urea, uric acid, bilirubin, drugs and their metabolites are transported, fetal drug addiction, infectious agents, cytomegalovirus, rubella, measles and microorganisms are also transported across the placenta unless stopped by placental barriers.

Placental Blood vessels, form in the connecting stalk first then in umbilical cord, anastomose in chorion, extend maternally toward chorionic villi extend embryonically

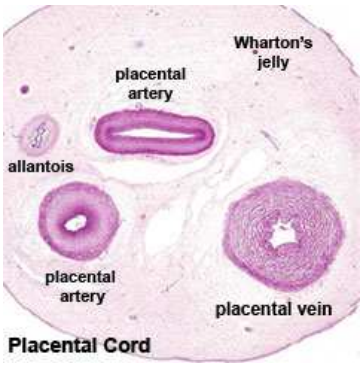
to the sinus venosus and dorsal aorta, Arteries paired carry deoxygenated blood (from dorsal aorta) and waste products to the placental villi Veins paired initially then only left at end of embryonic period carry oxygenated blood to the embryo (sinus venosus).

Wharton's jelly:

Wharton's jelly is a placental cord (umbilical cord) gelatinous connective tissue composed of myofibroblast-like stromal cells, collagen fibers, and proteoglycans. It is seen at parturition when it increases in volume (myxomatous, connective tissue embedded in mucus) to assist closure of placental blood vessels.

Matrix cells from Wharton's jelly have recently been identified as a potential source of stem cells.

This placental cord substance is named after Thomas Wharton (1614-1673) an English physician and anatomist who first described it.



Placental structure:

Angiogenesis development of new vessels from already existing vessels, this process is secondary to vasculogenesis which is the initial formation of first blood vessels by differentiation of pluripotent mesenchymal cells (extraembryonic mesoderm). A**ngioblast** form clusters or blood islands on surface of yolk sac. **Chorionic sac It is formed by the** fetal membrane that surrounds the developing embryo. C**ord knotting** umbilical cord knotting occurs in 1% of cases prevents the passage of placental blood. Pseudo knots also occur usually with no effect. **Cotyledons** maternal side cobblestone appearance, originally placental septa formed.

Cytotrophoblast:

extraembryonic cells of trophoblastic shell surrounding embryo, contribute to villi and placental membranes.

Decidua basalis reaction occurs in maternal endometrium at site of, and following, blastocyst implantation. Seen as a deposition of glycogen and proliferation of blood vessels.

Decidualization process by which uterine stromal cells differentiate in response to both steroid hormones and embryonic signals into large epitheloid decidual cells. This process is essential for the progress of implantation and establishing fetal-maternal communication.

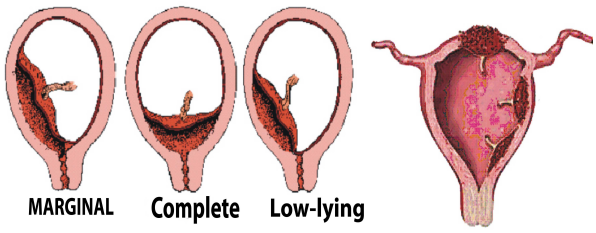


Fig 3.3: shows locality and position of placenta

Endocrinology of Fetal Placenta:

Trophoblast cells are the major source of placental hormones. Human chorionic gonadotrophin (hCG), like luteinizing

hormone, supports corpus luteum. Human chorionic somatomammotropin (hCS), or placental lactogen hormone level increases in maternal blood through pregnancy decreases maternal insulin sensitivity (raising maternal blood glucose levels and decreasing maternal glucose utilization) aiding fetal nutrition, "anti-insulin" function, Human chorionic thyrotropin (hCT), (hCT) Peptide placental hormone, similar to anterior pituitary are released Thyroid stimulating hormone (TSH), which along with human chorionic gonadotrophin (hCG) acts on maternal thyroid. Human chorionic corticotropin (hCACTH), placental hormone thought to have corticotropin (ACTH)-like activity, increasing maternal cortisol levels. Steroid Hormones, progestins - progesterone, support the endometrium and suppress uterine smooth muscle contractility, estrogens - estriol, stimulates growth of the myometrium and mammary gland. Both hormones support maternal endometrium Relaxin high levels early in pregnancy promotes angiogenesis probably plays a role in development of the uterus.

Placental growth hormone (PGH) is mainly expressed in the syncytiotrophoblast cells (PGH differs from pituitary derived growth hormone by 13 amino acids). extra villous cytotrophoblast - arise from anchoring villi invade the uterine spiral arteries, generating fibrinoid material and endovascular trophoblastic cells. Syncytiotrophoblast

HCG:

Human chorionic gonadotrophin (hCG) like luteinizing hormone supports corpus luteum. Human chorionic somatomammotropin (hCS) or placental lactogen, stimulate mammary development. Human chorionic thyrotropin (hCT). Human chorionic corticotropin (hCACTH), progesterone and estrogens support maternal endometrium, Relaxin- role in parturition, softens ligaments.

Placenta Human chorionic gonadotrophin (hCG) after implantation cells within the developing placenta (syncitiotrophoblast) synthesize and secrete Human chorionic gonadotrophin (hCG) into the maternal bloodstream. The main function of serum hCG is to maintain the corpus luteum in the maternal ovary and therefore maintain the early pregnancy that is block the menstrual cycle. Functions of Estrogen and progesterone – in receptive phase the

Weeks after Last Menstrual period (LMP)	**Days after Fertilization**	**hCG level for Singleton (mIU/ml or IU/L)**
Week 3	7	0 to 5
Week 4	14 (next period due)	5 to 426
Week 5	21	18 to 7340
Week 6	28	1,080 to 56,500
Weeks 7 to 8	35 to 42	7,650 to 229,000
Weeks 9 to 12	49 to 70	25,700 to 288,000
Weeks 13 to 16	77 to 100	13,300 to 254,000
Weeks 17 to 24		4,060 to 165,400
Weeks 25 to birth		3,640 to 117,000
Weeks 4 to 6 neonatal		Less than 5

Fig3.4: Shows Level of HCG in Pregnancy

Luminal and glandular epithelial cells change in preparation for blastocyst ad plantation. Human Chorionic gonadotropin - luminal epithelium endo replication leading to epithelial plaque formation. Human Chorionic gonadotropin - trophoblast invasion.

Decasualization of human stromal fibroblasts.

Maternal Decidual Cells are differentiated by progesterone from endometrial stromal cells (fibroblast-like). These cells change morphology (become enlarged and polygonal) and secrete various factors (prolactin, insulin-like growth factor binding protein-1, tissue factor, interleukin-15, and vascular endothelial growth factor).

Endocrine Function

Chorionic gonadotrophins - These hormones rise sharply during the early weeks of pregnancy, reaching a peak at 8-10 weeks. This falls rapidly to slightly above non-pregnant level at 20 weeks and continue to remain low till term. These hormones are produced by the cytotrophoblast.

O estrogens - They show a steady rise till the third week and then a more rapid rise to a peak just before term, falling rapidly just before the onset of lab our. Oestriol is discussed in more details under fetal physiology.

Progesterone - This rises during early pregnancy, steadily reaches a peak at about 36 weeks, after which there is a slight fall till term.

Adrenocorticotrophic Hormone - There is some evidence that the placenta secretes ACTH which may be an important factor in causing hypertrophy of the adrenal cortex in pregnancy.

Placental Lactogenic Hormone - This is a poly-peptide, similar to growth hormone, and has a somatotrophic and a mammotrophic action; it is hence also known as human chorionic somato-mammotropin.

Enzymes - The enzymes are produced by the Syncytial trophoblast. These include cystine amino-peptidase (oxytocinase), diamine oxidase, heat stable alkaline phosphatase lactic dehydrogenase and iso-citric dehydrogenase. The exact functions of these substances are not established.

Maternal Placental Components:

Fibrinoid – this substance is found in two different forms. It is extracellular matrix: Fibrin-type fibrinoid is a maternal blood-clot product which replaces degenerative syncytiotrophoblast and Matrix-type fibrinoid is secreted by invasive extra villous trophoblast cells. This fibrinoid layer (Nitabuch's layer) is thought to act to prevent excessively deep implantation. **Decidualization -** process of endometrial stromal cells (fibroblast-like) change in morphology (polygonal cells) and protein expression (specific decidual proteins) forming decidual cells. Endo replication - rounds of nuclear DNA replication without intervening cell or nuclear division (mitosis). **Cytokines -** of maternal origin also act on placental development. Natural Killer (NK) cells - are present in the maternal decidua in large numbers close to the extra villous trophoblast cells

Blood flow through the Embryo/Placenta:
Maternal Blood passes through umbilical vein and liver and anastomosis with sinus venosus and atria ventricles and truncus arteriosus leading to aortic sac, aortic arches, dorsal aorta and pair of umbilical arteries into maternal blood there are essentially 3 separate aortic/venous circulatory systems: umbilical, systemic and vitelline. The umbilical system is lost at birth, the vitelline contributes to the portal system and the systemic (embryonic) is extensively remodeled to form the cardiovascular system.

The knowledge regarding complete functions of the placenta is still very incomplete. Much of the work has been done on the lower animals where the structure of the placenta differs from that of the hemochorial human placenta.

Some substances, such as gases and crystalloid substances with small molecules apparently pass the placenta by simple diffusion. For the transfer of other substances active mechanisms are necessary. This occurs against a gradient, e.g. the amino-acids which are present in greater concentration on the fetal than on the maternal side, are transported across the placenta by a mechanism of active transport where energy is required for this function.

Respiratory Function - The placenta acts as the lungs of the fetus, taking up oxygen from the maternal blood and giving up carbon dioxide. Transfer occurs by simple diffusion from an area of higher concentration to an area of lower concentration.

Excretory Function - The placenta acts as a kidney, excreting waste material} urea, uric acid and bile pigments into the maternal blood. These substances also seem to pass freely by simple diffusion.

Nutritive Function

Water - passes to the foetus throughout pregnancy. This process is favored by the fact that the maternal blood pressure is higher than the foetal, and that the osmotic pressure of the foetal blood is higher than that of the maternal blood. The rate of transfer of water increases rapidly till the 35th week of pregnancy. There is a sharp fall till term because practically all the water is returned to the maternal circulation, so that the amount of water in the foetus is maintained by a dynamic equilibrium.

Carbohydrate - Sugar passes freely across the placenta by dif-fusion or assisted enzymatic process. Its concentration in the maternal blood is always somewhat higher than in the fetal blood. The fetal blood contains two sugars - glucose and fructose, the fructose being apparently derived from maternal glucose. There are large stores of glycogen in the placenta which acts to some extent, as the fetal liver. The placenta itself is metabolically very active, being rich in various enzymes. The oxygen consumption of the placenta is 10 ml/kg/min. which is twice that of the foetus or mother.

Proteins - Some proteins pass through the placenta unchanged, e.g. Rhesus antibodies and immunoglobulins. Pinocytosis has been suggested as a mechanism for this transfer. The pinocytic engulf vesicles of maternal plasma and discharge the contents into the fetal side of the trophoblastic layer. However, many other proteins with large molecules are broken down into simpler sub-stances before passing the placenta. These are then resynthesized in the foetus.

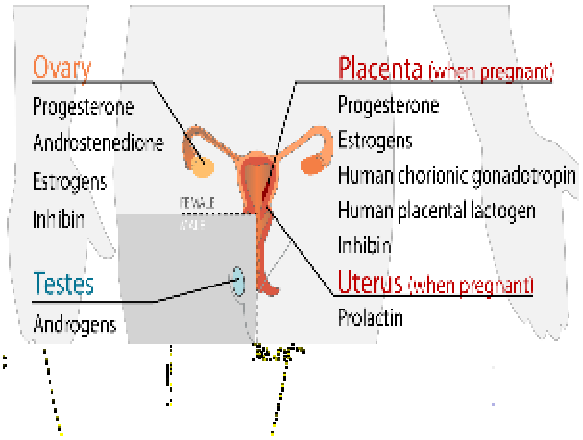


Fig3.5: Showing hormones produced and their actions.

Fats - There has been controversy as to whether the placenta is permeable to fats. Experiments have shown that part of the fetal fat is derived from pre-formed maternal fat but the greater part of it is synthesized by the foetus from carbohydrates.

Iron:

This mineral passes straight to the foetus without being first incorporated in the maternal haemoglobin.

Sodium:

The permeability of the human placenta to sodium increases 70 times from the 9th to the 36th week of pregnancy, after which it declines rapidly to term. However, less than 0.1 percent of the sodium that reaches the foetus is retained and 99.9 percent is re-turned to the maternal circulation.

Vitamins:

The water soluble vitamins pass through the placenta easily. The fat soluble vitamins, however, traverse the placenta more slowly and tend to accumulate in the fat stores.

Hormones - Steroid hormones are transported easily through the placenta (see foetal physiology: estriol metabolism) thyroxin is transferred slowly in physiological amounts from the maternal to the foetal blood, so is growth hormone.

Barrier Function:

Drugs:

Anaesthetic drugs like morphine and thiopentone cross the placenta with ease. Most anti-Biotics pass the placenta easily.

Organisms - These are stopped to a large extent. However, after prolonged infection and damage to the chorionic epithelium, organisms may pass into the foetus. Congenital tuberculosis is rare. In malaria, syphilis and toxoplasmosis the organisms may pass into the foetus, especially in late pregnancy when the syncytium is thin. Viruses (e.g. rubella, smallpox pass the placenta easily.

Red Blood Cells - Micro foetus - maternal transplacental hemorrhage can occur and are of great importance in the management of Rhesus isoimmune negation. The risks of such leakage are increased if the placenta is damaged ante-partum as it happens in hemorrhage and external cephalic version.

REFERENCES

1. Placental blood circulation: Kiserud, T.; Acharya, G. (2004). "The fetal circulation". Prenatal Diagnosis 24 (13): 1049. doi:10.1002/pd.1062. PMID 15614842.

2. Simister, N.E., and Story, C.M. 1997. "Human placental Fc receptors and the transmission of antibodies from mother to fetus." Journal of Reproductive Immunology 37: 1-23.

3. Clark DA, Chaput A, Tutton D (March 1986). "Active suppression of host-vs-graft reaction in pregnant mice. VII. Spontaneous abortion of allogeneic CBA/J x DBA/2 fetuses in the uterus of CBA/J mice correlates with deficient non-T suppressor cell activity". J. Immunol. 136 (5): 1668–75. PMID 2936806.

4. Williams Z, Zepf D, Longtine J, et al. (March 2008). "Foreign fetal cells persist in the maternal circulation". Fertil. Steril. 91 (6): 2593–5. doi:10.1016/j.fertnstert.2008.02.008. PMID 18384774.

5. Assad, RS; Lee, FY; Hanley, FL (2001). "Placental compliance during fetal extracorporeal circulation". Journal of applied physiology (Bethesda, Md. : 1985) 90 (5): 1882–6. PMID 11299282.

6. Prendiville, W. J.; Elbourne, D.; McDonald, S. J.; Begley, C. M. (2000). Begley, Cecily M. ed. "Active versus expectant management in the third stage of labour". Cochrane Database of Systematic Reviews (3). doi:10.1002/14651858.CD000007.

7. Buckley, Sarah J.. "Placenta Rituals and Folklore from around the World". Mothering. Archived from the original on 6 January 2008. Retrieved 7 January 2008.

8. Falcao, Ronnie. "Medicinal Uses of the Placenta". Retrieved 25 November 2008.

Chapter Outline

Historic Perspective

Fetal Circulation and Oxygenation

Respiratory System

Urinary System

The Body Composition

Estriol Production

FETAL PHYSIOLOGY

Historic Perspective

Over the past two decades there has been a vast increase in know-ledge relating to fetal physiology. The basic difference in the adult and fetal circulation should be known to every student, practicing obstetrics as it is he or she who will have to deal with problems arising due to difference in circulation.

Fetal Circulation and Oxygenation - The fetal circulation, as compared to the adult circulation, is characterized by the presence of the umbilical circulation and the functional vascular shunts. The blood from the placenta is carried via the umbilical vein. It divides into two branches, one of which carries a small amount of blood through the liver and empties into the inferior vena cava via the hepatic vein. The other larger branch, called the ductus venosus, empties directly into the vena cava. On entering the heart a greater portion of the blood from the inferior vena cava flows from the right into the left atrium via the foramen ovale. The blood from the left atrium (which also contains blood from the pulmonary veins) passes into the left ventricle from where it is pumped into the aorta. The major portion of this blood then passes into the carotid arteries to supply the head.

The blood in the right atrium is derived from the inferior vena cava, a small portion from the superior vena cava and the carotid sinus. This blood flows into the right ventricle and is then pumped into the pulmonary trunk. The greater portion of this blood passes into the descending aorta via the ductus arteriosus, due to the high vascular resistance of the pulmonary circuit. The rate of umbilical blood flow in the human foetus increases proportionately with the fetal weight at about 120 ml/kg/min. The return of blood from the placenta to the foetus occurs despite the lack of muscular contractions, respiratory movements or the influence of gravity. The cardiac output of the foetus is about 200 ml/kg/min.

Fetal Oxygenation:

The fact-ors that influence oxygen transfer across the placenta have already been discussed in the Chapter on placental physiology.

The oxygen pressure gradient is one of the most important factors in normal pregnancy. The human fetal umbilical arterial blood has an oxygen saturation of 2.5 - 4 per cent (PO_2 = 15-18 mm Hg). The oxygen consumption of the

fetus remains fairly constant at about 5 ml/kg/min, a value similar to that of an adult at rest. This finding has led to the concept of "Mount Everest in Utero" which has carried with it the implication that the foetus lives in a hypoxic condition. There are therefore certain special hematological aspects peculiar to the foetus to ensure adequate oxygenation of the tissues. There is a progressive increase in the erythrocyte count, haemoglobin concentration, and hematocrit with a decrease in the mean corpuscular volume, diameter and cell thickness.

The haemoglobin concentration at term is about 17G percent. The fetal haemoglobin (HbF) differs in structure from adult haemoglobin and has a greater affinity for oxygen. There is a difference in the oxygen dissociation curves of fetal and maternal blood. At a given PO2 and under identical temperature and pH, fetal blood has higher oxygen saturation than. The oxygen consumption of the fetus remains fairly constant at about 5 ml/kg/min, a value similar to that of an adult at rest. This finding has led to the concept of "Mount Everest in Utero" which has carried with it the implication that the foet Umbilical vein and arteries There are therefore certain special hematological aspects peculiar to the foetus to ensure adequate oxygenation of the tissues. There is a progressive increase in the erythrocyte count, haemoglobin concentration, and hematocrit with a decrease in the mean corpuscular volume, diameter and cell thickness.

The haemoglobin concentration at term is about 17G percent. The fetal haemoglobin (HbF) differs in structure from adult haemoglobin and has a greater affinity for oxygen. There is a difference in the oxygen dissociation curves of fetal and maternal blood. At a given PO2 and under identical temperature and pH, fetal blood has higher oxygen saturation than Maternal blood

Finally, with a normal heart rate of 120-160 per minute and a cardiac output of 200 ml/ kg/min oxygen supply to the tissues is ensured in the healthy foetus.

Respiratory System - Several authors have reported spontaneous foetal respiratory movements at or near term but the results are not yet conclusive. The main methods of study had been direct observation, injection of material into' the amniotic fluid, and the demonstration of amniotic elements (e.g. meconium, lanugo hairs) in the fetal lungs.

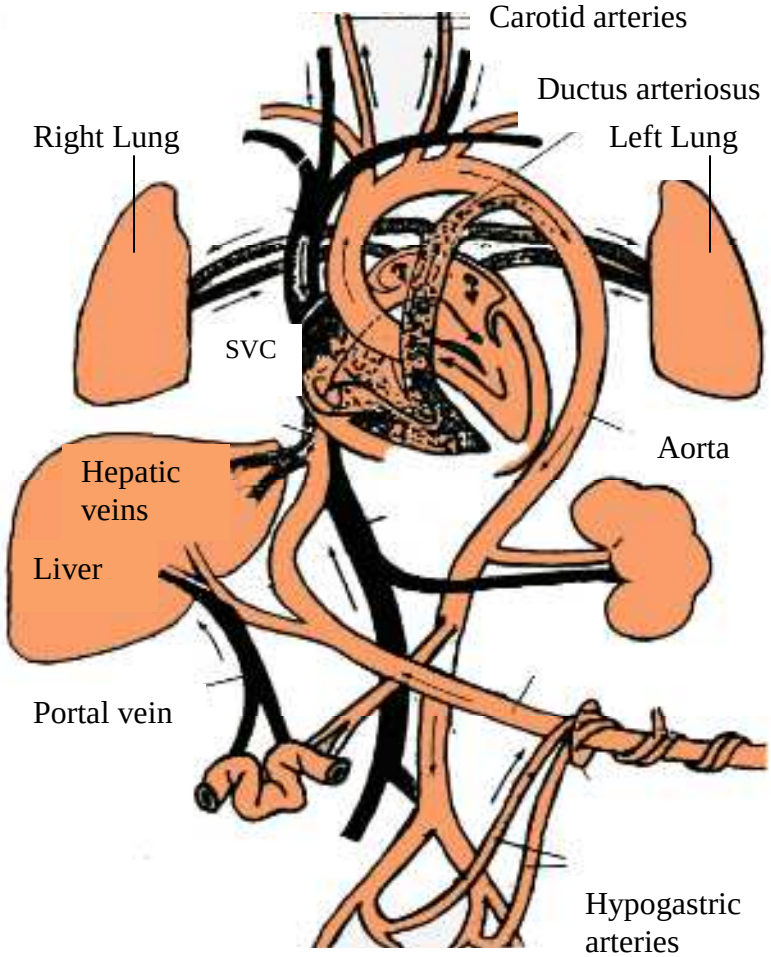


Fig 4.1: Shows fetal circulation with umbilical cord containing three vessels, two arteries and one vein.

Urinary System - The kidneys of the human foetus excrete urine as early as the 4th month of gestation. The formation of new glomeruli

continues up to' about the 36th week of gestation and the renal blood flow and clearance rate increases 'with advancing gestation. However, although the kidneys of the foetus are functional they do' not appear to' be necessary for fetal life since fetuses can be born alive with congenital absence of the kidneys.

The Body Composition - Human foetal development is accompanied by changes in the total body composition. These changes are due to' alterations occurring in the structure of individual tissues. There is increased fat deposition in the bones. Skeletal muscles show an increase in protein, potassium, phosphorus and magnesium concentrations. The quantity of water in the human foetus is between 90-95 percent of the body weight in early gestation and 70-75 percent of body weight at term.

The foetus synthesizes its own proteins from amino' acids derived from the maternal blood with the possible exception of gamma globulin. The concentration of amino' acid in the foetal blood decreases as gestation progresses reflecting the increased rate of protein deposition in the second half of gestation. The principal sugar in human foetal blood is glucose, with fructose present in small amounts. Although its level is influenced by the maternal level, the glucose concentration in the fetal blood is less than the mother's.

Estriol Production:
The foetus and placenta in the human act as an integrated "fetoplacental unit" in the production and metabolism of steroid hormones. This is mainly due to' the differential enzyme systems of the two organs, which compete with each other. The main interest has been the production of steroid hormones, especially estriol. The mechanism is summarized in Figure.

As can be seen from the diagram, estriol is manufactured in the 'fetoplacental unit' from both foetal and maternal precursors. The foetal adrenal gland produces dehydro-epiandrosterone sulphate, which is the main precursor. Oestrone and Oestradiol (produced

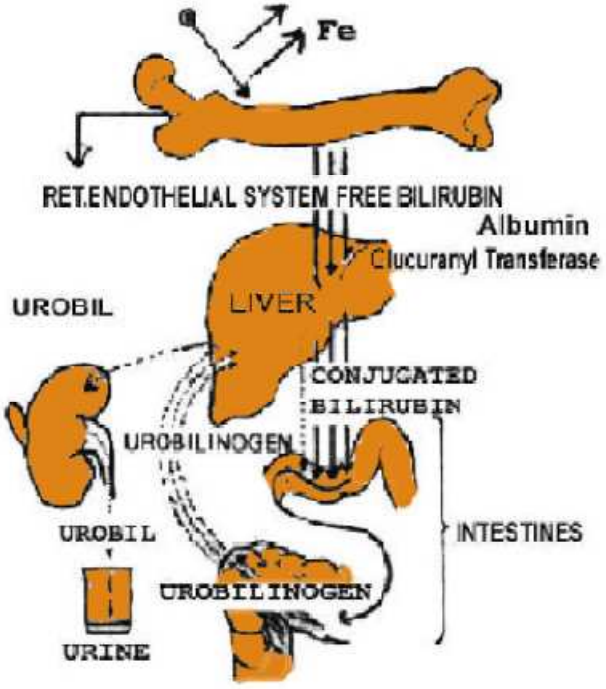


Fig 4.2: Shows Estriol biosynthesis in late pregnancy

sulphate (produced in the fetal adrenals) are hydroxylated mainly in the fetal liver. The estriol sulphate thus formed by the foetus returns to' the placenta, where it is hydrolyzed to estriol. The estriol liberated is conjugated in the mother and excreted as sulphate and glucuronides.

The importance of the faetal adrenal gland in the formation of estriol is also substantiated by the observation that urinary estriol excretin is very low in pregnant women with an Anencephalic foetus (deficient foetal adrenal cortical development from lack of hypothalamic-pituitary stimulation).

REFERENCES

1. Brace RA. Regulation of blood volume in utero. In: Hanson MA, Spencer JAD, Ro deck CH, editors. The circulation, Fetus and neonate. Physiology and clinical application, vol. 1. Cambridge: Cambridge University Press; 1993. P. 75e99.

2. Castle B, Mackenzie IZ. In vivo observations on intravascular blood pressure in the fetus during mid-pregnancy. In: Rolfs P, editor. Fetal physiological measurements. London, Boston, Durban, Singapore, Toronto, Wellington: Butterworth's; 1986. P. 65e9.

3. Johnson P, Maxwell DJ, Tytan MJ, Allan LD. Intracardiac pressures in the human fetus. Heart 2000; 84:59e63.

4. Ville Y, Sedaris I, Hasher K, Snijders RJM, Nicola ides KH. Umbilical venous pressure in normal, growth-retarded, and anemic fetuses. Am J Obstet Gyne col 1994; 170:487e94.

5. Thornburg KL, Morton MJ. Development of the cardiovascular system. In: Thor burn GD, Harding R, editors. Textbook of fetal physiology. Oxford: Oxford University Press; 1994.

Chapter Outline

Objectives of prenatal care:

Prenatal Care:

PRENATAL CARE

Pregnancy is primarily a social event which is marked by sense of personal fulfillment and pride of motherhood. The joy of introducing a new family member often over shadows the problems arising from pregnancy. The extra demands on the personal health of the women and increased pressure on the family budget are forgotten at this moment. This occasion can turn into a disaster and become cause of immense personal grief and disappointment if an unexpected complication of pregnancy develops.

Objectives of prenatal care:

Main objective of prenatal care is to provide choice of continuity of care and greater accessibility for women to see their doctor during pregnancy and thus provide a high standard of care to women.

In order to safe guard women from unpleasant surprises, the Physician should plan a Programme of continuous observation, assessment, support and intervention. His efforts should be directed towards maintaining or improving the physical and emotional health of the pregnant women. During this period he must foster an environment which is conducive to optimum growth and development of the fetus and infant. Ante partum care should be organized in such a fashion that it is comprehensive, continuous, and personalized. Its main objective should be to prevent occurrence of any medical or social event which may jeopardize the health of mother and her baby.

Who should Deliver Prenatal Care - Physician delivering care will be involved in widely diverse issues such as medical problems, socioeconomic class, smoking, drug abuse, nutrition, and travel safety. He is often expected to screen a wide variety of medical disorders and risk factors. The diagnostic tools as well as therapeutic regimen have changed dramatically in recent years and are likely to change further in future.

Women today is making their own choices about coping with pain in labor, positioning during delivery and breast-feeding. These demands are making the task of an ordinary physician, much more difficult. Practicing obstetrics is not the job for an ordinary physician. The training of our undergraduate students on this subject is inadequate, therefore one must decide whether he is going to

practice obstetrics and give prenatal care. One must recognize that his volume of obstetrical practice is sufficient to provide him with the opportunity of diagnosing and treating various medical disorders of pregnancy. One must be competent to screen patients for various complications on his own and then refer to a competent Physician capable of dealing with them.

Care Protocol:

It is desirable that a pregnant women at 6 - 12 weeks of pregnancy sees a doctor for confirmation of pregnancy, who will take history and do full physical examination. The doctor will check FBC and Platelets, Blood group and antibodies, VDRL & TPHA serology. He will also do Hepatitis B screening,
MSU & urinalysis, Rubella serology and HVS/HIV/Hep C in high risk patients.

At 16 weeks doctor will do Routine check, review Test results, at 20 weeks he will Review ultrasound result. Change dates only if ultrasound scan is > 10 days different to menstrual dates, at 24 weeks he will do Routine check, consider nutritional supplements, at 28 weeks he will do Routine check and carry. F.B.C. and Platelets Antibody screening and Consider G.T.T. for diabetes screening,

At 32 weeks the doctor will do Routine check, at 34 weeks he will do Routine check and if Rhesus negative, antibody screening will be carried, at 36 weeks the physician will Confirm presentation, growth and review birth arrangements, at 41 weeks the physician will Plan delivery. 6 weeks postnatal he will see Mother and do vaginal and take examination and take (Pap smear if necessary). For Infant he arranges pediatric assessment and arranges immunizations.

Continuing Medical Education: To maintain special skills, required for obstetrical care, continuous up dating of clinical knowledge is necessary. This can be possible if there is regular evaluation of the physician by his peers and continuous feedback from the obstetrical consultants to whom he refers his patients. Unfortunately this is not a routine in our country. Most of us who are involved in teaching obstetrics are very worried about the way this specialty is being practiced.

First Visit:

This should be arranged as early as possible preferably soon after the first menstrual period has been missed. The information obtained at this visit should include history, physical, and laboratory examination. This record can serve several useful functions. One may recognize a complication for which one feels referral is appropriate, and then one may pass on all necessary information to the obstetrical consultant. Other functions of this information are discussed below.

Uniformity of Record Documents:

If Physicians across the country could use standard prenatal records, this will facilitate a complete and organized collection of information and also make the task of Physician easy in following other colleagues' observations. Uniform documentation can help to perform other important functions such as good patient care, good communication, self-assessment and periodic audit, for evaluation of personal practice.

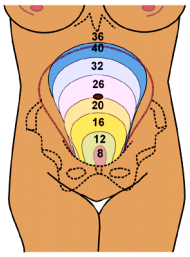
Determination of estimated date of Confinement:
The Nägele's Rule:

According to Nägele's rule approximate length of pregnancy is around 266 days and it can be worked out by adding 7 days to the first day of LMP, subtracting 3 months from the month of menstrual period and adding one year to the year of LMP.

With this method the average length of pregnancy comes to about 280 days. When the patient's LMP was on 2nd August, 1982 her EDC can be calculated.

Quickening:

This can sometimes provide rough estimation of duration of pregnancy It occurs around 18 weeks in multigravida while in primigravida it occurs at 20 weeks of gestation.



Height of Fundus:

This can be felt on palpating the abdomen; it lies just above the symphysis pubis at 12 weeks. At 16 weeks it lies half way between the symphysis and umbilicus, when it lies at the umbilicus it represents 20 weeks of gestational period.

At 24 weeks the fundal height lies at the upper border of the umbilicus. When the height is midway between the umbilicus and xiphoid the gestational age is around 32 weeks. At 36 weeks it lies at xiphoid. At 40 weeks it lies about 2 fingers below the xiphoid. These measurements are quite rough. The distance between symphysis and xiphoid varies from individual to individual. Similarly the girth varies.

Spiegelberg' S Measurements:

The distance between the fundus and symphysis is measured in centimeters and divided by 3.5. This gives the duration of pregnancy in lunar months.

Its reliability before 6 months of pregnancy is questionable. Most authorities use these measurements in conjunction with Nägele's Rule.

Ultrasonic Measurement:

Ultrasonic methods have been proven quite useful for measurement of gestational sac and biparietal diameter. These measurements are helpful in establishing the period of gestation correctly.

The student is referred to Chapter on ultrasound in obstetrics, for further details. To determine the EDC: If the last menstrual period (LMP) is certain and the menstrual cycle regular, add 7 days and 9 months or add 280 days to the first day of the LMP.

If the cycle length is greater than or less than 28 days then add or subtract the difference respectively. For example, for a 35 day cycle add 14 days and 9 months or 287 days.

In cases where the LMP is unknown or uncertain an ultrasound scan (USS) should be used to determine the EDC.

Using the USS(s) note:

The earlier the USS, the more accurate in terms of dating however the fetal heart beat needs to be seen. In choosing between multiple scans always use the earliest USS that shows a fetal heart beat.

Only change menstrual determined dates if:

The USS at less than 12 weeks gestation is 6 or more than 6 days different to the LMP. The USS at 12 to 20 weeks is 10 or more than 10 days different to the LMP. Dates should not be changed by a third trimester ultrasound scan.

Examinations:

It is suggested that the visits include the following: History - foetal movements, Symptoms of pregnancy, other, symptoms and issues. Examination: Blood pressure Urinalysis, Evidence of peripheral edema and the fetal presentation after 26 weeks. The engagement of the head after 37

weeks. Foetal Heart Rate - Doppler after 16 weeks Auscultation after 26 weeks. Estimation of Symphysial-fundal height Symphysial-Fundal Height to be measured after 20 weeks gestation.

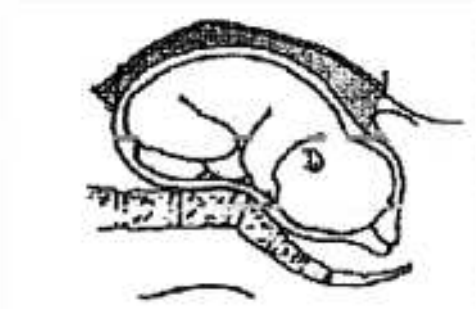


Fig 5.1: Shows symphysial fundal height measurement

Fundal height should be measured from the fundus of the uterus to the top of the symphysis pubis, with the tape measure lying in contact with the skin of the abdominal wall. The measurement at the fundus should be made by palpation vertically downward.

The curves represent the 10th, 50th and 90th percentiles for normal pregnancy. Readings below the 10th percentile, between 28 and 34 weeks' gestation are most likely to predict intra-uterine growth retardation.

Initial Assessment: This should be carried out after detailed history and physical examination of the women.

Personal History:

The knowledge of patient's family situation, state of her marriage, the health dependency status of other children is important and should be recorded.

Genetic Assessment:

If the patient is 35 years or older and had delivered a baby with sex-linked inheritable disease, genetic amniocentesis should be considered. Ideal time for this procedure is around 12 to 13 weeks of pregnancy.

History of Present Pregnancy:

History of current pregnancy should include record of the last menstrual period, regularity of the cycles preceding it. Symptoms of pregnancy, such as morning sickness, frequency of micturition, early bleeding leg cramps and excessive vaginal discharge should be recorded. Special note should be made if there is history of exposure to infection; X - Rays and toxic drugs.

Reproductive History:

This should include detailed account of all previous pregnancies. A prior history of still birth or neonatal death along with the details surrounding the tragedy should be obtained. History of an infant over nine pounds.

Medical and Surgical History:

Complete medical and surgical history with particular emphasis on current: medical problems such as diabetes, chronic hypertension, urinary tract infection, anemia and psychiatric disorders should be recorded.

Family History:

This should include genetic or medical disorders which may risk this pregnancy. Detailed history of diabetes, hypertension, fraternal twinning, and hemophilia and translocation mongolism should be obtained.

Suitability for shared care:
Women usually unsuitable for shared care include: Those with a major medical condition e.g. diabetes, thyroid disease, hypertension, significant anaemia, cardiac disease, hemoglobinopathy, renal disease and epilepsy. Drug addiction, Rhesus allo

immunization or other abnormal serology, Previous stillbirth, neonatal death, Multiple pregnancy, History of preterm delivery/preterm rupture of membranes <32/40 Uterine abnormalities and Suitability can be discussed with the Obstetrician involved at booking.

Criteria for referral back to the first available clinic with obstetrician:

The doctor is encouraged to return the woman to the first available Clinic if any of the following problems arise: Multiple pregnancies.

Significant hypertension is detected i.e. BP > 140/90. Gestational Diabetes, Uterine growth is unusually small or large, i.e. Symphysial-fundal height (cm) <3 or >3 Gestation (weeks). Increased uterine activity is noted or reported (i.e. ? preterm labour). Placenta praevia detected. Foetal abnormality is suspected/detected, Generalized pruritus, Hb <95g/l, Rhesus allo immunization, Malpresentation after 36 weeks. Necessity for support services such as social worker or drug & alcohol services. Any other problem which represents a significant departure from a normal course and which will require attention before a routine clinic.

Criteria for immediate assessment at hospital whenever the following occurs:

Intractable vomiting with dehydration and ketosis. Preterm rupture of membranes. Threatened preterm delivery. Undiagnosed severe abdominal pain. Antepartum hemorrhage. Decreased foetal movements. Suspicion of death in-utero. Unusual headaches or visual disturbances. Seizures or "faints" in which seizure activity may have occurred. Dyspnea on mild-moderate exertion, orthopnea or nocturnal dyspnea. Symptoms or signs suggestive of deep vein thrombosis. Pyelonephritis. Symptoms or signs of pre-eclampsia Rupture of membranes and antepartum hemorrhage should go immediately to the Delivery Suite for assessment.

Patients referred back to the Hospital should be assessed by either the obstetric registrar or a specialist. To help ensure this they should be accompanied by a letterhead referral. It is also advisable to notify the registrar of the referral. If unsure whether the situation requires urgent Delivery Suite assessment or an earlier clinic appointment then it should be discussed with the registrar. Complications arising that may not need hospital assessment should be discussed with the registrar. Please note that for women in these urgent categories, vaginal speculum examinations would not be appropriate in the GP rooms.

Physical Examination:

This should include base line data on initial measurements such as B.P., pulse, temperature, respiration, weight, and edema. These parameters should be checked regularly throughout pregnancy.
Pre-pregnancy weight should be used to assess the total weight gain. There is some controversy regarding total weight gain and figures varying between 21 to 27 pounds are usually reported in the literature. In my opinion, the weight gain of 21 pounds at the rate of 7 pounds in each trimester can be accepted as normal. Rapid weight gain beyond these limits may be abnormal.

General Examination:

This should include note of general appearance, the state of nutrition, and examination of eyes, ears, nose, and throat. Examination of teeth with special attention to caries and dentures should not be missed. Palpation of thyroid gland should e done and followed by thorough review of all systems like cardiovascular, gastro intestinal and respiratory system. The heart

should be carefully auscultated and legs examined for varicose veins.

Examination of the Abdomen:

Special attention should be paid to the length and girth omen. Firmness of the rectus muscle and presence of stria over the abdomen should be noted. The fundal height should be noted. The lie, presentation and position of the fetus, should be determined by employing Leopold's maneuvers. The relation of the fetus to the abdominal wall of the mother can be easily established after 20 weeks, by palpating the abdominal wall.

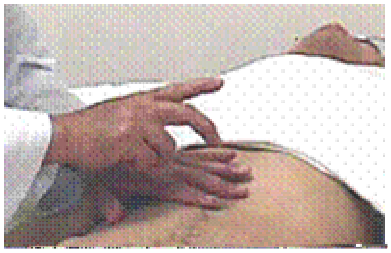


Fig 5.2: Shows abdominal, palpation and measurement for fundal height

The relation of the fetal body to that of the mother can be reliably established if these maneuvers are employed by an experienced physician. The student should stand facing toward the patient's head while carrying out the first three maneuvers while for the fourth maneuver he should face the feet of the patient.

The sequence of maneuvers should be followed strictly, while assessing the lie, presentation and position of the baby 2 each visit.

First Maneuver:

This can help to establish the part of the fetus which is occupying the fundus; there is no difficulty in establishing hard round bloated head from round soft and regular breech. The secret of successfully establishing fetal relationship to maternal part lies in the gentleness of the examiner's hand.

Second Maneuver:

This can provide information regarding the back of the baby. Standing on side of the patient and facing the head, the palms of the hand should be placed on either side of the abdomen. The back is usually felt as a linear, smooth bony ridge while on the opposite side a number of small parts can be felt. These findings can be very helpful in determining the position of the baby's back.

Third Maneuver:

This is usually carried by a single hand which is placed above the symphysis pubis. The examiner holds the presenting part between his thumb and fingers. The head is usually felt round and is easily ballotable while the breech feels nodular, soft and irregular lar.

Fourth Maneuver:

This is the only maneuver where the examiner faces towards the feet of the patient and uses both hands. He places his hands on each side of the lower part of the fetus. With this maneuver one can determine whether the presenting part is engaged or not. The attitude such as flex ion and extension of the fetal head along with the engagement can also be felt by this maneuver.

Fetal Movements:

These may be visible through the abdominal wall. Most patients can feel these movements after 20 weeks of pregnancy.

Estimation of Fetal Size: Rough estimation of fetal size and weight can be made by palpation and auscultation but precise measurement is extremely difficult

even in most expert hands and errors of 1 to lY2 pound weight are quite common.

Fetal Heart Rate Recording:

At each visit fetal heart rate should be recorded by fetoscope and compared with maternal pulse in order to check the rate and regularity. Now-a-days doptone machine is readily available; it should be preferred over conventional fetoscope.

Vaginal Examination:

This must be carried out at the first pre-natal visit to determine the size of the uterus, exclude pelvic tumors and obtain cervical smear for cytology. This examination can be repeated later in pregnancy under strict sterile conditions to determine the adequacy of the pelvis and rule out cephalopelvic disproportion.

Investigations:

Provides a list of routine antepartum screening tests. """"--ESE tests should be done in all patients. Some of these should be repeated at' each visit, special antepartum screening tests should be carried whenever indicated.

Objectives of Prenatal Classes:

The main objective of prenatal classes is to allay anxiety of the patient.

Estimation of Date of Confinement by Ultrasound Scan:

Difficulty in estimation of this time is one of the most common problem faced the practicing obstetrician. Amongst the various factors which contribute to un-certain dates; poor memory is the most frequently encountered problem. Irregular and abnormal periods, long or short cycle, intermenstrual spotting, recent use of contraception, are some of the other factors responsible for this problem, ultrasonic.

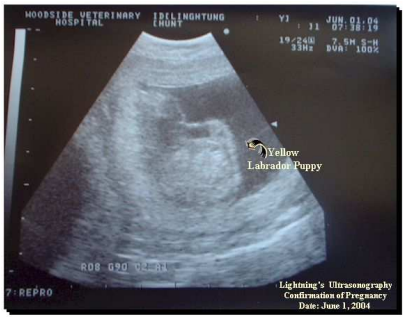


Fig5.3: shows ultrasound scan of fetus in utero

In when performed in the first or the second trimester of pregnancy can help if there is uncertainty of date. Biparietal diameter, when measured between 16 to 22 weeks provides reliable information. Similarly, measurements of the gestational sac and e crown-rump length of the fetus may be performed from six to eight weeks onward.

Ultrasonography can not provide reliable information about maturity from 28 weeks on, since there is increasing divergence in the fetal sizes during this period. Some babies are destined to be small and the others large, and there is no method available to differentiate between them.

Amniocentesis: This is an invasive test and therefore should be done only where definite indication is present a). Down syndrome and other genetic defects, this procedure is done between 14to 16 weeks.

b). Rh isoimmunization, whenever indicated after 22 weeks. c) Fetal age determination at 35 to 37 weeks screening for Sickle cell disease. Tay Sachs (both parents) should be screened special glucose tolerance test lasting for 3 to 5 hours.

Protocol for Subsequent Visits - A normal pregnant-women should be seen every month up to 32 weeks, thereafter

every two weeks up to 36 weeks and then weekly until delivery. Information collected during these visits should include gestational age, weight, height, blood pressure, symphysis to fundal height measurement in centimeters, and auscultation of the fetal heart.

Urine should be checked for sugar, protein and the blood ·for hemoglobin once every trimester. Blood Group and Rhesus type should be done routinely in all cases.

In Rh negative cases, antibody screening must be carried out. VORL and Kahn test for syphilis should be done on all patients irrespective of their social status. Rubella titre should be checked routinely. Pap smear should be obtained and checked for cervical cytology.

Additional testing should be individualized to particular patient needs. A woman with a past history of nine pound baby should have a glucose tolerance test. Where polyhydramnios is present, X-Ray abdomen to exclude fetal abnormality should be carried out.

There is absolutely no convincing evidence of benefit of 'routine' ultrasound scanning or antepartum fetal monitoring or estriol measurement in the normal and uncomplicated obstetrical patient.

Nutritional supplements and sneering test:

Folic Acid:

Folic Acid 500mcg should be recommended for all patients from preconception up to 12 weeks. The dose increased to 5mg if patient is taking antiepileptic drugs, has a history of NTD or a NTD-affected past pregnancy, has elevated homocysteine levels or has a BMI >30.

Iron:

A booking Hb of <10.5 should be further investigated, and extra iron supplements commenced where appropriate.

Iodine:

NHMRC recommends supplementation of 150 µg/day to ensure that all women who are pregnant, breastfeeding or considering pregnancy have adequate iodine status

Ultrasound:

First trimester dating scan is required for those with uncertain dates, Ultrasound should also be performed for relevant complications (e.g. vaginal bleeding).

Offer the option of a NT Plus scan at 11.5 – 14 weeks; please check that U/S provider is fully accredited to perform NT Plus scans At 18-20 weeks foetal morphology is assessed.
Please note abnormalities (e.g. low placenta) on the yellow card, the date the test was performed as well as gestational age at which it was identified:

Dating of the pregnancy by ultrasound becomes increasingly unreliable after 20 weeks gestation. Please fax the report and ensure the woman takes the ultrasound report and film to the Clinic at the next visit. After review, the films will usually be returned to the woman.

Colposcopy:

Women with Cervical intra-epithelial Neoplasia (CIN) diagnosed on the smear or just prior to the pregnancy

Team Approach In Prenatal Care - A team approach in the health care of pregnant patient is very desirable. An involvement of health care personal such

as Nutritionist, hospital nursing staff, nurse midwife and health visitors is indispensable. These people can contribute a great deal and form the backbone of good prenatal Programme.

These workers must work in close cooperation with the Physician, and help him to identify risk factors which may harm the mother and her baby if left without treatment.

Additional Screening and advice –

The Physician should ask leading questions about fetal movements, painful contractions, unusual discharge, dysuria, or back pain. If the uterus appears to be large for dates, he should consider error in dates, multiple pregnancy or large foetus due to gestational diabetes, or polyhydramnios. If the uterus is small for dates, then he should suspect error in dates, intrauterine growth retardation, oligohydramnios, or a congenital anomaly such as potter's syndrome. Ultrasound scanning, antepartum fetal monitoring and estriol measurement can help with the differential diagnosis in such cases.

If at any time after 20 weeks, a previously normal blood pressure rises to 140/90 or the systolic blood pressure rises to 30 mm of mercury and the diastolic blood pressure rises to 15 mm mercury, then the diagnosis of pregnancy induced hypertension or pre- eclampsia should be considered. Proteinuria, edema or excessive weight gain often but not always accompany these changes.

There is considerable increase in caloric need during normal pregnancy. The diet recommended should be well balanced and contains ample fluids.

In the past, there has been lot of emphasis on high protein diets. A recent randomized controlled trial suggests that excessive protein supplementation may be harmful and result in a higher prematurity rate.

Iron supplementation should probably be limited to women with a history of, or presently demonstrable, iron deficiency anemia. If the patient is identified as rubella sensitive, one should make a note and book the patient for rubella immunization after the delivery is completed. Rh immuno globulin should be given to all Rh negative women with Rh positive husbands.

First dose should be administered between 28 and 32 weeks of gestation, and then a second dose within 72 hours postpartum. Additional doses should be given during pregnancy in the event of antepartum hemorrhage; in any trimester where amniocentesis is carried out and in cases where the women had a therapeutic or criminal abortion or ectopic pregnancy. If for any reason anti-D-immunoglobulin injection could not be given within 72 hours postpartum, it can always be given later on with desired results.

The physician will be constantly subjected to inquiries from his patients regarding certain matters which concern their general health and the well being of their babies. He should therefore acquaint himself with the latest developments in these subjects.

Prophylactic Anti-d:

Given to all **Rhesus negative** women at 28 – 30 and 34 – 36 weeks in hospital clinics.

Thalassanemia Screening:

GP recommends that all pregnant women from the following risk groups be offered haemoglobin EPG as an initial investigation together with a full blood count and a manual film. South East Asian, Asian (including Indian, Pakistan,

Bangladesh) Mediterranean, Arabic, or Black African women If a patient is known or found to be a carrier the father's status needs to be ascertained, if father is also a carrier refer the patient urgently to a genetics counsellor to discuss fetal testing.

Varicella:

This screening test is to be offered to all pregnant women who do not have
a strong history of having had chicken pox or Herpes Zoster.

8) Influenza:

Vaccination1 is recommended by NHMRC for pregnant women in the 2nd and 3rd trimester during the influenza season, including those in the first trimester at the time of vaccination, as it has been shown to reduce hospitalization and morbidity. 10) Discuss Chlamydia testing with pregnant women who are under 25 years old, and any woman with an 'at risk' history.

Exercise - Pregnancy is a normal Physiological occurrence and shou Id be regarded as such. It is not necessary for the pregnant woman to limit exercise, but care should be taken that she does not over fatigue herself.

Where there is risk of body injury it should be avoided. Similarly any occupation that subjects the pregnant woman to severe physical strain should be avoided. Adequate periods of rest should be provided during the working day.

Travel - Travel in properly pressurized aircraft offers little risk. The pregnant woman should be encouraged to walk about when she intends to travel by rail car or automobile, every few hours during the journey.

Bathing and Clothing - Bathing poses no risk at any time during pregnancy or the Puerperium. Supporting brassieres along with loose but attractive clothing is desirable. Proper maternity girdle if available should be worn. Pregnant women develop backache from increased lordosis as a result of wearing shoes with high heels", these should be avoided.

Bowel Habits - There is generalized relaxation of smooth muscle and compression of the lower bowel by the enlarging uterus late in pregnancy, so constipation and hemorrhoids are more common during pregnancy.
Sufficient quantities of fluid, and reasonable amounts of daily exercise, supplemented when necessary by a mild laxative, such as milk of magnesia, can be helpful in preventing constipation.

Coitus - When abortion or premature labour threatens, coitus should be avoided, otherwise there is general agreement that intercourse should be avoided in last four to six weeks of pregnancy.

Massage of Breasts and Abdomen:

Traditional oil or ghee massage of abdomen or breasts is useless as it does not alter significantly the incidence of striae on the breasts or abdomen.

Smoking - The general impression amongst our Physicians is that smoking is more common in western women but this is probably not true. A sizable population of women in this country smoke hukka or chew tobacco.

Mothers who smoke during pregnancy commonly give birth to smaller infants than the nonsmokers. There appears to be positive quantitative relation between the incidence of infants of low birth weight and the number of cigarettes smoked by the mother.

Alcohol - Alcohol crosses the placenta. A few cases of acute withdrawal of alcohol

have been reported in the newborn infants of mothers who consumed excessive amounts of alcohol.

The affected newborn is depressed at birth but soon becomes extremely hyperactive with sweating, tremors, and episodes of generalized twitching of the face and extremities. Chronic alcoholism of the mother may also lead to fetal under-development.

Medications - The Physician should make sure about the period of gestation before prescribing drugs for any woman.

Fig5.4: Shows different shapes and colors of medicines given in pregnancy

A number of medications commonly prescribed can have deleterious effect on the embryo.

If a drug is to be prescribed during pregnancy, the advantages gained by its use should out weigh the risks inherent in its use.

It is not possible to provide a complete list of all drugs that can adversely affect the fetus and the newborn, therefore a brief list of important and most frequently used drugs is being described below.

REFERENCES

1. Fair weather, D.V.1. Nausea & Vomiting in pregnancy. Amer J. Obstet: Gynaec: 102: 135, 1968.

2. Forbes, G. Air Embolism as complication of vaginal douching in pregnancy. Brit Med J. 2: 529,1944.

3. Freaser, J. L. and Watt H. J. Megaloblastic anaemia in pregnancy and the Puerperium. Amer J. Obs; and Gynaec: 89: 532. 1964.

4. Neil, C.A. Etiologic and hemodynamic factors in congenital heart disease, in check, D.B.Human growth, Philadelphia, Lea and febiger, 1968.

5. Perl, G. Metronidazole treatment of trichomoniasis in pregnancy. Obstet: Gynec: 25: 273, 1965.

Chapter Outline

Introduction:

How drugs effect pregnancy:

Management:

History and physical:

Examination:

Drugs Abuse In Pregnancy

Introduction

The drug used without regard to risks and without medical advice is regarded as drug abuse. It is excessive self-administration of chemicals that change the user's perception, mood and consciousness.

How drugs affect pregnancy

Most of the "drugs of abuse" produce addiction-that is, tolerance, dependence. The risk of withdrawal syndromes is very real. The fetus is a non consenting addict.

Use of potent agents such as alcohol, cocaine, and heroin is associated with accidental trauma, respiratory failure and myocardial infarction.

Cocaine-induces vasospasm and pulmonary edema. Uteroplacental blood flow is affected during repetitive use of cocaine. It contributes to the high incidence of placental insufficiency or distress. Placental abruption and even fetal death can occur.

Prostitution as a profession encourages sexually transmitted diseases. The passivity of some patients in the face of serial or multiple sexual users, often results in drug abuse. Evaluation of drug- using mother must include search for sexually transmitted pathogens in unexpected and multiple orifices. Drug abuse and syphilis are important associates of human immunodeficiency virus (HIV) infection. Immunodeficiency syndrome and the opportunistic infections are associated with immuno incompetence.

Hepatitis B is also common among drug users. A variety of microbes not usually regarded as sexually transmitted can be spread by oro genital, oro anal, and anogenital sexual practices, including Haemophilus influenzae type B, Giardia lamdia, Entamoeba histolytica, Campylobacter jejuni, Shigella and Salmonella.

Indigenous flora such as staphylococci, streptococci, aerobic gram-negative rods (especially pseudomonades) and various anaerobes including Bacteroides clostridial species, and fungi, such as Candida. Septic thrombophlebitis, superficial Cellulitis, and abscess formation are common associates' conditions. Clinical tetanus may follow subcutaneous injection ("skin popping"). Bacteremia following un sterile intravenous injection may cause pyrogen reactions, septicemia,

metastatic abscess of bone and cartilage, and even endocarditis.

Management:

History and Physical Examination:

The specific questions about substance must be asked and urine testing for drugs must be carried. The physician must be alert to the psychosocial clues of drug abuse and to the complications. The appearance of needle tracks or tattoos which are used to cover needle tracks cause unusual infections in unusual locations, signs of physical torture. Unexplained indifference to the need for careful prenatal nutrition and care are often good clues to potential drug abuse. Questions about drug-using behavior and urine testing must be repeated, sometimes with every visit, because the presence of drugs and drug metabolites in the urine is transient and because drug use may occur in binges, not continuously. False-positive results on urine tests can be caused by urinary tract infections and the use of anesthetic lubricants for urinary catheters or for sexual purposes. A coordinated team approach including drug abuse treatment social and legal services along with obstetric and medical care yield good results. Drug abuse is a lifetime problem. Pregnancy can be unique opportunity to help the drug-using woman learn a different way of life.

Alcohol in Pregnancy:

Some adverse fetal effects can be attenuated by abstinence in the second half of pregnancies. The capacity of heavy drinkers to disguise their drinking is strong. Questions about drug use enquiry should include: "Have you ever had a drinking problem?" and "When was your last drink?" History of motor vehicle accidents or tickets for risky driving, are important clues for further investigation.

Management: 2 to 6 days of treatment with a short-acting barbiturate, such as pentobarbital, is preferable in pregnancy. Concern about the possible teratogenicity and neonatal effects of the benzodiazepines has restricted their use in pregnancy. Disulfiram (Antabuse) is a potential Teratogen and inhibits many enzyme systems. Its use in pregnancy should also be avoided. The opiate antagonist, naltrexone, unlike disulfiram, does not cause severe reactions. The recommended dose of naltrexone is 50 mg/day. The drug should be discontinued at least 72 hours in advance of delivery. Liberal thiamin and vitamin replacement should be instituted. Pregnant problem drinkers should be counseled about HIV and tested if they consent. They should be continually screened for other sexually transmitted infections and alcohol-related hepatitis, pancreatitis, and neuropathy. Alcohol abusers are twice as likely as nondrinkers to have a history of habitual abortion. The use of alcohol has been abandoned as a treatment for prevention of premature labor. Support for alcohol may be obtained through self-help groups like Alcoholics Anonymous.

Withdrawal Syndrome:

The most common withdrawal is, "the shakes," It is tremulousness and irritability, which begins within 48 hours after termination of drinking and usually subsides within a few days. Sedation with hydroxyzine or a benzodiazepine may retard the development of full-blown delirium tremens (DTs). The DTs remain a life-threatening metabolic disease characterized by marked sympathetic overactivity, fever, and encephalopathy, with terrifying visual hallucinations and confabulation. As many as 15% of patients with DT's die. Alcohol withdrawal seizures, (rum fits," begin within 12 to 48 hours after cessation of drinking). Any of these withdrawal phenomena may occur,

During labor and delivery.

Abnormalities of almost every organ system have been noted to occur with increased frequency in off spring of alcoholic mothers. Effects on ocular, oral, auditory, skeletal, hepatic, and cardiac development have been observed. Among the cardiac defects, ventricular septal defect is the most common. Of special note is radioulnar synostosis, which is almost unknown in the general population.

Fetal Alcohol Syndrome: Both alcohol and its metabolite, acetaldehyde, directly affect cell growth. Microcephaly is a characteristic feature of FAS. Mental retardation, behavior problems, learning and language disabilities, hyperactivity, and sleep disturbances have all been reported with greater frequency in off-spring of alcoholic mothers. FAS is now believed to be the leading cause of mental retardation, in excess of Down syndrome, cerebral palsy, and spine bifida. The full-blown FAS is found in 30% to 40% of the neonates of mothers consuming more than 2 oz of absolute alcohol per day during the first trimester. Nutritional deficits, particularly folic acid and zinc deficiency, seem to potentiates the teratogenicity of alcohol.

Cocaine: It is a potent stimulant of the central and periphery sympathetic nervous systems. Cocaine acts indirectly as a potent vasoconstrictor by interfering with norepinephrine and dopamine uptake by adrenergic nerve terminals. These actions account for the usual physiologic effects of tachycardia, hypertension, dilated pupils, and muscle twitching. Cocaine decreases uptake of tryptophan and thus diminishes serotonin biosynthesis. Decreased serotonin levels decrease the need for sleep and contribute to the post- stimulant depression.

Effect of Cocaine on Pregnancy:

1. It decreases umbilical artery prostacyclin production and can deplete antithrombin III and protein C, thus enhancing the risk for thrombogenesis.

2. It interferes with the low-pressure, high-flow physiology of gestation, with predictable ill effect on both the mother and the fetus.

2. The mature placenta can convert cocaine into less active metabolites, presumably by placental cholinesterases. Despite this potential protection for the fetus, low birthweight, neonatal withdrawal, intrauterine fetal death, fetal vascular complications, and accelerated fetal lung maturity are regular complications.

3. After Cocaine intake, there is a rapid onset of intense "high" euphoria. As tolerance develops, the euphoric effects are quickly replaced by depression, exhaustion, and anxiety,

4. Maternal cocaine use produces decreased uterine blood flow and there is dose-dependent increase in fetal heart rate. Chronic Cocaine use appears to be a cause of maternal cardiomyopathy, which may be confused with peripartum cardiomyopathy.

5. Cocaine exaggerates uterine contractions. Half of cocaine-using women not receiving prenatal care deliver prematurely.

Effect of Cocaine on fetus: Teratogenicity exclusively to cocaine use has not been established. Limb reduction defects, genitourinary malformations, cardiac anomalies, and gastrointestinal atresia are commonly reported.

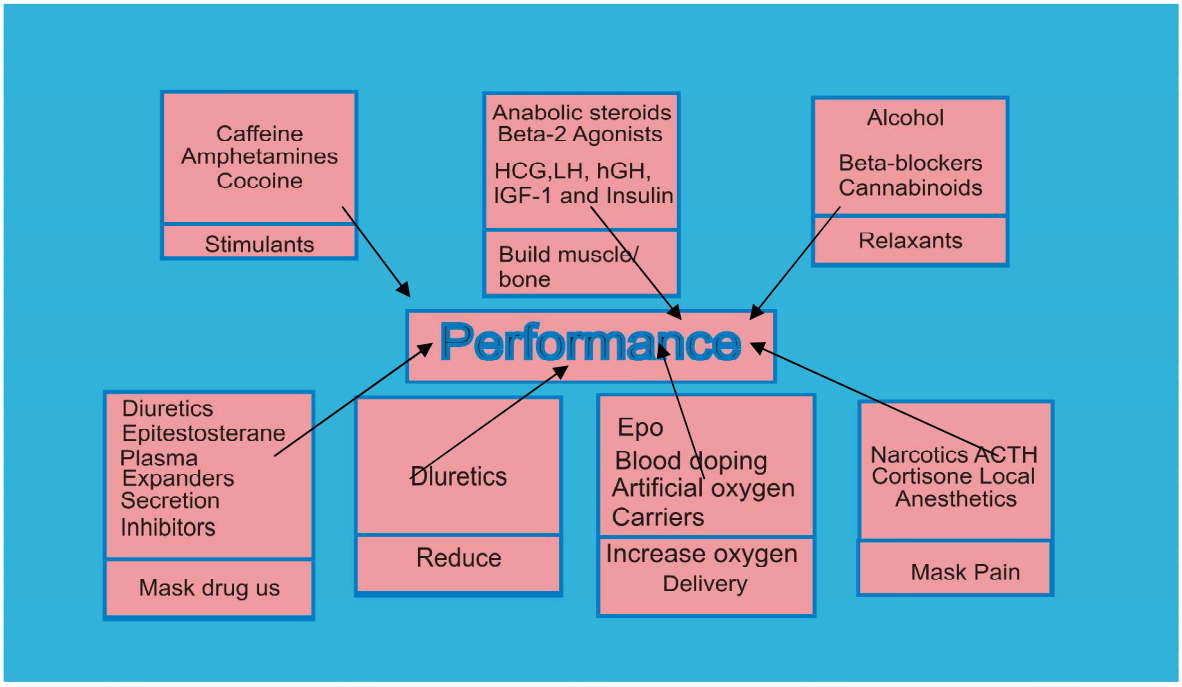


Fig6.1: Shows schematic presentation of various drugs in pregnancy

Other Complications

Maternal hyperthermia during cocaine intoxication may contribute to the increased incidence of congenital malformations. Seizures and Pulmonary complications have been associated with smoking crack cocaine. Pulmonary edema and bronchiolitis obliterans have been less commonly reported. "Crack lung" is the name given to the constellation of hemoptysis, chest pain, and diffuse alveolar infiltrates. The association among crack cocaine use, syphilis and HIV infection is compelling.

Management:

Good prenatal care and sheltered withdrawal from drugs and the drug scene are the principal management objectives. There are no known effective pharmacologic agents available to block cocaine craving and to sustain abstinence.

Amphetamines

These drugs continue to be popular among drug users and experimenters because of their euphoric, sympathomimetic properties. These drugs are taken by inhalation, oral, or intravenous routes. Tolerance to these substances develops with regular use. Patients who actively abuse amphetamines are hyperactive, paranoid, and have hallucinations. They have anorexia and insomnia. They are usually badly malnourished. Amphetamine use increases the risk of serious arrhythmias, including ventricular tachycardia and asystole, during obstetric anesthesia. Inhaled amphetamine ("ice") has repetitive drug-induced vasospasm. It is thought to be the cause of prematurity, placental abruption, and intrauterine growth retardation. The major fetal problem has been retarded intrauterine growth confirmed by finding amphetamines in the urine.

Antidepressant:

Most antidepressants are inhibitors of serotonin uptake. Fluoxetine, sertraline,

paroxetine are common antidepressant. No teratogenic or addicting effect has been reported by their use. Their popularity as a ('feel-good" pill has generated a street market. Fluoxetine (Prozac) crosses the placenta and is excreted in breast milk. No association has been found between first trimester exposure to fluoxetine and congenital anomalies.

Tranquilizers: (Benzodiazepines) and (barbiturates i.e. Glutethimide, have not been proven, to have direct toxic or teratogenic effect on the fetus. These drugs are often used to blunt the symptoms of over stimulation and abstinence by users of alcohol, cocaine, and amphetamines. All of the tranquilizers and sedatives produce tolerance and an abstinence syndrome in both the mother and the child.

Barbiturates:

Rapid withdrawal of barbiturates before delivery may be accompanied by intrauterine fetal withdrawal and distress similar to that seen in children of narcotics addicts. Neonatal withdrawal can occur in the children of mothers treated with phenobarbital in doses appropriate for seizure control. Barbiturate withdrawal may be exceptionally difficult during labor and delivery. Blood and urine levels of barbiturates must be measured to help confirm the diagnosis.

During the third trimester, benzodiazepines readily cross the placenta and accumulate in fetal tissue. As a result, severe neonatal depression, the floppy baby syndromes and neonatal withdrawal can occur. It is desirable to attempt withdrawal from benzodiazepines before delivery and to stop their use late in Pregnancy.

Narcotics

The heroin users have around them dirty needles and often a criminal behavior. Premature labor and low-birthweight infants in heroin-addicted mothers are common. There is a trend toward higher perinatal morbidity and mortality among the infants of these mothers. The overdosed patient is comatose, with pinpoint pupils, and should be given naloxone. Naloxone is a narcotic agonist without respiratory depressant effect. The dose of naloxone is 0.01mg/kg and is given intravenously. Pulmonary edema may occur with heroin overdose.

Effect of heroin on Foetus:

In the first trimester the fetus may be expelled. Later in pregnancy, maternal withdrawal is accompanied by fetal withdrawal. It produces hyperactivity, hypoxia, and the passage of meconium by the foetus. Intrauterine fetal death may occur. Narcotic withdrawal is not encouraged during pregnancy, and narcotic antagonists, such as pentazocine (Talwin) and naloxone (Narcan), should be used with great caution. Heroin detoxification using clonidine usually takes 5 to 7 days. Doses for moderate withdrawal symptoms are 0.1 to 0.2 mg every 4 to 6 hours for 3 days, then tapering the dose by 0.2mg/day.

Management:

Heroin addicts should be enrolled in narcotic maintenance programs. Methadone is a drug of choice and a long-acting, synthetic opiate that can be taken by mouth; it reduces the risk of needle complications. Methadone blocks the euphoria produced by heroin and blunts the appetite for "shooting up." Daily methadone doses suppress withdrawal symptoms. It has the same properties as heroin but it is not a narcotic antagonist. LAAM does not have psychoactive effects and is not addictive. Its advantage over methadone is its prolonged duration of action, with suppression of withdrawal symptoms for up to 72 hours. Usual doses range from 30 to 100 mg by mouth every 2 to 3 days. There is, as yet, not a lot of

experience with maintenance during pregnancy.

Detection and treatment of infections, improved nutrition, and improved prenatal and psychosocial care contribute to the improved pregnancy outcome. One third of neonates of methadone-maintained mothers are undersized. Pentazocine abusing mothers should be withdrawn during the second trimester and should be cautiously placed on methadone maintenance.

Hallucinogens:

Phencyclidine (PCP), or "angel dust" and lysergic acid diethylamide (LSD), or ('acid," are two commonly used agents. There is suggestive but not conclusive evidence that illicit or "street" LSD can produce chromosomal anomalies in fetal tissue if taken during the first trimester of pregnancy.

Tobacco and Marijuana:

Cigarette smoking is one of the major health hazards of pregnancy. Spontaneous abortion rate, perinatal mortality, fetal growth and childhood development are all affected adversely.

Marijuana is frequently used by the cigarette smokers, alcohol users; low socioeconomic status is associated with drug abuse. Prolonged heavy marijuana smoking is causes diminished libido and psychological symptoms including depression and lethargy. Increase in precipitous delivery, meconium passage, and need for neonatal resuscitation in marijuana users is more. Marijuana may be teratogenic in animals. Fried reported dose-related nervous system abnormalities and diminished visual responses in neonates exposed to these substances in utero.

Other Inhaled Substances:

Pregnant women may engage in "sniffing" glue, paint thinner or other substances containing organic solvents. Inhalation of volatile organic compounds is a particular practice of children and teenagers. A variety of other materials are also used i.e. glue, toluene, gasoline, solvents, thinners, and aerosols. Maternal and neonatal renal tubular acidosis, pulmonary injury, and cardiac arrhythmias are exacerbated. Preterm delivery, intrauterine growth retardation, and fetal death have been reported when these agents are abused during pregnancy.

Caffeine:

Caffeine, like theophylline is rapidly absorbed from the gastrointestinal tract. Its half-life is increased two to three-fold in pregnancy. It is known to cross the placenta. The average daily intake is 99 mg, and approximately 28% of pregnant women consume more than 150 mg of caffeine per day throughout pregnancy.

There is no evidence that caffeine intake has any adverse effect on late pregnancy outcome or fetal growth. Caffeine intake of greater than 150 mg/day increases the risk of late first trimester and second trimester spontaneous abortion. Coffee per se may be more embryo toxic than other caffeine sources.

Reference:

1. Gray J, Weaver R, Bollert J et al. The oral toxicity of clindamycin in laboratory animals. Toxicol Appl Pharmacol 1972; 21: 516.

2. Hammill HA. Metronidazole, clindamycin, and quinolones. Obstet Gynecol Clin North Am 1989; 16: 31.

3. Hautekeete ML. Hepatoxicity of antibiotics. Acta Gastroenterol Belg 1995; 58: 290.

4. Heinonen CP, Slone D, Shapiro S. Birth Defects and Drugs in Pregnancy. Littleton: Littleton Publishing Sciences Group, 1977.

5. Heisterberg L. Placental transfer of metronidazole in the first trimester of pregnancy. J Perinatol Med 1984; 12: 43.

6. Hengst VP. Investigations of the teratogenicity of daraprim (pyrimethamine) in humans. Zentralbl Gynakol 1972; 94: 551.

7. Hermans PE, Wilhelm MP. Vancomycin. Mayo Clin Proc 1987; 62: 901.

8. Czeizel AE. Drug exposure in pregnant women. Lupus 2004. 13: 740-745.

8. Lacroix I, Damase-Michel C, Lapeyre-Mestre M, Monastruc JL Prescription of drugs during pregnancy in France. Lancet 2000. 42: 1735-1736.

9. Briggs GG, Freeman RK, Yaffe SJ. Drugs in Pregnancy and Lactation, 5th ed. Baltimore: Wilkins and Wilkin, 1998.

10. Czeizel AE, Rockenbauer M, Sorensen HT, Olsen J. A populationbased case-control study of oral chlordiazepoxide use during pregnancy and risk of congenital abnormalities. Neurotox Terat 2004. 26: 593-598.

11. Australian Drug Evaluation Committee. Medicines in Pregnancy: An Australian Categorization of Risk. Canberra, Australia: AGPS. 1992.

Chapter Outline

Historic perspective:

Nutrition Canada Survey Report:

Food Habits:

Nutrition in the Adolescent:

Stages of Malnutrition:

Nutrition In Pregnancy

The controversy regarding importance of Nutrition in pregnancy continues. The two world wars provided data on forced starvation of masses; unfortunately the findings of that data did not solve many controversies. However, in the last two decades we have seen some well controlled studies conducted in the USA, Europe and Australia, and some mysteries have started to clear. The student will note from the review of the literature presented that there still remain a number of important issues completely unresolved. Evidence both in favor and against the value of nutrition on perinatal outcome is so enormous that it is not possible to completely present that in this short review.

HISTORIC PERSPECTIVE:

Studies which suggested poor or no relationship of nutrition to perinatal Outcome, at the end of first World War some Russian Writers like Kutting, Bruce and Murray had concluded that the mother's insufficient food during the war had no noticeable effect on the weight of the newborn and therefore there was lack of low birth weight babies born during that period. Smith reported that even severe famine conditions had remarkably little effect on the birth weights, or on perinatal mortality, where the population was previously well fed. In the earlier studies it had been reported, that the maternal tissue took precedence over the nutrition of the fetus, however, this view was altered by human balance experiments which created a great deal of confusion. The student is cautioned that this is a minority view and not accepted by most authority's to-day.

Studies which gave highly suggestive prospective evidence of a definite relationship of nutrition to the quality of perinatal outcome included the work of Rodolski who in 1893 on the basis of his experiments on animals, concluded that "a general reduction in the food of pregnant female brings about insufficient general development."

Lurine and Belugin concluded, that "insufficient maternal diet caused a slight decrease in birth weight". Later on Shkarin reported that the proportion of babies with very small birth weights was higher in 1919 after war than before the war in 1913.

Similarly the proportion of babies with birth weight above the average (more than 4000 grams) was lower in 1919 than in 1913.

Gershenson reported, that "mother's exhaustion caused by insufficient food (possibly combined with serious emotional disturbances) results in considerable lowering of the birth weight".

Burke and her colleagues found that significant relationship exists between the protein content of the mother's diet during pregnancy and the length of her infant at birth.

This increase could be demonstrated with each additional increment of protein in the prenatal diet, irrespective of the mother's height. Antonov, A.N. reported that his findings on children born during the siege of, Leninqrad.which lasted from August 1941 to January 1943 morbidity and mortality of the new borns."Had increased When compared with figures of 1913 before the war. Similarly the proportion of babies with birth weight above the average (more than 4000 grams) was lower in 1919 than in 1913. Gershenson reported, that "mother's exhaustion caused by insufficient food (possibly combined with serious emotional disturbances) results in considerable lowering of the birth weight".

Burke and her colleagues found that significant relationship exists between the protein content of the mother's diet during pregnancy and the length of her infant at birth.

This increase could be demonstrated with each additional increment of protein in the prenatal diet, irrespective of the mother's height. Antonov, A.N. reported that his findings on children born during the siege of Leningrad. Which lasted from August 1941 to January 1943 had increased morbidity and mortality of the new borns."

He attributed this to the low vitality of children. This was particularly high during severe hunger in the first half of 1942,when the still birth rate rose to 5.6 per cent, (twice the normal figure), and the rate of premature births reached the usually high figure of 41.2 percent.

Dieckman-et-al reported. that a strikingly significant correlation exists between the condition of the baby and the average protein intake of the mother. They also found definite correlation between the level of protein intake and the incidence of abortions and anaemia, but no correlation between the weight and length of babies. Woodhill et a-l found a statistically significant relationship between poor maternal diet and the incidence of toxemia and of prematurity.

Animal experiments suggest that inadequate maternal nutrition during pregnancy leads to stunting and impairment of fetal brain development. Protein and other nutritional deficiencies in rodents, lead to retardation of growth, increases mortality rates and lower intelligence. Love and Kinch in their study on factors influencing the birth weight in normal pregnancy, reported that the weight, height, body built and weight gain of the mother, positively correlates with the birth weight of the baby.

Weiss and Jackson, reported on thirty two maternal factors affecting birth weight, and concluded "the maternal weight gain strongly influence the baby's weight." A woman's pre-pregnancy weight strongly influenced her weight gain during pregnancy, if pre-pregnancy weight was more the maternal weight gain was less, but if the pre-pregnancy weight was less, the maternal weight gain was more on the average.

Animals born of protein deficient mothers demonstrate permanent impairment in their ability to utilize nitrogen and remain with a deficit in the total number of brain cells at weaning. Physical activity, prevalence of disease and maternal nutritional stores before pregnancy are important determinants of the relative

contribution of calories and protein to birth weight.

Klein R.E. and his colleagues reported on the study of children from four chronically mal· nourished Guatemalan Villages and concluded that a significant association between food supplementation during pregnancy and lower prevalence of growth retardation and infant mortality existed. Supplementation of the children's diet also correlated with better performance on psychological tests.

Hemminki and Star field presented their findings on routine administration of iron and vitamin during pregnancy in a review of the 17 controlled clinical trials. They found that none of the studies reported showed any improvement for important outcomes, such as low birth weight, pre-term births, infant morbidity and mortality and maternal morbidity and mortality.

Moghissi and his colleagues reported that "maternal pre-pregnancy weight was significantly related to birth weight and cranial volume in the new born. Among the amino acids/glycine, lysine and total amino acids were positively correlated with birth weight. They also found that concentration of certain "maternal amino acids and proteins in the third trimester of pregnancy, correlated significantly with fetal growth and development".

Nutrition Canada Survey Report - Nutrition Canada Survey was conducted recently by the Depart- e'fare, Canada. The report concluded maternal nutrition plays an important e fetus and future infant. The maternal diet however, should be well balanced; et may compromise the outcome for the infant, especially when protein intake ~eased, in relation to the pre-pregnancy intake and to the other dietary components.

If the patient's pre-pregnancy weight is less than 47 kg, or 20% less than her ideal weight for t, there is need for review of her dietary habits. Allowance should be made for extra- and caloric intake particularly during the last trimester. If the pre-pregnant weight is 20% e ideal standard weight, caloric intake should be reduced and maintained around 1800 to 2000 calories per day, Recent

Bulletin of Society of Obstetricians and Gynecologists of Canada reported a strong positive relation exists between low birth weight and unfavorable perinatal health, duding perinatal mortality. Reduction in the incidence of low birth weight infants can be achieved severely under-nourished pregnant women by supplementing their caloric intake during pregnancy.

Food Habits - Historically the food habits of a family are an out-come of the adaptable it between the body and her socioeconomic and physical environment. It is depended upon the availability of food, the economic status, or the buying power of annual, education and the environment around him. It is also affected by age, sex and limit.

Nutrition in the Adolescent - Normal biologic growth of women follows a very ordered series of events relating to physical growth and development concomitant with her endocrinologic and sexual maturation. When menarche, which is a matter of sexual maturation in female has occurred only two more inches of growth in height remains in young adolescent. In the young girl the nutritional and caloric requirements reach its peak just prior to menarche and then decline in the next 2 to 3 years to adult levels.

If we first accept that the. Pregnancy is a normal physiological state then the preconception condition and preparation for child bearing may become easy to understand. Now-a-days marriage and child bearing are occurring at a relatively earlier stage of life and this is especially

true in cases of underdeveloped countries. In a recent Pakistan fertility survey the mean age of marriage reported is 16.6 years. When the prospective mother is less than 17 years of age, her diet requires special attention to include the needs for her growth, as well as that of the developing fetus.

Those who become pregnant before the age of 17 are at a greater risk, from both biological and physiological point of view. These girls enter into pregnancy with inadequate nutritional stores and are poorly equipped to meet the demands of motherhood, therefore, the infant mortality rates are higher among infants born to such mothers. Before the age of 17 the patient requires nutrients for her own growth as well as her fetus, The standardized diet used in most prenatal clinics are not suited to the nutritional needs of the adolescent.

The young adolescent should be expected to gain weight even if she is obese.

Many studies have shown that the nutritional state of the mother previous to and during pregnancy plays an important role in her health and in that of the fetus. Most authorities agree that the nutritional status of the mother prior to conception is important.

Baird concluded, that "the nutritional status of the mother, is dependent upon her life time dietary habits and this has a greater influence on the outcome of pregnancy than the diet during pregnancy.

Actual foundations are laid down during prenatal period and early childhood. The incidence of low birth weights and neonatal mortality rates are affected by socio-economic status of the mother and other factors such as biological immaturity (under 17 years of age).

Stages of Malnutrition - The body reacts to the nutritional deficiency, through many functional and pathological reactions. These reactions usually adopt a set pattern of stages. I n the first stage, biochemical changes occur which lead to functional disability and this in turn leads to Pathological stage, which produces a fall in the level of blood nutrients and finally the stage of clinical malnutrition is manifested.

Assessment of Nutritional Status in Pregnancy - This requires a serious effort on the part. of the Obstetrician who deals with this vulnerable group of individuals. He should adopt both direct and indirect methods to make proper assessment of such cases.

Direct Method - Routine Prenatal inquiries will provide information, on the education, social and cultural background of the patient. Her height and weight can provide information about her pre-pregnancy status of nutrition. When one has to make assessment of adequate nutritional intake during pregnancy, verbal inquiry by the investigator, on the consumption of different items and amounts of food, taken over a specific period of time, usually for the last 24 hours is employed. This is the direct method of dietary assessment and quite reliable for practical purposes, other methods like food purchased during specific period and actual food measurements are useful for research purposes.

Indirect Method - This include maintenance of food balance sheets, which do not provide information on actual per capita food consumed, but instead they provide information on availability of nutrients at the retail level. This is not a very useful method for the clinician.

Fetu-Maternal Adaptations –

The concept of fetus, placenta and mother as three independent units, where placenta acts as a filter, the fetus as a complete

parasite, and the mother as a nutritional supply depot, is too simple.

Fig7.1: Shows food basket and items for consumption during pregnancy

The concentration of' most nutrients and metabolites Le. Total proteins albumin, urea, creatinine, glucose, some amino acids, folate, Vitamin B12, pyridoxine and ascorbic acid decrease in the maternal blood during pregnancy.

Conversely the levels of the total phospholipids, triglycerides, cholesterol, phospholipids, free fatty acids. Alpha and beta globulins and some amino acids rise.

Other changes which automatically occur during pregnancy are osmolality of blood which is reduced, erythrocyte sedimentation rate is increased and certain enzyme levels are altered.

Since most of these changes can be seen very early in pregnancy and that they occur in perfectly healthy women, these changes are considered normal. The fetus is a remarkably efficient parasite who manages to obtain what it needs, even when the maternal diet is not abundant. This unique role of human fetus seems to be directed, by evolutionary forces, which must ensure the survival of species, even under extremely adverse circumstances such as starvation.

Nutritional Requirements during Normal Pregnancy:

During pregnancy extra energy is needed for the growth of the fetus, the placenta, maternal tissues, and maintenance of a heavier body.

The need for extra calories and therefore, extra food is clear. The total caloric cost which must be met from diet in order to supply and maintain the health of these new tissues is approximately 80,000 Kcal per pregnancy. Half of this requirement is assumed to have met by" reduced activity during pregnancy and the other half must therefore come from increased diet intake.

The WHO/FA Committee has recommended an increased intake equivalent to 40,000 Kcal per pregnancy, especially during the 2nd and 3rd trimesters of pregnancy. This amounts to roughly 200 Kcal per day. Table 19 shows these estimates. Extra 1000 Kcal
per day are needed for the period of lactation. What does this mean in terms of actual diet and how evenly this demand is spread through pregnancy? Table 20 shows some of these features in terms of weeks of pregnancy and grams of protein and fat needed to provide this much energy (Kcal).

Undernutrition - It is also termed malnutrition or departure from normal healthy state of an individual due to cultural, economic and social factors, interfering with the normal body nutrition. It may be primary when it is due to defect in the availability and quality of diet or secondary when it is caused by a factor or factors not in the diet, but body itself for example some disease process which interferes with normal digestion, absorp-tion, utilization, or excretion, of the constituents of a balanced diet.

During pregnancy both primary and secondary form of undernutrition can occur, due to extra demands of maternal body adjustments and rapidly growing fetus and lack of adequate and balanced diet intake. Li ke non-pregnant patient pregnant women may be affected by viral, bacterial or parasitic agents, which may induce secondary malnutrition. Undernutrition in pregnancy invariably leads to fetal undernutrition or starvation; this may be acute or chronic.

Acute Starvation **-** There is sudden interruption in the nutritional supply line to the fetus as it occurs in abruptio placentae, antepartum hemorrhage due to placenta previa, cord accidents, maternal starvation, and hemorrhage.

Chronic Starvation - In spite of adequate nutritional intake and supply to the mother, the maternal disease process, like hypertension in pregnant women can produce starvation in the fetus.

Metabolic adaptations during normal pregnancy - Most of these metabolic adaptations are induced by the temporary endocrinologic alterations which are essential for normal pregnancy and represent something more than mere nutritional deficiencies or excesses. Unfortunately all these changes can not be regarded as merely physiological adaptations, since some aspects of these adaptation for example, alterations in kidney function result in considerable losses of amino acids, glucose, and some other nutrients in the Urine.

WHO quote explains these changes and reads as follows, "From the standpoint of physiological function, pregnancy cannot be regarded as a process of fetal growth, superimposed on the ordinary metabolism of the mother, fetal development is accompanied by extensive changes in maternal body composition and metabolism."

In fact the boundary between physiology and pathology as regards metabolism is so blurred that the diagnosis of pathological states can not be made unless standards obtained from healthy pregnant women are compared and not with the data obtained from non-pregnant individuals.

Similarly Hytten and leitch commenting on alteration in metabolism during pregnancy concluded, "that for the purpose of homeostasis the body maintains its fluid environment, the amount and concentrations of the substance it needs for maximum and efficient function in health:' If this concept is accepted then the greatly altered amounts and concentrations which are characteristic of pregnancy cannot be regarded equally advantageous to the mother's metabolism. The most likely explanation is that they represent changes which allow maximum efficiency of fetal growth and metabolism. The fetus using hormone as manipulators, overrides and I rests the mother's homeostasis mechanisms in its own interest.

Restoration of Normal Biochemistry to Non-pregnant Levels. - When we critically look upon our efforts to restore the normal biochemistry to non-pregnant levels in the light of these metabolic adaptations in pregnancy, then we will realize that most nutritional and therapeutic interventions are futile, and may not be entirely harmless to the fetus. Until such time there is clear proof that these maternal adaptations are harmful, they should be regarded as beneficial to the fetus.

The Placenta and Its Role in Pregnancy. - All the current evidence suggests that physiologic role of the placenta is by no means that of a passive filter of nutrients and fetal waste products.

We know many substances exist in higher concentration in the fetal than the maternal

blood, which suggests "one way traffic" in favor of the fetus· Ascorbic acid passes through placenta as dehydroascorbic acid and is converted on the fetal side to L Ascorbic acid to which the placenta is much less permeable, similar changes probably occur in other nutrients. Placenta is also an efficient organ for providing nutrition. It plays an active role in favoring the nutrition of the fetus and functions as a fetal excretory organ and a ductless gland.

Recommended Daily Allowances - Every country has recommended allowances for their people, and a value in terms of 1800-3000 (kcal) per day is often recommended for pregnant women depending on their activity.

These requirements are often determined on the basis of observed dietary habits of healthy people as well as on the sound knowledge of physiological changes of pregnancy. The standards of recommended daily allowances for non-pregnant and pregnant women during light work prepared by various national and international agencies are shown in Table 23.

The four sets of standards shown are broadly in agreement. If the diet of an individual falls short of a standard, this does not necessarily mean his food is inadequate, unless of course there is clinical evidence of such shortage.

Based on these recommended daily allowances for a population and keeping in view the physiological changes which occur during pregnancy, it is not difficult to realize the need for extra nutritional demands of the pregnant patient.

Nutritional advice given to the pregnant patient should not only consider the physiological changes in the maternal body, but also the demands of growing fetus and placenta.

Pregnancy BMI	BMI*(kg/m2) (WHO)	Total Gain Range (Ibs)	Rates of weight Gain* 2nd 3rd Trimester (Mean Range in lbs/wk)
Under weight	<18.5	28.40	1 1-13)
Normal weight	18.5-24.9	25.35	1 (0.8.1)
Over weight	25.0-29.9	15.25	0.6 (0.5-0.7)
Obese (includes all classes)	≥30.0	11.20	0.5 (0.4-0.6)

***Calculations assume a 0.5-2 kg (1.1-4.4 ibs) weight gain in the first trimester (based on siega-Riz et al. 1994; Abrams et al. 1995; Carmichael et al. 1997)**

In Pakistan, recommended daily allowance for pregnant mother is 2040 Kcal per day. These calories may be insufficient to meet all the demands of pregnancy if the pre-pregnancy nutritional status of the patient is poor, on the other hand reduction in (Kcal) during pregnancy may produce no deleterious effect on the growing fetus, if the prepregnancy nutritional status of the patient is good.

Current Status of Minerals

Iron - The world health Organization's expert Committee on nutrition in pregnancy and in lactation calculated the iron balance during pregnancy. The mother transfers nearly 6 mgm of iron daily to the fetus in the second half of pregnancy. This is stored in fetal liver and placenta.

Adequate diet contains approximately 6 mgm of iron per 1000 (K Calories). Taking into consideration insufficient maternal stores, and losses due to excretion, iron supplements of 30-60 mgm daily in the form of a ferrous salt are generally recommended.

Magnesium:

This is a predominant Cation in living cells and is essential part of many enzyme systems. Severe deficiency may lead to neuromuscular dysfunction. The recommended daily allowance for adult females is 300 mgm.

Calcium and Phosphorous:

They are important minerals needed for calcification of the fetal bones and teeth, approximately 30 grams of calcium are deposited in the infant at birth. If the diet is deficient in this mineral, mother will have to sacrifice her bones. The allowance of calcium recommended during pregnancy is 1.7 gram daily. Standard supplement of non-pregnant daily allowance varies between 0.8 to 1.2 grams. The phosphorous intake should be at least equal to that of calcium during the later part of pregnancy.

Iodine:

This important mineral is needed to meet the demands of fetal development and correct deficiency of iodine, which may occur due to loss in urine during pregnancy. When use of iodized salt is restricted in pregnancy, Iodine supplements in the diet must be provided.

Sodium:

Salt and sodium containing preparations have been blamed for contributing to pre eclamptic toxemia, these patients cannot handle sodium properly. However we must remember that different people handle sodium differently so restriction of salt in all individuals is not recommended.

Current Status of Trace Elements:

These elements could not be measured before, minute levels. The measurement had to be carried out in parts per billion and sophisticated instruments used for their measurements were e at that time. Many of these mineral elements function in enzyme systems. They are widely descried in food.

Zinc:

Recommended daily allowance of zinc for females over 23 years of age is15 microgram per, day. Most of the zinc in the body is in the bones, with a concentration of nearly _00 microgram per gram. Plasma concentration ranges from 80-110 microgram per gram. It is mainly excreted in the feces. Its deficiency has been reported to cause growth failure, sexual infantilism in teenage individuals and impaired wound healing.

No agreement on a set value has appeared about its allowance during pregnancy.

Copper:

It is a component of several amino oxidases and other enzymes. It is essential in the utilization of iron, and helps in maintenance of myelin. WHO suggests an intake of 30 microgram per Kilogram per day for adult males, but makes no reference to females.

Manganese:

It is also a part of enzyme systems of man, no recommended daily allowances have been established.

Cobalt:

It is physiologically active in man in the form of Vit. B 12 cyanocobalamine. No recommended allowances for this essential trace element are established.

Chromium Selenium and Fluorine - These trace elements are essential for human nutrition but no recommended allowance has been established. Similarly,

silicon,nickel and tin have been shown to be essential for the rat but nothing is known yet about them in human nutrition.

The Current Status of Vitamin and Iron Supplements in Pregnancy:

It has become customary over the years to prescribe iron, vitamins and mineral supplements to pregnant women during prenatal period. Physicians and patients alike believe that prenatal vitamin, iron supplement represent an acceptable substitute for an optimally nutritious diet during pregnancy.

Examination of dietary data in nutrition Canada Survey has revealed that in women who were not taking supplements, iron intake in pregnant and non-pregnant woman was comparable, but folic acid intake was higher in pregnant state.

Number of studies including a recent review of 17 controlled clinical trials, conducted throughout Western World, concerning routine administration of iron and Vitamins during prenatal period and outcome of pregnancy concluded, that "there was no consistent advantage to the mother or her baby".

Therefore, excessive reliance paced upon the use of nutritional supplement with no clear evidence, that they alter the pregnancy outcome is not warranted.

Iron supplement is usually not necessary in the first half of pregnancy providing adequate nutrition and hemoglobin concentration is being maintained. However, if hemoglobin concentration is below 10.5 g in the first trimester of pregnancy and is not increasing, supplement should be prescribed.

However, there is no justification for prescribing vitamin and iron supplements routinely in pregnancy, unless there is specific evidence of deficiency in vitamin intake or a predisposition to anaemia.

In Pakistan where nutritional deficiency states are prevalent during pregnancy and anemia with a hemoglobin level of 8 Gram per cent is fairly common, iron and vitamin supplements are commonly indicated.

Selected bibliography and suggested reading:

Reference:

1. Osofsky, H .J: Antenatal malnutrition: Its relationship to subsequent infant and child development Am. J. Obstet, Gynecol1969, 105: 1150.

2. Winnick M: Cellular growth in intrauterine malnutrition pediatr, Clin, North Am. 1970, 17: 69 ..

3. Shkarin, A.N. Weight of new born children in 1919 as compared with 1913, Vrach Gazeta No. 3-41922.

4. Lurie, P.B. & Belugin N.V: Weight of pregnant women &
Children born term in times of war & famine, Ruski Gynecologicheki Vestnik 1: No.3, 1919.

5. Antonov, A.N. Children born during the siege of Leningrad in 1942 J. Pediat 30: 1947, 250.

6. Burke, B.S: Nutrition during pregnancy: a review J. Am. Dietet, A. 1944,20: 735.

7. Woodhill-et-AI: Nutrition studies of pregnant Australian women Amer J. Obstet Gynea 1953, 70,987 - 1003.

8. Love, E.J. Kinch, R.A.H: Factors influencing the birth weight in normal pregnancy. Amer J.
Obstet & Gynae 1964,91,342-349.

9. Weiss, W. & Jackson, E.C. Maternal factors affecting birth weight P.A.H.O. & WHO Scientific
Publication No. 185, 1969,1972.

10. Naeye, R.L. Blanc, W. & Paul, C. Effects of maternal undernutrition on the human fetus pediatrics, 1973,52: 494.

11. Moghissi. K.S. Churchill, J.A. & Kurrie, D: Relationship of maternal amnio acids and proteins to fetal growth and mental development. Amer J. Obstet & Gynecol 1975, 123: 398-410.

12. Lechtig, C. Yarbrough, C. & others. Influence of maternal nutrition on birth weight, Amer J.
Clin Nut: 1975,28: 1223-1233.

Chapter Outline

Human Milk:

Advantages of Breast Feeding:

Literature Review:

Disadvantages of Breast Feeding:

Requirements for successful:

Breast-Feeding:

Benefits to Baby:

Medicines and Nursing Mothers:

Conclusion:

BREAST FEEDING

Human Milk

There is no real and complete alternative to human milk. Its composition is ideal. Colostrum contains antibodies that may play a part in the immune mechanism of the newborn. It has a laxative action and is an ideal natural starter food.

Constituents of human milk in their natural state are delicately balanced for infant's requirements i.e.

Absorptive ability and utilization capability. No fixed formula can match its suitability and utility.

The breast fed infants are protected against infections. In Pakistan less than 4% infants are hospitalized for infective diarrhoea who are fully breast fed.

Human Milk's Nutritional Benefits -

Human milk, the best food for babies, contains the right amount of nutrients, in the right pro-portions, for the growing baby. A living, biological fluid, it contains many unique components. For ex-ample, lactoferrin provides optimal absorption of iron and protects the gut from harmful bacteria; lipases assist in digestion of fats; and special growth factors and hormones contribute to optimal growth and development. Mother's own milk changes during a feeding from thirst-quenching to hunger satisfying, and comes in a variety of flavors as mother's diet varies.

Its composition changes as the baby grows to meet baby's changing nutritional needs. It serves as the nutritional model for artificial baby milks, but none of these can match it.

Advantages of Breast Feeding –

Literature Review:

Numerous studies from around the world have shown that diarrhea, lower respiratory illnesses, and ear infections happen less often in breastfed babies, and are less severe when they do occur.

Exclusive breastfeeding (meaning no solid food) for at least six months seems to offer the most protection.

Researchers have found that immune factors that are present in colostrum (the first milk your body produces) guard against invading germs by forming a protective layer on your baby's mucous membranes in his intestines, nose, and throat. The main immune factor at work here is

secretory IgA (immunoglobulin A).

It is present in large amounts in colostrum which is why it is important to start nursing your baby right after birth but is also found in lower concentrations in mature milk.

Breastfeeding may also protect your baby from developing inflammatory bowel disease later in life. Several studies have documented a link between a lack of breastfeeding in infancy and later development of Crohn's disease and ulcerative colitis.

Fig8.1: Shows breast feeding

Several studies have found that breastfeeding for six months or more makes it less likely that your baby will go on to develop food or respiratory allergies. At least one study has found that this protection appears to last well into adolescence.

Another study found that preterm infants from families with a history of allergies had a lower risk of developing eczema than their formula-fed peers. A third study found that exclusive breastfeeding for at least the first four months after birth reduced a child's risk of developing asthma by age 6.

Scientists think that the fatty acids and immune factors such as IgA in breast milk prevent allergic reactions by stopping large foreign proteins from getting into a baby's system. Proteins in cows' milk are one of the most common allergens, which is one reason that babies who are fed cows' milk-based formulas tend to have more allergic reactions than breastfed babies.

Several studies have found a possible connection between breastfeeding and higher IQs. Baby's breastfed for six months or more seem to have the most advantage; Experts say that the emotional bonding that takes place during breastfeeding probably contributes to some of the increase, but that the fatty acids in breast milk may play the biggest role in a baby's brain development.

Breast milk contains less insulin than formula (insulin stimulates the creation of fat). And breastfed babies have more of the protein hormone Leptin in their system; a substance that researchers believe plays a role in regulating appetite and fat.

Breastfeeding for more than six months appears to reduce a child's risk of developing insulin-dependent (type 1) diabetes. Very low birth weight babies nourished by breast milk had fewer serious blood infections and meningitis, they are also less likely to have high blood pressure by the time they are teenagers.

Numerous studies have found that the longer women breastfeed, the more they're protected against breast and ovarian cancer.

Disadvantages of Breast Feeding –

In the early weeks, it can be painful. A woman's nipples may become sore or cracked. She may experience engorgement more than a bottle-feeding mother, when the breasts become so full of milk they're hard and painful. Some nursing women also develop clogged milk ducts, which can lead to mastitis, a painful infection of the breast.

It affects a woman's entire lifestyle. A nursing mother with baby must wear clothes that enable her to nurse anywhere, or she'll have to find a private place to undress. She should eat a balanced diet and she might need to avoid foods that irritate the baby. She also shouldn't smoke, which can cause vomiting, diarrhea and restlessness in the baby.

A new mother can pump her breast milk several times during the day and refrigerate or freeze it for the baby to take in a bottle later.

A nursing mother is physically tied to her baby more than a bottle-feeding mother. The baby needs her for nourishment, and she needs to nurse regularly to avoid getting uncomfortably full breasts.

Some women just don't feel comfortable with the idea of nursing. They don't want to handle their breasts, or they want to think of them as sexual, not functional.

Requirements for successful Breast-Feeding –

The following tips can help foster successful nursing:

Get an early start: Nursing should begin within an hour after delivery if possible, when an infant is awake and the sucking instinct is strong. Even though the mother won't be producing milk yet, her breasts contain colostrum, a thin fluid that contains antibodies to disease.

Proper positioning: The baby's mouth should be wide open, with the nipple as far back into his or her mouth as possible. This minimizes soreness for the mother. A nurse, midwife, or other knowledgeable person can help her find a comfortable nursing position.

Nurse on demand: Newborns need to nurse frequently, at least every two hours, and not on any strict schedule. This will stimulate the mother's breasts to produce plenty of milk. Later, the baby can settle into a more predictable routine. But because breast milk is more easily digested than formula, breast-fed babies often eat more frequently than bottle-fed babies.

Supplements: Nursing babies don't need sugar water or formula supplements. These may interfere with their appetite for nursing, which can lead to a diminished milk supply. The more the baby nurses, the more milk the mother will produce.

Infection: Symptoms of breast infection include fever and painful lumps and redness in the breast. These require immediate medical attention.

Engorgement: A new mother usually produces lots of milk, making her breasts big, hard and painful for a few days. To relieve this engorgement, she should feed the baby frequently and on demand until her body adjusts and produces only what the baby needs. In the meantime, the mother can take over-the-counter pain relievers, apply warm, wet compresses to her breasts, and take warm baths to relieve the pain.

Nutrition and rest: To produce plenty of good milk, the nursing mothers needs a balanced diet that includes 500 extra calories a day and six to eight glasses of fluid. She should also rest as much as possible to prevent breast infections, which are aggravated by fatigue.

Composition of Human Milk

Fats - The fatty acid composition of mammalian milk is different. There are more unsaturated fatty acids present in human milk. Human milk fed babies has fats of different composition in their bodies compared to other milk feds. The lipid content of neonatal brain is 60 per cent. The brain grows quite rapidly. Fats of

the correct type and amount are essential for its growth. Cholesterol is high in breast milk presumably to ensure appropriate development of Cholesterol splitting enzymes. Cholesterol is also required for myelinization of in early life.

Carbohydrates - Lactose constitutes almost the whole of Carbohydrate fraction and provides about 40 per cent of total milk calories. Lactose is also needed for formation of galactolipid, which is one of the main constituents of brain along with cholesterol.

There is a relationship between galactose content of the milk and growth rate of brain in several animals. Lactose also enhances calcium absorption. Some disaccharides from lactose escape digestion and are fermented in the gut to produce organic acids which inhibit growth of coliform bacteria.

Proteins - Cow's milk contains three times more protein of which 80 per cent is casein. In human milk this is only 20 per cent. Significant differences exist between urea hydro x - proline excretion and blood amino acid levels between infants fed with different types of milk.

Methionine/cystine ratio in human is low compared to other mammals. This is seven times more in cows. Since synthesis of cystine from methionine is less, the cystine content of human milk is higher.

The above correlates well with the high albumin/casein ratio and smaller quantities of aromatic and branched chain amino acids. When there is increase in these compounds, even for a transitory period, this can affect the brain and intellectual development of infants.

Human milk is richer in nucleic acids. Higher Phenyl alanine and histidine levels in cow’s milk cause hyperaminoacidemia with immediate and possibly permanent ill effects.

Minerals - The mineral content of human milk is considerably less than cow's milk but absorption is better and variations according to demand and supply also occur. There is increased thirst due to more mineral contents in cow's milk for which more milk is given therefore obesity is common. Kidneys are faced with greater excretory load and may be damaged especially if dehydration occurs due to any cause.

Calcium - Human milk contains less calcium than cow's but absorption is better.

Iron - Human milk provides about 1 mgm of iron daily. Absorption from human milk is superior to cow's milk. Extra iron in neonates saturates the iron binding protein called lactoferrin. This interferes with its anti-infective action.

Fluoride - Cows milk contains more fluoride but dental caries is more prevalent in cow milk fed. This may be due to poor absorption or nursing bottle syndrome.
Copper - This is more in human milk. No case of copper deficiency has been reported in breast fed.

Zinc - Human and cows milk contain equal amounts of zinc. It is better absorbed in human milk. Zinc deficiency has not been reported in breast fed babies. Colostrum contains large amounts. Probably nature wants to provide a big bolus of zinc to the baby, which is enough for his subsequent requirements.

Enzymes*:*

Human milk has active enzymes, like lipase and hormones such as cortico-steroids .Thromboplastin level is higher while alkaline phosphatase level is lower.

Vitamins - Infants on breast feeding do not require any additional vitamins in the first 4 to 6 months provided the mother's nutrition is adequate.

Defense Mechanisms - Immune mechanisms are immature in early life and only become fully operative gradually in childhood. Protection is afforded by factors acquired from the mother through placenta and breast milk.

Human milk has been shown to contain antibodies against E. coli (which causes neonatal sepsis and meningitis) polio, ECHO, Coxsackie and influenza viruses, Tetanus bacilli, H. Influenza, step, staph, Pneumo, Shigella and salmonella.

Mothers exposed to harmful bacteria from their infants quickly produce antibodies which are passed on through the milk to the infant. Humoral Factors (Secretory IgA) - This is synthesized and secreted in mother's milk. It is present only in small quantities in cow's milk; it coats the intestinal mucosa and prevents invading bacteria to attack there, binds organisms and viruses, and agglutinates them together with lysozyme. It also exercises a cidal effect.

	Fat g%	Lactose g%	Protein g%	Calcium g%
Pakistan	2.73	6.2	0.8.0.90	28.4
Sirilanka	2.8	6.8	1.5	29.5
India	3.42	7.15	1.06	34.2
Britain	4.78	6.95	1.16	29.9
America	4.5	6.8	1.1	34

Fig 8.2: Shows human milk composition

Lactoferrin - This is bacteriostatic and has some antifungal properties. It is an unsaturated compound which binds iron, depriving certain pathogenic organisms of this element in the infant's gut.

Lysozyme - This has cidal effect against Enterobacteriaceae and gram positive bacteria and protects against certain viruses such as Herpes hominis. Lysozyme is many hundred times more in human milk than in cows.

Interferon - This is produced by lymphocytes and inhibits replication of viruses.

Lactoperoxidase - This is produced by macrophages and with hydrogen peroxide causes cidal effect.

Cellular Effects - Human milk contains live active macrophages, lymphocytes, neutrophil Is. and epithelial cells. They combat infection in the baby's gut by Phagocytosis.

Nutrition - In feeding premature infants of any size the goal is not only to achieve adequate caloric intake but also to balance the intake of carbohydrates, amino acids and fats.

Carbohydrates - Premature infants require intravenous or intra-arterial infusion of 10% glucose at a rate sufficient to provide approximately 7 mg/kg/min to maintain a blood glucose level greater than 40 mg/dl and under 120 mg/dl. When lactose-containing milk feedings are begun, they provide additional carbohydrates in the form of lactose, which is rapidly taken up by the newborn liver and converted to glucose and glycogen.

	Total Solids g%	Fat g%	Casein g%	Protein g %	Lactose g%
Man	12.4	3.8	0.4	0.6	7
Camel	13.6	4.5	2.7	0.9	5
Cow	12.7	3.7	2.8	0.6	4.8
Buffalo	17.2	7.4	3.6	0.8	5.5
Goat	13.2	4.5	2.5	0.4	4.1
Sheep	19.3	7.4	4.6	0.9	4.8

Fig 8.3: Shows composition of milk in different species

Amino Acids - Amino Acids can be given intravenously to infants using anyone of the commercially available protein hydrolysates. Human breast milk or modified Cow's milk formulas with high whey/curd ratios are the preferred feedings in very low birth weight infants.

Fats - Formulas with mixtures of medium-chain triglycerides and complex fats should be used.

Supplements **-** Vitamin D along with intravenous or oral calcium should be given during the first few days to few weeks of life to prevent rickets. In addition, for infants of less than 35 weeks gestation, we recommend 50 mg of vitamin C, 25 International Unit Vitamin E, and 50 micro gram of folate daily. Phytomenadione
(Vitamin K 1), 1 mg intramuscularly is also advised.

Benefits to Baby - Breastfeeding is good for every part of baby's body--from the brain to the diaper area. Here's a list:

Brain Higher IQ in breastfed children. Cholesterol and other types of fat in human milk support the growth of nerve tissue.

Eyes Visual acuity is higher in babies fed human milk.

Ears Breastfed babies get fewer ear infections.

Mouth Less need for orthodontics in children breastfed more than a year. Improved muscle development of face from suckling at the breast. Subtle changes in the taste of human milk prepare babies to accept a variety of solid foods.

Throat Children who are breastfed are less likely to require tonsillectomies.

Respiratory system Evidence shows that breastfed babies have fewer and less severe upper respiratory infections, less wheezing, less pneumonia and less influenza.

Heart and circulatory system Evidence suggests that breastfed children may have lower cholesterol as adults. Heart rates are lower in breastfed infants.

Digestive system:

Babies which are breast feed have less diarrhea, fewer gastrointestinal infections. In babies who have six months or more of exclusive have breastfeeding reduces risk of food allergies, also less risk of Crohn's disease and ulcerative colitis in adulthood.

Immune system Breastfed babies respond better to vaccinations. Human milk helps to mature baby's own immune system. Breastfeeding decreases the risk of childhood cancer.

Endocrine system Reduced risk of getting diabetes.

Kidneys With less salt and less protein, human milk is easier on a baby's kidneys.

Appendix Children with acute appendicitis are less likely to have been breastfed.

Urinary tract Fewer infections in breastfed infants.

Joints and muscles Juvenile rheumatoid arthritis is less common in children who were breastfed.

Skin Less allergic eczema in breastfed infants.

Growth Breastfed babies are leaner at one year of age and less likely to be obese later in life.

Bowels Less constipation. Stools of breastfed babies have a less-offensive odor.

Contraindications*:* There are certain conditions where it is contraindicated. Some of these conditions include active pulmonary tuberculosis in the mother and severely affected rhesus sensitized baby. The presence of maternal drug such as phenyl butanone, antithyroid medicines and certain anticancer agents are not desirable for feeding because these drugs are excreted in the breast milk.

Since virtually all nutritive, drugs and toxins are transmitted through breast milk to the infant, foods eaten by the mother may cause increased gas or stool changes and even produce severe adverse effects. If the mother's intake of any drug is excessive, toxicity may be produced in the child.

Medicines and Nursing Mothers - Most medications have not been tested in nursing women, so no one knows exactly how a given drug will affect a breast-fed child. Very few problems have been reported, In the January 1994 issue of Pediatrics, the American Academy of Pediatrics included the following in a list of drugs that are usually compatible with breast-feeding:

- acetaminophen
- many antibiotics

- anti epileptics (although one, Primidone, should be given with caution)
- most antihistamines
- alcohol in moderation (large amounts of alcohol can cause drowsiness, weakness, and abnormal weight gain in an infant)
- most anti hypertensive
- aspirin (should be used with caution)
- caffeine (moderate amounts in drinks or food)
- codeine
- decongestants
- ibuprofen
- insulin
- quinine
- thyroid medications

Tobacco Smoke: Nursing mothers should avoid smoking. Nicotine can cause vomiting, diarrhea and restlessness for the baby, as well as decreased milk production for the mother. Maternal smoking or passive smoke may increase the risk of sudden infant death syndrome (SIDS) and may increase respiratory and ear infections.

Preparation for Nursing - Nipple soreness can be minimized by preparation of the breasts prior to delivery. With a soft washcloth, rub the nipple 4 or 5 times, then gently pull the nipple several times. This can be done once or twice daily. A daily bath is all that is necessary for cleanliness of the breasts. When the mother is too weak to take bath simple washing of the nipples will suffice. The mother should assume a comfortable position either lying down or sitting in a rocking or upright chair, before starting breast feeding.

The infant should be fed when signs of hunger appear and should be offered both breasts at each feeding for maximum milk production. The infant usually nurses for about 10 minutes on the first side, completely emptying this breast, and then finishes the feeding on the opposite breast.

It is important to help the infant to grasp the whole areola and to have the nipple well back in the infant's mouth. Mother's fluid intake especially milk, should exceed 2L/d. It is likely that a woman who breast feeds less than 5 times a day will stop effective lactating within about 1 to 2 months. When the mother first attempts to feed, an experienced and trained nurse should be present in her room. She should

provide explanation of physiologic process and assist the mother and make her comfortable by helping her to sit on a chair or lean on one side.

Breast engorgement usually occurs on about the third day after delivery. This may interfere with nursing because the infant can not grasp the nipple easily. A nipple shield may be provided to these patients. Soreness of the nipples is a frequent complaint by the nursing mothers. This can be minimized by reducing the nursing time to 5 minutes. A bland ointment may be used on the nipples.

The mother who wishes to nurse a premature, sick, or debilitated infant, must empty her breasts several times a day with a mechanical pump or by manual expression to maintain lactation. This milk can be given to her baby through naso gastric tube or through feeding bottle with a soft nipple.

Feeding Schedule - Feeding on demand is the best practice as it allows the baby to drink when awake and hungry. It also leads to optimal intake and eventual establishment of a 'schedule.' This can be satisfying to both the baby and the mother.

The first feeding with sterile water can be offered after the birth recovery period which ends at 3 to 6 hours of age. Any attempt at forced feeding should be resisted. The baby should be hungry and have normal bowel sounds, before starting the feeding.

The initial feeding may consist of a few swallows or ounces. Soon after the feeding is established, the baby may be allowed to regulate the volume and frequency. Care should be taken to meet the necessary fluid and Caloric requirements.

Fig 8.4: Shows feeding bottle which can be sterilized by microwave

Bottle Feeding - In cases where breast feeding is contraindicated or not possible bottle feeding should be done. There is hardly ever a problem in a normal healthy and mature baby. He is able to suck through most commercially available nipples. It is the premature and sick baby who has weak sucking reflex and may face difficulty. If the nipple hole needs to be enlarged, this can easily be done with a hot needle. Bottles and nipples should be washed in soap and water and then rinsed and dried. Where the water supply is not clean, boiled water should be used. In situations where cleanliness is more difficult to maintain, powdered milk should be used and dissolved in boiled water. Cow's milk and evaporated milk formulas are now not recommended because of the relatively high osmotic load. The physician should make certain that the formulas are diluted correctly and that caloric needs are being met.

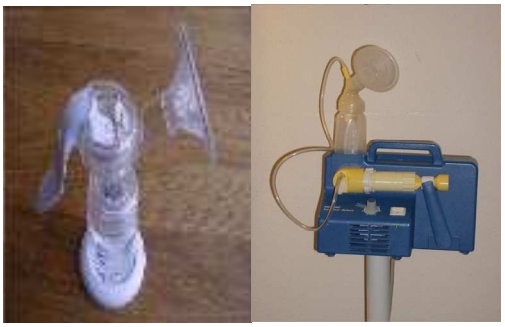


Fig8.5: Shows simple and electronic pump

Breast Milk Bank - The idea of establishing bank for breast milk is quite attractive but this can not be done in Pakistan. According to Islamic faith it is objectionable to feed a baby indiscriminately with different mothers milk; infect it is forbidden, because of danger of marrying a sister/brother breast fed by common mother. In Islam wet mothers or Dais are allowed to feed babies other than their own if they so desire. Inter marriages between her own and other babies fed by her are also forbidden.

Conclusion

In light of the overwhelming evidence of breastfeeding benefits not only for babies but also for mothers and the planet, Artificial feeding increases personal and societal health care costs, and detrimentally affects the environment.

Breastfeeding in a society where bottle-feeding is the norm clearly requires a significant commitment, especially when relatives and friends do not support breastfeeding. However, women making the decision about infant feeding should know that breastfeeding is clearly more than a lifestyle choice: it is a significant health decision with life-long consequences.

REFERENCES

1. Kramer MS, Chalmers B, Hodnett ED, et al. Promotion of Breastfeeding Intervention Trial (PROBIT): a randomized trial in the republic of Belarus. JAMA (Journal of the American Medical Association) 2001; 285(4):413–20.

2. Philippe BL, Merewood A, Miller LW, et al. Baby Friendly Hospital Initiative improves breastfeeding initiation rates in a U.S. hospital setting. Pediatrics 2001; 108(3):677–81.

3. Perez-Escamilla R, Segura-Milan S, Polite E, Dewey KG. Effect of the maternity ward system on the lactation success of low-income urban Mexican women. Early Human Development 1992; 31(1):25–40.

4. Purpose: American Academy of Pediatrics, American College of Obstetricians and Gynecologists. Breastfeeding Handbook for Physicians. Elk Grove Village, IL: American Academy of Pediatrics; 2006. III-a. Process for Pregnant Mothers and Mothers With Healthy Newborns.

5. American Academy of Pediatrics. New Mother's Guide to Breastfeeding. Meeks JY, Tippins S, eds. New York, NY: Bantam Books; 2002

6. American Academy of Pediatrics Section on Breastfeeding. Breastfeeding and the use of human milk. Pediatrics. 2005;115:496–506.

7. Patricia Haggerty and Shea Rut stein, "Breastfeeding and Complementary Infant Feeding, and the Postpartum Effects of Breastfeeding," DHS Comparative Studies no. 30 (Calverton, MD: MACRO International, Inc., 1999). 20 UNICEF/WHO/UNFPA, "Maternal and Neonatal Tetanus Elimination by 2005.

Chapter Outline

Normal Newborn:

Evaluation of the Newborn:

Asphyxia Neonatorum:

Classification:

Asphyxia Pallida:

Asphyxia Livida:

Causes:

Management:

Breastfeeding Advantages:

THE NEW BORN

Normal Newborn - The normal newborn breathes without difficulty and cries soon after delivery. He moves his extremities and "pinks up" quickly, as venti-lation continues. His pulse rate is over 100 per minute and strong. His respirations appear nearly effortless.

Fig 9.1: The newborn baby

Management of the Normal Newborn - The infant should be placed on the specially prepared baby trolley in a slightly head down position. The mouth and oropharynx should be cleared of fluid, using the bulb syringe or a similar low suction device, as soon after the delivery as it is safely possible.

This procedure should be per-formed gently, keeping in mind the marked vagotonia of the newborn. An overzealous and inexperienced physician or nurse can some time produce vigorous stimulation of the Pharynx. This may result in reflex apnoea, bradycardia or laryngospasm and make things worst instead of improving.

Gentleness therefore is the key to success in such cases. Soon after the cord is clamped and divided, the infant should be wrapped in a receiving blanket and placed in a suitable receptacle where body temperature is maintained. The infant's head is again positioned slightly below that of the rest of the body. It is a sound practice to carefully and continuously observe all infants for a minimum of 10 minutes, in order to ensure that regular and effortless respiration has been well established.

Physical Examination – This should be made in the delivery room soon after birth. A thorough or complete examination is not appropriate at this time because of the care of the mother, who may need suturing of the episiotomy and monitoring for postpartum hemorrhage. The time and attention of health personal present in the delivery room should be directed more towards the mother than baby at this stage. Soon after the mother has been attended too and third stage of delivery has

been completed without any complication, a thorough and more detailed evaluation of the baby must commence.

Fig 9.2: Showing newborn ready for examination

Evaluation of the Newborn - It is not difficult to separate the normal from the severely depressed newborn, provided an objective method of quantitating the degree of depression such as Apgar scoring is used. The physical sign that determine the scoring are in general, a score of 7 to 10 which implies a "vigorous" infant, a score of 4 to 6 implies a "depressed" infant, and a score of 0 to 3 implies a markedly depressed infant. Routinely the infant's score is recorded at 1 minute after complete delivery and subsequently at 5 minutes. Occasionally, infants born with an initial high score will do poorly whereas other infants with an initial low score will do well, but in general this objective scoring system provides quite useful guidelines for the management of such babies.

Stomach Tube - When it is important to rule out the possibility of a tracheoesophageal fistula a soft rubber catheter can be passed into the stomach without much difficulty. The house staff should be trained to do this procedure.

Asphyxia Neonatorum: It is a clinical manifestation where the baby fails to breathe at birth. This is visible at birth and usually reflects intrauterine anoxia. An infant who is well in utero or is not depressed by sedatives given to the mother, starts respiration spontaneously, and ventilates his lungs without any difficulty unless there is any organic lesion in the respiratory system.

Classification: We classify asphyxia neonatorum into Asphyxia pallida, and Asphyxia Livida.

Modern Classification: This is based upon Apgar scoring.

Sign	0 point	1 point	2 points
Skin colour	Cyanosis Pallor	Peripheral Cyanosis	Pink
Muscle tone	Flaccid	Limbs	Good
Resp effort	None	Gasps	Good
Heart rate	None	<100	>100
Response to stimulus	None	Slight	Good

Fig 9.3: Shows the Apgar Scoring System

Asphyxia Pallida: it is equal to Apgar score ranging between 1-4 at 1 minute and is usually clinically very severe asphyxia.

Asphyxia Livida: It is equal to Apgar score ranging between 5-9 and clinically is mild to moderate, generally the lower the Apgar score the severer the asphyxia. In case of mild asphyxia, the airway is cleared and baby is stimulated, no positive pressure breathing or intubation is required.

Incidence: In developed countries where obstetrical practice is modernized asphyxia neonatorum occurs in about 10 per cent cases. But in developing country like

Pakistan this complication is far greater than 10 per cent.

Causes: The frequent causes of asphyxia neonatorum are premature delivery, abruptio placenta and antepartum hemorrhage. There may be chronic starvation and intra uterine hypoxia of the fetus. Fetal hypoxia is more frequently encountered in cases of cord prolapse, breech delivery, intra-uterine growth retardation and where fetal distress in utero was present.

***Complications*:** These neonates are very prone to acute attacks of acidoses. Sometime prolonged acidoses can result in serious neurological consequences. These babies go into shock easily. Meconium aspiration syndrome is far more common; hypoglycaemia develops rapidly and if the asphyxia is prolonged, cerebral depression leading to cerebral irritation and even convulsions can result.

Management

***Prophylaxis*:** Prophylactic management of these babies requires detailed evaluation of all high risk obstetrical factors. This allows the practicing Physician to prepare himself with resuscitative measures such as Oxygen supply, facial mask, and mucous suction catheter, along with laryngoscope and endotracheal tube to use in case of emergency. The equipment required for resuscitation such as different sizes of face masks endotracheal tubes and laryngoscopes have been described in more detail in chapter 6 of this book.

Therapeutic: It is very important that the neonates at birth are watched carefully. The Apgar score should be recorded at one minute and then five minutes after birth. This allows thorough evaluation of the degree of asphyxia in a more realistic and scientific way. .Detail management of common respiratory problems in the neonate have been described in chapter 6

Fig 9.4: Correct way to hold the newborn baby

Eye Prophylaxis: Routine eye prophylaxis against gonorrheal infection must be done. One percent silver nitrate can be instilled carefully into each eye so that the conjunctival surface is adequately bathed in the solution. In this country 0.5 per cent chloramphenicol drops are used in-stead of silver nitrate. I personally use these drops and have found this therapy very satisfactory.

Prophylactic therapy with vitamin K: Vitamin K (phytomenadione), 1 mg intramuscularly, should be given routinely to every newborn.

***First Urine and Stool*:** The normal infant will pass stool and urine within 24 to 48 hours of age, if this does not occur the cause must be investigated.

Bathing: The baby usually stabilizes in 2 to 6 hours after delivery then it can be bathed, dressed and fed.

Duration of Stay: A normally delivered term baby may stay in the hospital for 3 days. However following Cesarean Section this stay should be delayed to at least 8 days. Some families' request Discharge within the first 1 to 2 days after delivery, this should be resisted. Because early discharge is accompanied by definite, risk of delay in detecting problems such as severity of jaundice, infection and minor congenital

defects. The difficulty in establishment of breast feeding will also go undetected.

***Nose*:** Congenital syndromes are associated with abnormal nose configuration. Nasal discharge, noisy breathing, or complete obstruction to breathing may be present. About one third of term infants are obligatory nasal breathers. Nasal obstruction from mucous discharge can occur in infants who are born with an upper respiratory tract infection and where mothers have been treated with reserpine for hypertension.

Ears: The size shape and location of ears should be examined. Low set or rotated ears are often associated with other congenital abnormalities, especially of the urinary tract.

Feeding to Newborn

Breast or Bottle? The American Academy of Pediatrics (AAP) and other professional groups concerned with the care of newborns advocate breastfeeding as best for your baby. Specifically, the AAP recommends that babies be breastfed exclusively for about the first 6 months. Following the introduction of solid foods, breastfeeding should continue through the first year of life and beyond, if desired.

Breastfeeding may not be possible or preferable for all women. Deciding to breastfeed or bottle feed a baby is usually based on the mother's comfort level with breastfeeding as well as her lifestyle, Remember, your baby's nutritional and emotional needs will be met whether you choose to breastfeed or formula feed.

Breastfeeding Advantages: Breastfeeding your newborn has many advantages. Perhaps most important, breast milk is the perfect food for a human baby's digestive system. It contains the vitamins and minerals that a newborn requires, and all of its components lactose, protein (whey and casein), and fat are easily digested by a newborn's immature digestive system. Commercial formulas try to imitate breast milk, and come close, but the exact composition cannot be duplicated.

Also, breast milk contains antibodies that help protect infants from a wide variety of infectious diseases, including diarrhea. Studies suggest that breastfed babies are less likely to develop certain medical problems, including diabetes, high cholesterol, asthma, and allergies. Breastfeeding may also decrease the chances that the child will become overweight or obese.

Breastfeeding is great for moms, too. It burns calories and helps shrink the uterus, so nursing moms get back into shape quicker. Breastfeeding may also protect mom from breast and ovarian cancer.

Some moms find breastfeeding easier and quicker than formula-feeding; it needs no preparation, and you don't run out of breast milk in the middle of the night. Also, breastfeeding costs little. Nursing mothers do need to eat more and may want to buy nursing bras and pads, a breast pump, or other equipment. But these expenses are generally less than the cost of formula.

Breastfeeding meets a variety of emotional needs for both moms and babies the skin-to-skin contact can enhance the emotional connection, and providing complete nourishment can help a new mother feel confident in her ability to care for her newborn.

In some cases, a mother's health may interfere with her ability to breastfeed. For example, mothers who are undergoing chemotherapy for cancer and moms who are

infected with human immunodeficiency virus (HIV, the virus that causes AIDS) should not breastfeed. If you have a medical condition or take any medications regularly, or if you or your baby gets sick, talk with your doctor about whether it's OK to breastfeed. If you have to stop nursing temporarily, it's important to continue to pump breast milk to maintain milk production.

In some situations, it may not be possible to breast-feed, such as when a baby is sick or born pre-maturely. Even if the infant cannot breastfeed, breast milk may be given via a feeding tube or bottle.

Sometimes mothers who have inverted nipples may have difficulty breastfeeding, but with the help of a lactation consultant this usually can be overcome. Likewise, women who have had plastic surgery on their breasts should be able to successfully breastfeed.

Avoid using pacifiers or bottles until after the first month of life. Introducing them before breastfeeding is known to cause "nipple confusion," and can lead to an infant giving up the breast.

How often to feed: Your newborn should be nursing eight to 12 times per day during the first month. In the beginning, mothers may want to try nursing 10 to 15 minutes on each breast, and then vary the time as necessary.

Once your milk supply is established, breast-feeding should be "on demand" (when your baby is hungry), which is generally every 1 to 3 hours. As newborns get older, they'll need to nurse less frequently some may feed every hour and a half, whereas others may go 2 or 3 hours between feedings. For babies who are getting formula, they'll likely take about 2 to 3 ounces every 2 to 4 hours. Newborns should not go more than 4 hours without feeding.

Call your baby's doctor if you need to awaken your newborn frequently or continually urge your baby to suck. Most experts suggest feed your baby whenever he or she seems hungry. Signs that babies are hungry include:

Signs of Hunger

- Moving their heads from side to side
- Opening their mouths
- Sticking out their tongues
- Placing their hands and fists to their mouths
- Puckering their lips as if to suck
- Nuzzling again their mothers' breasts
- Showing the rooting reflex (when a baby moves its mouth in the direction of something that's stroking or touching its cheek)

Signs of Adequate Feeding: You can be assured that your baby is getting enough to eat if he or she seems satisfied, produces about four to six wet diapers a day, has regular bowel movements, sleeps well, is alert when awake, and is gaining weight. A baby who is fussing, crying, seems hungry, and does not appear satisfied after feeding may not be getting enough to eat.

Although your baby will probably start on some solid foods between 4 and 6 months, breast milk or formula will remain the most important source of nutrition through the first year of life.

Nutritional Supplements: Breast milk contains the right combination of vitamins

and easily absorbed iron that will be sufficient until your baby begins eating iron-rich cereals around 6 months of age. A healthy infant being nursed by a healthy mother does not need any additional vitamins or nutritional supplements, with the exception of vitamin D. Breast milk does contain some vitamin D, and vitamin D is produced by the body when the skin is exposed to sunlight. However, sun exposure increases the risk of skin damage, so parents are advised to minimize exposure. The AAP recommends that all breastfed babies begin receiving vitamin D supplements during the first 2 months and continuing until the infant consumes enough vitamin D-fortified formula or milk (after 1 year of age).

Formula contains the right blend of vitamins, including vitamin D, for a baby, so supplements are usually not necessary. Iron-fortified formula is recommended for a baby's first year and should contain up to 12 milligrams of iron per liter.

Water, juice, and other foods are usually unnecessary during a baby's first 6 months. Breast milk or formula provides everything babies need nutritionally until they start eating solid foods.

It's "not surprising" that massage seemed to improve sleep and crying, according to the researchers. It's not clear how often, when or for how long babies should receive massage to get the most benefits.

Many parents react to a tired child's cries by holding and carrying the infant, this adds stimulus and also prevents the child from learning to fall asleep on its own.

Safety for the baby: Crawl from room to room, picking up small or fragile objects that may fit in your baby's mouth and pose a choking hazard. Should be avoided. Babies tend to pull and grab at any cord or string they can reach. An agile baby may wriggle out of a too-big shirt and twist it around his or her neck with surprising speed. Don't place the crib next to a window or hang a diaper bag or any other items from the crib railings.

Don't let your baby play with balloons, marbles, coins or other small items. Throw out any soft, squeezable toys that may fit into your baby's mouth when compressed. Safety gates for stairs can help prevent falls.

Prevent poisoning:

To prevent accidental poisonings, keep anything hazardous out of reach. This includes various house plants and products such as: Alcohol, Medications, and Vitamins, Iron supplements, Bleach, Ammonia, Dishwasher soap, Furniture polish, Drain openers, and Toilet bowl cleaners Rust removers, Oven cleaners, and Windshield washer fluid and Paint thinner

Keep potentially dangerous products in the original containers, including product labels containing safety information? Post the number for your local poison control center in a prominent spot. And remember the most important safe-guard adult supervision.

REFERENCES

1. Tarini BA (2007). "The current revolution in newborn screening: new technology, old controversies". Archives of pediatrics & adolescent medicine 161 (8): 767–72. doi:10.1001/archpedi.161.8.767. PMID 17679658.

2. Newborn Screening Authoring Committee. Pediatrics 2008;121;192-217 DOI:10.1542/peds.2007-3021.

3. Screening Tests for Newborns American Association for Clinical Chemistry. This page was last reviewed on March 16, 2008. |

This page was last modified on December 1, 2009.

4. American College of Medical Genetics Newborn Screening Expert Group. Newborn screening: toward a uniform screening panel and system--executive summary. Pediatrics. 2006 May;117(5 Pt 2):S296-307.

5. Cost-Benefit Analysis of Universal Tandem Mass Spectrometry for Newborn Screening. Pediateics 2002 PMID 12359795 [3]

6. Financial, Ethical, Legal, and Social Issues, Newborn DNA samples to be destroyed Clague A, Thomas A (2002). "Neonatal biochemical screening for disease". Clin. Chim. Acta 315 (1-2): 99–110. doi:10.1016/S0009-8981(01)00716-1. PMID 11728413.

7. .Klein AH, Agustin AV, Foley TP (1974). "Successful laboratory screening for congenital hypothyroidism". Lancet 2 (7872): 77–9. doi:10.1016/S0140-6736(74)91637-7. PMID 4137217.

8. Chace DH, Kalas TA, Naylor EW (2003). "Use of tandem mass spectrometry for multianalyte screening of dried blood specimens from newborns". Clin. Chem. 49 (11): 1797–817. doi:10.1373/clinchem.2003.022178. PMID 14578311.

9. Lin KW. Screening for sickle cell disease in newborns. Am Fam Physician. 2009;79(6):507-8.

10. Pesce MA. Laboratory Testing in Infants and Children. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, eds. Nelson Textbook of Pediatrics. 18th Ed. Philadelphia, Pa: Saunders Elsevier; 2007: chap 714.

Chapter Outline

Resuscitation:

Method of intubation

Drug Therapy

The Management of Acidosis

Stomach Tube

Newborn Resuscitation Priorities:

Challenging Resuscitation Conditions:

Equipment for Neonatal Resuscitation:

Challenging Resuscitation Conditions:

Resuscitation of The Newborn

Resuscitation:

Resuscitative measures are indicated when the neonate fails to initiate respiration spontaneously after delivery. The main objective of resuscitation is to ensure adequate pulmonary respiration. There is no doubt that effective and timely institution of resuscitative measures can prevent permanent damage or even death in the newborn. The urgency of resuscitative needs of any particular infant can be determined by the physical signs present at the time of delivery. The Apgar score and the heart rate are probably the best guides to follow.

Newborn Resuscitation Priorities: Clear meconium as needed when head delivers. Deliver baby: Place your hand around neck posteriorly and one underneath head to control delivery. Tie or clamp cord in two places and cut between ties/clamps.

Assess heart rate: If less than 60 bpm after 30 second start bag mask ventilation, begin chest compressions and prepare medications. Epinephrine is indicated when HR is <60 bpm after 30 second of assisted ventilation plus 30 second of chest compressions.

Equipment for Neonatal Resuscitation:

The practicing physician should be familiar with the equipment required for resuscitation the list includes resuscitator (infant), Masks (2 sizes, term and premature), Dry towels/blankets Suction equipment, ET tubes (sizes 2.5, 3.0, 3.5) Laryngoscope and blades (sizes 0, 1). In the room where the procedure may have to be carried.

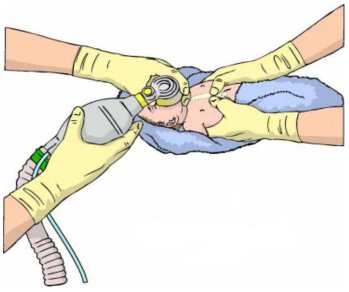


Fig 10.1: Showing face mask. in use on full term newborn

Fig 10.2: Showing face mask for term baby

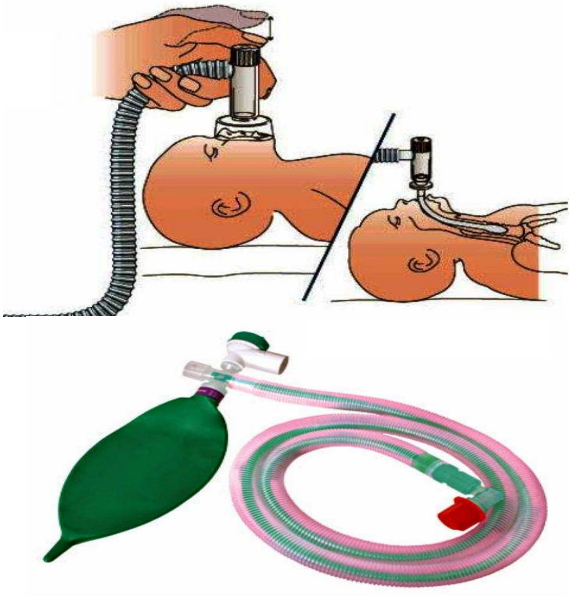


Fig 10.3: Showing face mask for premature baby

Fig10.4: Showing different sizes of laryngoscope and blades

Fig10.5: Showing endotracheal tube size 2.5

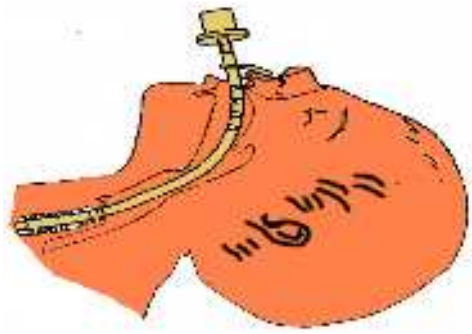


Fig10.6: Showing position of endotracheal tube after insertion

Challenging Resuscitation Conditions:

Technical problems: like Esophageal intubation, difficulty in intubation hypoxia hypoventilation unrecognized pulmonary problems such as Pneumothorax, meconium aspiration, and diaphragmatic hernia may be present. Sever metabolic problems such as acidosis, hypoglycemia, hypothermia may also be present. Congenital anomalies, severe anemia can be present. also and will need to be differentiated.

The moderately depressed infant with a heart rate of over 100 per minute but with weak respirations or cry (immediate Apgar score of 3 to 6) can be treated with 100 per cent oxygen blown over the face. Such infants may benefit from a quick slap on the soles of the feet.

If regular breathing and the heart rate does not improve despite these measures, then intermittent positive pressure breathing with oxygen should be applied. It is advisable to inspect the larynx directly for the presence of fluid or mucous that might be forced into the trachea before instituting intermittent positive pressure.

Any such fluid should be removed by suction from the oropharynx or trachea. Positive pressure should not exceed 35 ml of water pressure and prolong for more

than 1 to 2 seconds as it may easily rupture the lung of the newborn. One must make sure that inflation of the stomach is not confused with inflation of the lung. Auscultation of the lungs can help to confirm pulmonary ventilation. An increase in pulse rate and an improvement in color usually indicate that effective ventilation has been achieved.

The markedly depressed infant is limp, and has a heart rate less than 100 per minute. These infants require urgent tracheal intubation.

Method of intubation - The tube should be inserted after the airway has been properly cleared under direct vision. The resuscitator can start inflating the lungs by careful mouth to tube insufflations, but pressure must be cautiously applied. Only 30 to 40 ml of air are required for inflation, and this is perhaps most safely delivered by using the cheek muscles to expel just the air in the mouth.

A second tube delivering oxygen to the resuscitator's mouth may be used, in order that oxygen enriched air can be expelled into the endotracheal tube. Mouth to tube breathing should be continued until spontaneous respirations have begun. A properly-placed tube should be left in position until respirations are definitely well established.

Fig10.7: Showing technique of closed chest cardiac massage

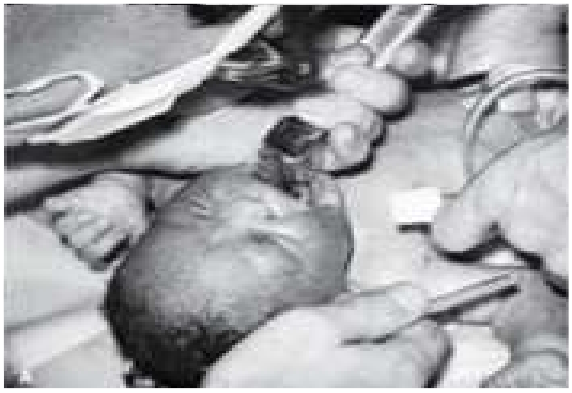


Fig10.8: Shows proper position of baby for intubation

In certain babies the respiration may not be established in spite of active resuscitative measures and cardiac arrest may eventually occur. Cardiac arrest of recent onset may be effectively treated with intubation and external cardiac massage.

Cardiac massage is accomplished by two finger compression of the middle third of the sternum. External massage should' be discontinued with each lung inflation.

The effectiveness with which the heart is emptied during massage may be determined by palpating the femoral pulse. An intracranial injection of 0.05 to 0.1 mg of epinephrine may prove helpful in re-establishing spontaneous cardiac activity in some cases.

Fig10.9: shows correct method of giving oxygen by face mask.

Drug Therapy - When respiratory depression is related to the use of morphine or morphine derivatives given to the mother, a morphine antagonist such as nalorphine (Nalline) 0.2 mg or levallorphan (Lorfan) 0.05 mg is injected into the umbilical vein. The only other drug that may prove useful is epinephrine. The stimulant drugs such as Coramine appear to be more hazardous than helpful in resuscitation of the newborn and therefore should not be used.

The Management of Acidosis - Hypoxia in the newborn usually produces respiratory and metabolic acidosis. Artificial ventilation
is very often sufficient in correcting mild to moderate respiratory acidosis.

In case of metabolic acidosis glucose and sodium bicarbonate given intravenously appear to be more effective. Meticulous care with respect to dosage and rate of administration are required in preventing a rapid and dangerous overshoot to alkalosis. Blood acid base status should be monitored frequently throughout the period of therapy.

Stomach Tube - When it is important to rule out the possibility of a tracheoesophageal fistula a soft rubber catheter can be passed into the stomach without much difficulty. The house staff should be trained to do this procedure.

REFERENCES

1. Palme C. "State of the art" in workshop participating countries: a report of a survey. In Breathing and warmth at birth. Sterky G, Tafari N, Tunell R, (eds.) SAREC report R2,1985,29-32.

2. Kinoti SN. Asphyxia of the newborn in East, Central and Southern Africa. East African Med J., 1993, 70:422-433.

3. Shah PM. Birth asphyxia: a crucial issue in the prevention of developmental disabilities. Midwifery, 1990, 6:99-107.

4. The World Health Report 1995. Geneva, World Health Organization, 1997, p. 21.

5. Costello AM, Manandhar DS. Perinatal asphyxia in less developed countries. Arch Dis Child, 1994, 71:F1-F3.

6. Kumar R. A community-based study on birth asphyxia risk factors. IJPSM 1995, 26:53-59.

Chapter Outline

What is Neonate?

Examination:

The First Few Hours:

The First Few Days:

Physical examination:

Abdominal Examination:

Orthopedic Examination:

The Neurological Examination:

Screening:

HIV Screening:

Toxicology Screening:

Hearing Screening:

DETAILED EVALUATION OF THE NEONATE

Neonate - An infant is considered to be a "newborn" or "neonate" up to age 1 month (4 weeks old). This "neonatal period" represents a short time of life where changes are very rapid and when many critical events can occur.

Pre requisites for all dealing with evaluation of the neonate - Hand washing is critical for all personnel to prevent transmission of infection. Active participation in the birth by both the mother and her partner facilitates adaptation of both to parenting.

Examination

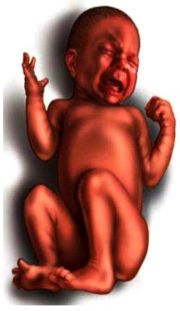
Initial Assessment: - Normal appearance, normal breathing, and normal circulation are assuring signs. Vital signs: such as heart rate should be recorded it should be at least 120 per minute Respiration rate should be also recoded and it should be 22 per minute at least Blood pressure should be 100 over 70 and body temperature should be 38 C ..

Examination should include a very thorough and detailed examination of the baby. Pallor, cyanosis, jaundice, birth injury, respiratory distress, abdominal distension, congenital malformation and activity of the baby should be carefully checked.

Generalized cyanosis is an important observation and requires immediate evaluation.

Pallor may be due to acute blood loss at the time of delivery. Edema when generalized indicates serious renal cardiac or other systemic disease, including erythroblastosis foetalis.

The Apgar score rates: based on recording of the following parameters is shown in the fig below



Reflexes, irritability

Muscle tone

Respiration, crying

Skin color of body and extremities

Pulse, heart rate

Fig11.1: Shows screening of newborn baby

The First Few Hours: Immediately at delivery, the neonate's respiratory effort, heart rate, color, tone, and reflex along with irritability should be assessed

Preventive interventions include administration into both eyes of an antimicrobial agent (e.g., 1% silver nitrate solution 2 drops, 0.5% erythromycin, 1% tetracycline to prevent,

Gonococcal and chlamydial ophthalmia. Administration of vitamin K 1 mg IM to prevent hemorrhagic disease of the newborn. Subsequently, the neonate is bathed, wrapped, and brought to the family. The head should be covered with a cap to prevent heat loss. Rooming-in and early breastfeeding should be encouraged.

The First Few Days -

Physical examination: The neonate should undergo a thorough physical examination within 24 hrs. Basic measurements include length, weight, and head circumference. Length is measured from crown to heel; normal values are based on gestational age and should be plotted on a standard growth chart. When gestational age is uncertain or when the infant seems large or small for age, the gestational age can be precisely determined using physical and neuromuscular findings. These methods are typically accurate to ± 2 weeks.

Cardiovascular System - Many clinicians begin with examination of the heart and lungs when the infant is quiet. The examiner should identify the location where the heart sounds are loudest (to exclude dextrocardia). Normal heart rate is 100 to 160 beats/min. The rhythm should be regular, although an irregular rhythm from premature atrial or ventricular contractions is not uncommon. A murmur heard in the 1st 24 h is most commonly caused by a patent ductus arteriosus. Daily heart examination confirms the disappearance of this murmur, usually within 3 days. Femoral pulses are sought and compared with brachial pulses. A weak or delayed femoral pulse suggests aortic coarctation or other left ventricular outflow tract obstruction. Central cyanosis suggests congenital heart disease, pulmonary disease or sepsis.

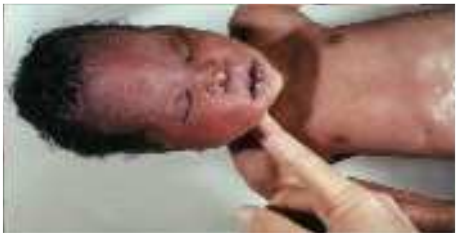


Fig11.2: Shows Down syndrome baby

Respiratory System - The respiratory system is evaluated by counting respirations over a full minute because breathing in neonates is irregular; normal rate is 40 to 60 breaths per min. The chest wall should be examined for symmetry, and lung sounds should be equal throughout. Grunting, nasal flaring, and retractions are signs of respiratory distress.

Head & Neck - After cardiac and pulmonary evaluation, a systematic head to toe examination is performed. In a breech delivery, the head has less molding, with swelling and ecchymosis occurring in the presenting part (i.e., buttocks, genitals, or feet).

Molding of the head is quite an innocent finding and settles within 24 hours. Caput succedaneum is an area of edema over the presenting part that extends across suture lines. This is produced by bleeding into the subperiosteal space. The size of the anterior fontanelle varies from 1 to 4 cm in any direction. It is smaller when the sutures are over-riding. It is soft, pulsates with the baby's pulse and becomes slightly depressed when the baby is upright and quiet. The posterior fontanelle is less than 1cm in diameter.

A large anterior fontanelle may be a sign of hypo-thyroidism. Also common is a cephalohematoma, an accumulation of blood between the periosteum and the bone that produces a swelling that does not cross suture lines. It may occur over one or both parietal bones and occasionally over

the occiput. Cephalhematomas usually are not evident until soft-tissue edema subsides; they gradually disappear over several months. Increased intracranial pressure in the newborn is associated with increasing head circumference and a full anterior fontanelle. Shape and length of neck should be noted. Motion and muscle tone should be checked. Webbing of the neck suggests Turner's syndrome. Enlargement of the thyroid may occur in the newborn. This can be easily detected and needs immediate evaluation.
Voice - The cry of the baby is important. Its character should be noted. A high pitched cry suggests brain damage. A hoarse cry may result from inflammation or edema of the larynx or vocal cord paralysis.

Nose - Congenital syndromes are associated with abnormal nose configuration. Nasal discharge, noisy breathing, or complete obstruction to breathing may be present. About one third of term infants are obligatory nasal breathers. Nasal obstruction from mucous discharge can occur in infants who are born with an upper respiratory tract infection and where mothers have been treated with reserpine for hypertension.

Ears – Low set ears may indicate genetic anomalies, including trisomy 21. The external Auditory canal should be examined. Clinicians should look for external ear pits or tags, which are sometimes, associated with hearing loss and kidney abnormalities.

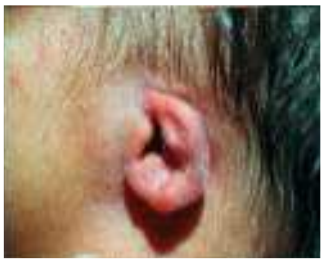


Fig11.3: Shows low set and hypoplastic ear

The size, shape and location of ears should be examined. Low set or rotated ears are often associated with other congenital abnormalities, especially of the urinary tract.

Mouth - The examiner should observe the lips and mucous membranes for pallor and cyanosis. He should also look for Natal teeth which may be present. These are usually soft incisors. They may need to be removed in order to avoid the risk of aspiration, but usually they are left alone and need no treatment.

High-arched palate may be present as an isolated finding or may be associated with cleft lip and palate.

Fig11.4: Showing cleft lip and palate

The clinician should inspect and palpate the palate to detect a posterior palate defect. Some neonates are born with an epulis, a benign hamartoma of the gum, which if large enough can cause feeding difficulties and may obstruct the infant's airway. These lesions can be removed without recurrence.

Neonates can also be born with primary or natal teeth. Natal teeth do not have roots and may need to be removed because they may fall out and be aspirated. Inclusion cysts called Epstein's pearls may occur on the roof of the mouth.

When examining the neck, the clinician must lift the chin to look for abnormalities such as cystic hygromas, goiters, or branchial arch remnants. Torticollis can be

caused by a sternocleidomastoid hematoma from birth trauma.

Shoulder and Clavicle:

The examiner should move the shoulders both anteriorly and posteriorly. If fracture of the clavicle is present the movements on the affected side will be limited. There will be tenderness, and crepitus present at the fracture site.

Thorax - The shape contour and its movements are noted. Fullness of the thorax due to increased anteroposterior diameter can be seen with overexpansion of the lungs.

Umbilical Cord - The umbilical cord begins drying within hours after birth and becomes loose from the underlying skin by 4 to 5 days. I t falls off by 7 to 10 days, but occasionally, a granulating stump may remain which can be easily treated with silver nitrate cauterization.

In cases of hemorrhagic disease of the new born there may be bleeding from the umbilical stump as well as from other nocuous membranes.

Genitalia - In most term male infants, the scrotum is pendulous, with rugae completely covering the sac. The testis has completely descended.

In females, the labia majora at term completely cover the labia minora and clitoris. During the first few days after birth, a white mucous discharge that may contain blood, issues from the vagina.

This is harmless, and normally subsides in few days. Patency of anal canal should be checked especially when meconium has not been passed.

Fig 11.5: Shows Female baby with ambiguous Genitalia

The penis should be examined for hypospadias or epispadias. In term boys, testes should be present in the scrotum. Scrotal swelling may signify hydrocele, inguinal hernia, or, more rarely, testicular torsion with hydrocele, the scrotum transilluminate.

Torsion, is a surgical emergency, it causes ecchymosis and firmness. In term girls, the labia are prominent. Mucoid vaginal and sero-sanguineous secretions (pseudo menses) are normal; they result from exposure to maternal hormones in utero and withdrawal at birth. A small tag of hymenal tissue at the posterior fourchette, believed to be due to maternal hormonal stimulation, is sometimes present but disappears over a few weeks.

Fig11.6: Shows male ambiguous Genitalia

Ambiguous genitals (intersex) may be a consequence of several uncommon conditions (eg. congenital adrenal hyperplasia; 5α-reductase deficiency; Klinefelter's, Turner's, or Swyer syndrome); referral to an endocrinologist

is indicated for evaluation and a discussion with the family about the benefits and risks of immediate versus , delayed gender assignment.

Extremities and Back - The symmetry of the arms and legs should be noted. Absence of a bone, clubfoot, fusion or webbing of digits or missing parts should be checked. Hip dislocation is suspected when there is limitation of abduction of the hips or when a click can be felt when the femur is pressed downward and then abducted.
This is a serious complication, which if left un-detected and untreated can lead to permanent disability; therefore, it should be immediately treated. The back is observed for curvature and spinal defects such as meningomyelocele and spina bifida. These conditions require appropriate treatment as soon as it is possible.

Eyes - The eyes may be easier to examine the day after birth because the birth process causes swelling around the eyelids. Eyes should be examined for presence of the red reflex; absence occurs with glaucoma, cataracts, and retinoblastoma. Subconjunctival hemorrhages are common and caused by forces exerted during delivery.

Eyes should be examined carefully preferably before silver nitrate or chloramphenicol prophylaxis is given. The examination should include evaluation of the periorbital structures, nerve function, anterior orbital structures, and light reflex. The eyes are usually open and the infant is alert for the first 30 minutes, then the eyes tend to be closed, as the baby sleeps for the next few hours.

Abdominal Examination - The abdomen should be round and symmetric. A scaphoid abdomen may indicate a diaphragmatic hernia, through which intestines have migrated to the chest cavity in utero, sometimes causing pulmonary hypoplasia and post-natal respiratory distress. An asymmetric abdomen suggests an abdominal mass. Splenomegaly suggests congenital infection or hemolytic anemia. The kidneys may be palpable with deep palpation, the left more easily than the right. Large kidneys may be due to obstruction, tumor, or cystic disease. The liver is normally palpable 1 to 2 cm below the costal margin. An umbilical hernia, due to a weakness of the umbilical ring musculature, is common but rarely significant.

Abdominal wall may be absent. Umbilical hernia may be present. The spleen tip is felt from the infant's right side and is sometimes 2 to 3 cm below the left costal margin. The liver usually is palpable 1 to 2 cm below the right costal margin. The lower poles of both kidneys should be felt. Abnormal enlargement of these organs needs further evaluation and referral to the specialist.

Orthopedic Examination – This focuses on detection of hip dysplasia. Risk factors for dysplasia include female sex, breech position in utero, twin gestation, and family history. The condition is assessed by using the Barlow or Ortolani maneuver. In the Ortolani maneuver, the neonate is placed on his back with his feet facing the examiner. With an index finger on the greater trochanter and a thumb on the lesser trochanter, the examiner first fully flexes the legs at the knees and hips, and then fully abducts the legs while exerting pressure upward and inward until the knees touch the examining table. A palpable clunk of the femoral head with abduction signifies movement of an already dislocated femoral head into the acetabulum and constitutes a positive test for hip dysplasia.

The maneuver may be falsely negative in infants greater than 3 months because of tighter hip muscles and ligaments. If the

examination is equivocal or the infant is high risk (e.g., girls who were in the breech position), hip ultrasonography should be done at 4 to 6 wk; some experts recommend screening ultrasonography at 4 to 6 wk for all infants with risk factors.

The Neurological Examination – This includes an evaluation of the neonate's tone, level of alertness, movement of extremities, and reflexes. Typically, neonatal reflexes, including the Moro, suck, and rooting reflexes, are elicited. The Moro reflex, the neonate's response to startle, is elicited by pulling the arms slightly off the bed and releasing suddenly. In response, the neonate extends the arms with fingers extended, flexes the hips, and cries. The rooting reflex is elicited by stroking the neonate's cheek or lateral lip, which prompts the infant to turn the head toward the touch and open the mouth. The suck reflex can be elicited by using a pacifier or gloved finger. These reflexes are present for several months after birth and are markers of a normal peripheral nervous system.

Examination of the Skin - A neonate's skin is usually ruddy; cyanosis of fingers and toes is common in the 1st few hours. Vernix caseosa covers most neonates over 24 wk gestation. Dryness and peeling often develop within days, especially at wrist and ankle creases. Petechiae may occur in areas experiencing trauma during delivery, such as the face, in a delivery where the face is the presenting part; however, neonates with diffuse petechiae should be evaluated for thrombocytopenia.

Fig 11.7: Shows examination of the skin spots

Many neonates have erythema toxicum, a benign rash with an erythematous base and a white or yellow papule. This rash, which usually appears 24 h after birth, is scattered over the body and can last for up to 2 wk.

Skin Mongolian spots these are bluish or black areas of pigmentation over the back and buttocks and are occasionally found in the neonate. Capillary hemangiomas are common over occiput, eyelids, forehead, nose, and lips. These are harmless conditions and need no treat-ment.

Screening– Screening recommendations will vary in each individual Blood typing is indicated when the mother has type or Rh-negative blood or when minor blood antigens are present because of the risk of hemolytic disease of the newborn.

All neonates are evaluated for jaundice throughout the hospital stay and before discharge. The risk of hyperbilirubinemia is assessed using risk criteria, a measurement of bilirubin or both. Bilirubin can be measured using transcutaneous or serum measurements. Many hospitals screen all neonates and use a predictive nomogram to establish the risk of extreme hyperbilirubinemia. Follow-up is based on age at discharge, Pre discharge bilirubin level, and risk of developing jaundice.

HIV Screening – It is required in children of mothers known to be HIV positive or those en-gaging in HIV high-risk behaviors.

Toxicology Screening:

It is indicated when there is a maternal history of drug use, unexplained placental abruption, or unexplained premature labor; the mother has had poor prenatal care; or the infant exhibits evidence of drug withdrawal.

Hearing Screening:

Initial screening often involves using a hand held device to test for echoes produced by healthy ears in response to soft clicks (otoacoustic emissions); if this test is abnormal, auditory brainstem response (ABR) testing is done. Some institutions use ABR testing as an initial screening test. Further testing by an audiologist may be needed.

High-Risk Factors for Hearing Deficits in Neonates -
When any of the following risk factors is present screening for hearing defects will be mandatory in a good neonatal unit

- Birth weight < 1500 g
- Apgar score ≤ 7 at 5 min
- Serum bilirubin > 22 mg/dL (> 376 μmol/L) in a neonate whose birth weight is > 2000 g, or > 17 mg/dL (> 290 μmol/L) in a neonate <2000 g
- Perinatal anoxia or hypoxia
- Neonatal sepsis or meningitis
- Craniofacial abnormalities
- Seizures or apneic spells
- Congenital infections (rubella, syphilis, herpes simplex, cytomegalovirus, or toxoplasmosis)
- Maternal exposure to aminoglycoside drugs
- History of early hearing loss in a parent or close relative

Routine care and observation: Neonates are bathed once their temperature has stabilized at 37° C for 2 h. The umbilical cord clamp can be removed when the cord appears dry, usually at 24 hrs. The umbilical stump should be kept clean and dry to prevent infection. Some centers apply isopropyl alcohol several times a day or a single dose of triple dye, a bacteriostatic agent believed to decrease, bacterial colonization of the cord. The cord should be observed daily for redness or drainage because it is an entry portal for infection.

Weight, Vernix & Meconium - Most neonates lose 5 to 7% of their birth weight in the 1st few days of life, due primarily to urinary and insensible fluid losses and secondarily to passage of meconium, loss of vernix caseosa, and drying of the umbilical cord. In the 1st 2 days, urine may stain the diaper orange or pink because of urate crystals, which are normal and a result of urine concentration. Most neonates void within 24 h after birth; the average time of 1st void is 7 to 9 h after birth, and most void at least 2 times in the 2nd 24 h of life.

A delay in voiding is more common in boys and may result from a tight foreskin; a male neonate's inability to void may indicate posterior urethral valves. Circumcision is usually delayed until at least the first void; failure to void within 12 hrs of the procedure may indicate a complication.

If meconium has not been passed within 24 hrs, the clinician should consider evaluating the neonate for anatomic abnormalities such as imperforate anus, Hirschsprung's disease, and cystic fibrosis, which can cause meconium ileus.

REFERENCES

1. Hussein M, Howard ER, Mieli-Vergani G, et al. Jaundice at 14 days of age: exclude biliary atresia. Arch Dis Child 1991;66: 1177–9.

2. American College of Medical Genetics Newborn Screening Expert Group. Newborn screening: toward a uniform screening panel and system--executive summary. Pediatrics. 2006 May;117(5 Pt 2):S296-307.

3. Lin KW. Screening for sickle cell disease in newborns. Am Fam Physician. 2009;79(6):507-8.

4. Pesce MA. Laboratory Testing in Infants and Children. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, eds. Nelson

Textbook of Pediatrics. 18th Ed. Philadelphia, Pa: Saunders Elsevier; 2007: chap 714.

5. Smith L. Updated AAP Guidelines on Newborn Screening and Therapy for Congenital Hypothyroidism. Am Fam Physician. 2007; 76(3).

6. Francoual J, Myara A, Benattar C, et al. Investigation of total and conjugated bilirubin determination during the neonatal period. Eur J Clin Chem Clin Biochem 1993;31:499–502.

Chapter Outline

Definition:

Causes:

Respiratory distress syndrome:

Incidence:

Prenatal Diagnosis:

Differential Diagnosis:

Management:

Therapeutic Measures

Surfactant R Therapy:

Supportive treatment:

Prognosis:

Common Respiratory Disorders of The Newborn

Definition:

Apnea is considered to be present if there is Cessation of breathing.
The physician practicing neonatology, perinatology obstetrics and attending delivery process can come across any of the following disorders ie. Apnea of prematurity (AOP) Respiratory distress syndrome (RDS), Transient Tachypnea of the Newborn (TTN) Meconium aspiration syndrome (MAS) and chronic lung disease (CLD).

Pathologic Apnea:

When respiratory pauses are greater than 20 seconds and any pause is accompanied by bradycardia or significant desaturation it is considered pathological apnea .

Periodic Breathing:

This condition is a type of central apnea with Brief pauses in breathing of less than 10 seconds which repeat it self for several cycles? This is due to significant immaturity of respiratory control and a variant of apnea.

Pathophysiology:

Lung surfactant deficiency is the primary cause of RDS, Pulmonary surfactant synthesis occurs, in type II Pneumonocyte: It begins at 24-28 weeks of gestation, and gradually increases until full gestation.

Causes: It is most prevalent prior to 36 weeks' gestation. 50 - 70% of all preterm infants will have apnea; more then 50% of infants with less than 1500g require intervention for apnea. Majority Causes of apnea of prematurely (AOP) resolve by 37 weeks' post conception age. The problem can Persists longer with low Gestational age (GA) Most infants reach respiratory maturity by 42 - 44 weeks CGA.

Clinical significance: Apnea and bradycardia is a common problem, adverse, neuro developmental outcome, may result from more frequent, significant desaturation and bradycardia.

Transient Tachypnea of the Newborn: This condition Results from slow absorption of lung fluid. After caesarean section mild respiratory distress occurs which Peaks at about 36 hours of life and Resolves spontaneously.

Meconium Aspiration Syndrome: 10-20% of all deliveries have in utero

passage of meconium; Meconium staining alone is not a good marker of asphyxia. Meconium-stained amniotic fluid (MSAF) is found in all races and socioeconomic strata in human. The thicker the consistency of MSAF, the greater the likelihood of (MAS) Meconium Aspiration Syndrome.

RESPIRATORY DISTRESS SYNDROME:

The term RDS is usually used synonymously with hyaline membrane disease of the newborn. Clinically it manifests itself with intercostal retraction, decrease in air entry and a grunting sound which begins at birth. When this clinical picture persists beyond three hours of age and there is no organic cause found for this problem, the condition is called respiratory distress syndrome.
Lung disease of the newborn caused by surfactant deficiency is defined as RDS. Its incidence and severity is inversely proportional.

to gestational age HMD is the most common cause of respiratory failure during the first few days after birth.

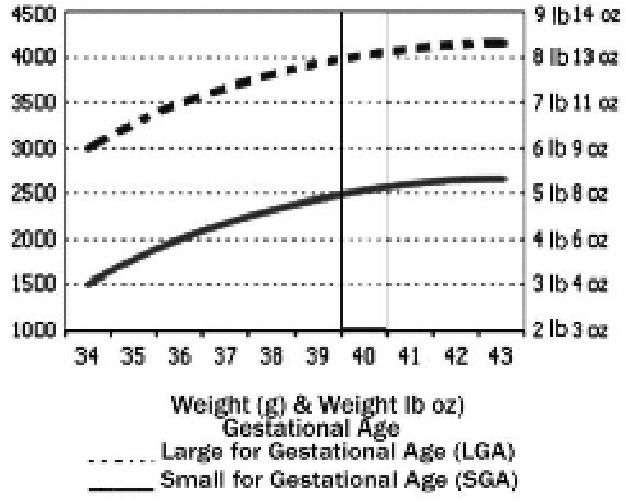


Fig12.1: Showing growth chat weight for gestation

Incidence: RDS occurs in approximately 30,000 newborn infants each year. 50% of the neonates born at 26-28 weeks of gestation develop RDS while less than 30% of premature neonates born at 30-31 weeks develop RDS.

It has been reported in all races worldwide, occurring most often in premature infants of Caucasian ancestry. Most deliveries in developing countries occur at home; therefore accurate records are unavailable to determine the frequency of RDS in developing countries such as Pakistan.

Causes **-** Respiratory distress syndrome affects 10% of all premature infants. It rarely affects those born full term. The disease occurs when the lungs lack a chemical that helps them inflate with air and keeps the air sacs from collapsing. This chemical, called lung surfactant normally appears in mature lungs. The lack of this chemical causes the air sacs to collapse and prevents the child from breathing properly. Symptoms usually appear shortly after birth and slowly become more severe. Risk factors are prematurity, diabetes in the mother, and delivery complications that lead to acidosis in the newborn at birth.

Signs and Symptoms:

Primarily there is only decrease in the air entry, with grunting sound and intercostal retraction, but later on tachypnea results which leads to peripheral edema. Both hypotonia and pleural rales can also develop. Baby is usually cyanosed and his blood gases i.e. P02 is decreased and PC02 is increased. Chest X-Ray reveals reticulo-granular pattern.

Breathing difficulties (dyspnea), rapid breathing (tachypnea), excessively deep and rapid breathing (hyperventilation) and insufficient levels of oxygen in the circulating blood (hypoxemia).are tare typical signs of acute RDS (ARDS) This condition may develop in conjunction with widespread infection in the body (sepsis)

or as a result of pneumonia, trauma, shock, severe burns, and aspiration of food into the lung along with, multiple blood transfusions, and inhalation of toxic fumes.

Fig12.2: Shows newborn with costal retraction in case of RDS

When Unusual breathing movements occur and there is drawing back of the chest muscles with Shortness of breath and grunting sounds and Nasal flaring even, Breathing, Bluish colour of the skin appears and mucus membranes, arms or legs become puffy or swollen it indicates that the newborn is having RDS.

Prenatal Diagnosis: History of premature delivery Estimation of Concentration of lecithin in the amniotic fluid and ratio of lecithin/sphingomyelin, greater than 2:1 indicates lung maturity, Sphingomyelin remains constant during pregnancy it is lecithin which changes with lung maturity

Differential Diagnosis: TTN, Usually improve while RDS deteriorates oxygen requirement is less in TTN, there is prominent perihilar streaking, and there will also be fluid in the fissures, Small pleural effusions may be seen, Patchy infiltrates have also been described, Bacterial pneumonia is very difficult to distinguish therefore antibiotics are necessary and should be started without delay .Congenital anomalies, should be considered seriously and Echocardiogram should be performed. if severe arterial hypoxemia is present and no improvement after respiratory support and surfactant administration occurs anemia, hypoglycemia, aspiration syndrome e.g. meconium, aspiration and hypothermia must be considered and treated. The diagnosis of: Ureaplasma or Mycoplasma pneumonia should be considered and confirmed by means of tracheal aspirate cultures grown in the appropriate medium. Pulmonary Function: Compliance decreases. Functional residual capacity is reduced, Hypoxemia is usually present. PDA and foramen ovale plays role in hypoxemia due to R-L shunting. Alveolar ventilation is decreased and Minute ventilation is increased these studies should be made essential part of diagnostic work up in neonatal units

Chest X-Ray : Bilateral Reticular, granular appearance or Ground glass, appearance, will be typical picture in RDS In air bronchogram Poor lung expansion will be noted.

Management:

Prophylaxis - Since the incidence of prematurity is related to premature delivery, the criteria for elective induction especially if Cesarean Section has to be done, should be planned within 10 days of term if possible. All measures and modern diagnostic facilities such as measurement of L/S ratio for fetal lung maturity, amniotic fluid creatinine, lipid cells, ultrasonography and radiography should be employed to establish fetal maturity before Cesarean Section is performed. In cases of premature labor where delivery is unavoidable

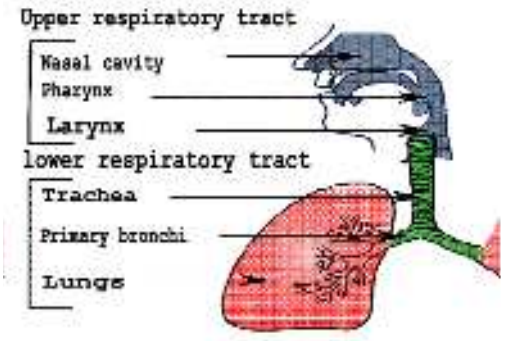


Fig12.3: Showing anatomy of respiratory tract in the neonate

heavy sedation should be avoided too. High-risk and premature infants require prompt attention by a pediatric resuscitation team.
First, the infant is given high oxygen and humidity concentrations. Infants with mild symptoms are given supplemental oxygen. Those with severe symptoms need a breathing machine to deliver oxygen as well as pressure, which keeps the lungs inflated. Oxygen and pressure will be reduced as soon as possible to prevent side effects associated with too much oxygen or pressure. For infants born before 30 weeks of age, surfactant is sometimes delivered through a tube placed into their lungs. This treatment is given only to older babies if the oxygen level drops below a certain level and the doctors believe RDS is present.

Fig12.4: Shows newborn with respiratory problem intubated and I/V lines inserted.

Therapeutic Measures - Active resuscitative measures should be employed to counteract asphyxia neonatorum aggressively. These neonates should be given solution of 10 per cent glucose intravenously through scalp vein. Intravenous fluid should be worked out from the birth weight of the newborn, for 1800 gram and over babies, 65 ml. of fluid/kg. Body weight can be given in 24 hours.

Body temperature should be maintained to 360C or 970F by placing the baby in the incubator. Properly controlled oxygen concentration should also be supplied to these babies to prevent hypoxia, without any delay.

These babies should also receive 5 milliequivalent of sodium bicarbonate. More bicarbonate can be given in cases of severe metabolic acidosis.

If these babies are not promptly treated then abdomen gets distended and they present with paralytic ileus. They become very easily hyperkalemic and acidotic and show abnormal patterns of ECG. If the heart is auscultated ductus murmur can be heard in most cases.

Surfactant Therapy:
Where needed it should be given without delay? It decreases surface tension and during expiration allows the alveolus to remain partly expanded and maintains functional residual capacity. Pulmonary surfactant deficiency Causes inflammation and respiratory epithelial injury, decreases fluid absorption and produces lung edema. Structure of lung surfactant consists of Protein 10%. small proteins hydrophobic protein SP-B and SP-C Hydrophilic proteins and SP-A and SP-Dare three types found in the lung surfactant.

Protein of Pulmonary Surfactant: SP-B, is required for normal pulmonary function, Mutation in SFTPB gene results in deficiency of SP-B. Abnormal expression of SP-B Can cause severe lung disease that is lethal in perinatal period. Protein of Pulmonary Surfactant: SP-C, Promotes formation of phospholipid film lining of alveoli, Human with SP-C deficiency develop interstitial pulmonary fibrosis in early childhood and SP-C deficiency does not cause respiratory distress at birth.

Protein of Pulmonary Surfactant: Hydrophilic SP-A and SP-D, are host defense of the lung, they kill bacteria, viruses and they also have carbohydrate recognition domain which allows coating, and Phagocytosis of virus and bacteria. The lung surfactant or (Lecithin) production occurs at 32-34 weeks .Fetal

cortisol increases its production, it stimulates Type II Pneumocyte cells, by 34-36 weeks, sufficient amount of Lecithin is secreted into alveolar lumen, and excreted into the amniotic fluid. Lecithin concentration in amniotic fluid indicates lung maturity.

Secondary surfactant deficiency may occur; in infants with the Pulmonary infections e.g. group B Strep, Pulmonary hemorrhage, Meconium aspiration and pneumonia. Oxygen toxicity; barotrauma or volutrauma to the lungs and congenital diaphragmatic hernia and pulmonary hypoplasia may also be responsible. Factors which can decrease the risk of RDS are use of antenatal steroids. Pregnancy induced or chronic maternal Hypertension, Prolonged rupture of membranes and maternal narcotic addiction. Natural lung surfactant: Alveolar factor is extracted from cow lung lavage fluid, similarly Curosurf is extracted from material derived from minced pig lung, Infasurf is extracted from calf lung lavage fluid and Survanta is extracted from minced cow lung with additional DPPC, palmitic acid and tripalmitin. Curosurf (Poractant alfa): Dosage: of this substance which is given by Intratracheal route varies from patient to patient. Initial: 2.5 mL/kg/dose (200 mg/kg/dose) is given; the physician may repeat medication with1.25 mL/kg/dose (100 mg/kg/dose) at 12-hour intervals for up to 2 additional doses; maximum total dose: 5 mL/kg
Precautions: Correction of acidosis, hypotension, and anemia, are necessary requirements hypoglycemia, and hypothermia should also be taken care off and recommended strongly prior to administration of surfactant. Warnings: Curosurf rapidly affects oxygenation and lung compliance, Its use should be restricted to a highly supervised set up in a clinical setting with immediate availability of clinicians experienced with intubation and ventilatory management of premature infants. When using Curosurf: if transient episodes of bradycardia and decreased oxygen saturation occur, discontinue the dosing procedure and initiate measures to alleviate the condition, Curosurf: produces rapid improvements in lung oxygenation and compliance it may require immediate reductions in ventilator settings

Supportive treatment: Temperature regulation: is very important every effort must be made to prevent hypothermia. Fluids, , and nutrition: therapy should be closely monitored . .an Blood glucose, electrolytes, acid base balance, calcium, and phosphorous levels should be regularly checked and maintained as close to normal as possible. Renal function and hydration must be checked. Once the infant is stable, intravenous nutrition with amino acids and lipids can be given to the baby. After the respiratory status is stable, initiate small volume of gastric feed (preferably breast milk) via a tube. Monitor heart rate, peripheral perfusion, and blood pressure. Blood or volume expanders may be required, start antibiotics in all infants who present with respiratory distress at birth after obtaining blood cultures. Discontinue antibiotics after three to five days if blood cultures are negative.

Mortality - The incidence of neonatal death in such cases can exceed 35 per cent. If the babies are premature then nearly 50 per cent of them can die.
Monitoring - The babies should be monitored by blood gases and X-Rays.

- **Prognosis** - The condition may persist or worsen for 2 to 4 days after birth with improvement thereafter. Some infants with severe respiratory distress syndrome will die. No matter what the treatment so the condition must be

Generic name	Trade name	Composition	Surfactant protein content	Phospholipid concentration	Dose	Volume	Availability in UK
Beractant	Survanta® (Ross, USA)	Bovine, minced lung + DPPC, trimalmitin & palmitic acid	<0.5% SP-B & C	25mg/mL	100mg/kg	4mL/kg	Yes
Bovine Lipid Extract Surfactant	BLES® (BLES Biochemicals, Canada)	Bovine lung lavage	~1% SP-B & C	27mg/mL	135mg/kg	5mL/kg	No
Bovactant	Alveofact® (Thomae, Germany)	Bovine lung lavage	~1% SP-B & C	41.7mg/mL	50mg/kg	1.2mL/kg	No
Calfactant	Infasurf® (ONY Inc., USA)	Bovine lung lavage	SP-B 290g/mL SP-C 360g/mL	33.3mg/mL	100mg/kg	3mL/kg	No
Poractant alfa	Curosurf® (Chiesi, Italy)	Porcine minced lung	~1% SP-B & C	80mg/mL	100-200mg/kg	1.25-2.5mL/kg	Yes
Surfactant TA	Surfacten® (Tokyo Tanabe, Japan)	Bovine, minced lung + DPPC, trimalmitin & palmitic acid	<0.5% SP-B & C	30mg/mL	120mg/kg	4mL/kg	No

Fig12.5: Shows names and dosage of different preparations of surfactant

treated seriously and aggressively. Long-term complications, may develop as a result of oxygen toxicity, the brain or other organs which did not receive enough oxygen can cause problems later on.

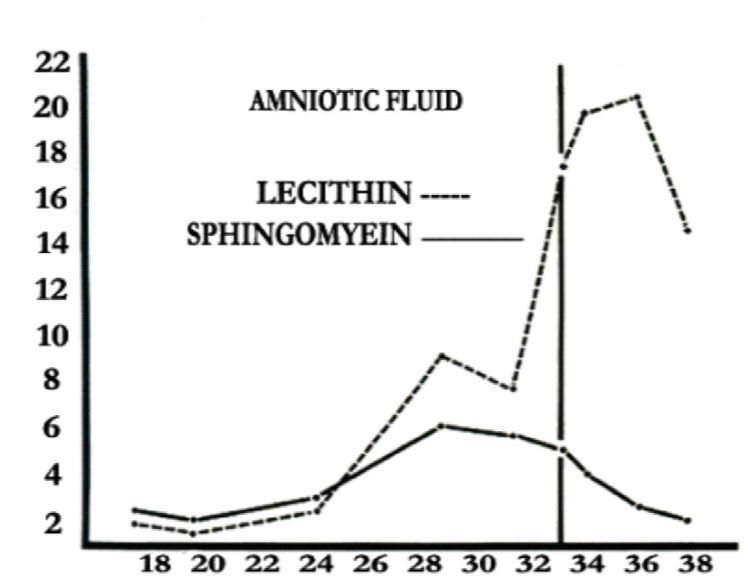
Complications Both early and late can include any of the following:

- Pneumothorax
- Pneumomediastinum
- Pneumopericardium
- Bronchopulmonary dysplasia
- Hemorrhage into the brain (intraventricular bleed)
- Hemorrhage into the lung (sometimes associated with surfactant use)
- Thrombotic events associated with an umbilical arterial catheter
- Retrolental fibroplasia and blindness
- Delayed mental development and mental retardation associated with anoxic brain damage or hemorrhage.

Prevention – Attendance at delivery by skilled personnel must be mandatory in all delivery rooms suctioning of mouth & oropharynx, as soon as head is delivered. Keep the baby warm Assess at delivery A = airways, B = breathing and C = circulation and Apgar scores. This is easy way to remember. Since infant respiratory distress syndrome (IRDS) is one of many conditions that usually occur in a premature infant, every effort should usually be made to help mothers carry babies to term. Ideally, this effort begins with the first prenatal visit, which should be scheduled as soon as a mother discovers that she is pregnant. Good prenatal care results in larger, healthier babies and fewer premature births. If a mother goes into labor early, every effort should be made to stop the labor and allow the pregnancy to continue to full term. A lab test called the L/S ratio (a measurement of the fetus's lung maturity) is done, and labor is usually halted until this test shows that the baby's lungs have matured. This decreases an infant's chances of developing IRDS.

When it appears that premature delivery is unavoidable, the mother should be given corticosteroids2 to 3 days prior to delivery.

In some cases, this may help the baby's lungs mature earlier.



Concentration (mg/100 ml)

Fig 12.6: Mean concentrations in amniotic fluid of sphingomyelin and lecithin during gestation.

Respiratory Distress Syndrome:

American Academy of Pediatrics recommendation in year2008 reported that Intubation of infant born at or before 30 weeks gestation in the delivery, should not be delayed Prophylactic natural surfactant therapy should be administrated through the ET as soon as the infant is stable after intubation, Do not delay surfactant therapy antenatal Steroids should also be given to any pregnant women at 24 to 34 weeks of gestation with intact membranes at high risk for preterm delivery. After administration of surfactant if the infant is active and exhibit spontaneous respiratory effort extubation and stabilization on CPAP is recommended, rather than continued intubation and mechanical ventilation. Prophylactic surfactant therapy is not recommended in infant greater than 30 week's gestation, delaying premature birth. Tocolytic may delay delivery by 48 hours and therefore enable time for antenatal corticosteroids to be given. Good control of maternal diabetes and avoid of hypothermia in the neonate. Helps improve results greatly.

REFERENCES

1. Rodriguez RJ, Martin RJ, and Fanaroff, AA. Respiratory distress syndrome and its management. Fanaroff and Martin (eds.) Neonatal-perinatal medicine: Diseases of the fetus and infant; 7th ed. (2002):1001-1011. St. Louis: Mosby. Antenatal use of glucocorticoids in women at risk for preterm delivery Authors:Men-Jean Lee, MD, Debra Guinn, MD, Charles J Lockwood, MD, Vanessa A Barss, MD. Retrieved on April 15, 2010.

2. Schwartz, R.M., Luby, A.M., Scanlon, J.W., & Kellogg, R.J. Effect of surfactant on morbidity, mortality, and resource use in newborn infants weighing 500 to 1500 g. New England Journal of Medicine, 330 (1994): 1476-1480.

3. Morrison JC, Whybrew WD, Bucovaz ET, Schneider JM. Injection of corticosteroids into mother to prevent neonatal respiratory distress syndrome. Am J Obstet Gynecol 131:358,1978.PMID:352152.

4. Effect of corticosteroids for fetal maturation on perinatal outcomes. NIH Consensus Development Panel on the Effect of Corticosteroids for Fetal Maturation on Perinatal Outcomes. JAMA.1995 1;273(5):413-8.PMID:PMID:7823388

Chapter Outline

Historic perspective:

Brief History of Newborn Screening:

Newborn Screening by MS/MS and Reporting of Results:

Primary Physician:

Management:

SCREENING OF THE HIGH RISK NEONATES

Fig13.1: Showing newborn screening

Neonate – "A neonate is a baby who is four weeks old or younger." The student will realize that normal intrauterine growth leading to term delivery provides the best chance to the baby in extra uterine life. Monitoring of intrauterine growth provides reliable as well as sensitive criteria for identifying new-born that are at risk. The need for involvement of obstetrician and neonatologist together in the antenatal period therefore becomes important. Screening of patients for high risk factors in pregnancy has been discussed in Chapter on High Risk Pregnancy. Therefore some high risk categories of the neonate only will be discussed here. When tandem mass spectrometry (MS/MS) was introduced into a few newborn screening laboratories worldwide. MS/MS could detect more than 30 additional disorders by simultaneous ac carnitine and amino acid analyses in a single blood spot. These disorders are caused by genetically determined (inherited) defects in protein and fatty acid metabolism. The ability to identify affected newborns before the onset of symptoms can dramatically improve the prognosis.

Historic Perspective:

Before newborn screening be-came available, PKU due to a genetic defect of phenylalanine hydroxylase was not diagnosed before six months of life, when developmental delay or other nonspecific neurological symptoms become apparent. It was already late. Treatment based on a phenylalanine restricted diet became available in the 1950s. Already incurred neurologic damage, however, could not be re-versed but only mitigated. To allow for the presymptomatic, identification of PKU patients and timely initiation of dietary intervention, a simple method for the measurement of phenylalanine in blood spots dried on filter paper was developed by Dr. Robert Guthrie. A few additional disorders such as,

hypothyroidism, galactosemia, and sickle cell disease were also soon added to many newborn screening programs. Historically, testing for inborn errors of metabolism (IEM) has been provided by research laboratories, each offering analyses only for disorders in line with their scientific interest. With increasing awareness of genetics in medicine and hundreds of IEMs identified to date, Clinical Biochemical and Genetics disorders can now be recognized laboratory discipline concerned with the evaluation and diagnosis of patients and families with inherited metabolic disease, it is now possible to monitor and treat patients earlier and distinguish . Heterozygous carriers from non-carriers by metabolite and enzymatic analysis of physiological fluids and tissues.

Screening tests, such as the analyses of amino acids, organic acids and acyl carnitine and are performed on specimens from patients presenting with symptoms reminiscent of an IEM (high-risk screening), postmortem samples obtained primarily from children that have died suddenly without apparent reason (postmortem screening), as well as for the purpose of prenatal diagnosis. have been very helpful for early diagnosis.

Newborn Screening by MS/MS - The quantitative measurements of various amino acids and acyl carnitine support the interpretation of complete profile but are not diagnostic by themselves. The interpretation is by pattern recognition. This concept sets apart a biochemical and genetics laboratory from conventional clinical chemistry and newborn screening laboratories that are used to provide quantitative results without interpretation.

Abnormal results of a screening test are typically not sufficient to conclusively establish a diagnosis of a particular disease. To verify a preliminary diagnosis, independent of biochemical (i.e., in vitro enzyme assay) or molecular genetics analyses are required.

A report for an abnormal screening result will include:

- A quantitative result of the abnormal metabolites
- A detailed interpretation of the results, including an overview will provide significant information on differential diagnoses,

A new MS/MS based method for the determination of 17OHP and other relevant steroids has also become available lately.

Primary Physician - The responsibility for proper care of the newborn rests with primary health care provider who first sees, examines and evaluates them. His role is very important; he not only plans management of pregnancy, delivery and postpartum care for the mother but also the proper evaluation and management of the neonate.

His responsibility is to estimate birth weight and length of gestation. These two parameters can place the inf.ant into its right category large, appropriate and small for gestational age. Similarly this helps to differentiate preterm and term from post-term babies. The training and skill of the primary care physician is very important.
Accurate categorization of the new born babies is important as it helps in organi-zing proper care of the high risk babies. One can then anticipate mortality and

potential neonatal problems, more accurately.

Large for gestational age (LGA) babies are commonly at risk of birth injury, asphyxia and hypoglycemic convulsions. Small for gestational age (SGA) infants may have severe intrapartum asphyxia, respiratory distress, nutritional deprivation and trauma during labor and delivery.

Premature infants are also susceptible to hypoglycemia and respiratory distress syndrome.

Post mature infants are usually depleted of oxygen and nutrition during the intrapartum period. Asphyxia, meconium aspiration, hypoglycemia and polycythemia are common in these babies.

Weight of the infants:

The survival rate for live born babies according to Lubchenco and colleagues as shown in Figure 144 are related to the birth weight then they are to the period of gestation.

The baby who weights 2000 grams or more at 28 weeks gestation has only 17% chances of dying while if his weight is less than 1500 grams his chances of dying are 35%.

Therefore it is important that correct weight of the baby must be assigned at the time of birth and due consideration given to this parameter while deciding intensive care to such high risk neonate.

Management:

Intensive care of these high risk babies in special care nurseries which are equipped with current tools for fetal monitoring, ventilators, blood gas analyzers and incubators have helped to improve the mortality as well as morbidity. The cost of providing such intensive care is enormous. Such care has also reduced the limit of viability to 25 weeks of gestation and birth weight to 700 grams. All developing nations with population growth problems may have to consider these problems when planning facilities for improvement in the care of critically ill neonates.

A healthy situation may be hidden in moderation. Over developing can be equally dangerous when considered in context of its impact on general population and society.

REFERENCES

1. Maxon, A. B., White, K. R., Behrens, T. R., & Vohr, B. R. (1995) Referral rates and cost efficiency in a universal newborn hearing screening program using transient evoked otoacoustic emissions (TEOAE), Journal of the American Academy of Audiology, 6, 271-277. White, K. R., Mauk, G. W., Culpepper, N. B., & Weirather, Y. (1998).

2. Tarini BA (2007). "The current revolution in newborn screening: new technology, old controversies". Archives of pediatrics & adolescent medicine 161 (8): 767–72.doi:10.1001/archpedi.161.8.767. PM ID 17679658.

3. Kayton A (2007). "Newborn screening:

a literature review".Neonatal network : NN 26 (2): 85–95. PMID 17402600.

4. Newborn Screening Expands: Recommendations for Pediatricians and Medical Homes-Implications for the System. Pediatrics121:1 192-217 January 2008[1]

5. labtestsonline.org > Screening Tests for Newborns American Association for Clinical Chemistry. This page was last reviewed on

6. March 16, 2008. | This page was last modified on December 1, 2009.

7. Newborn Screening for Metabolic Disorders. Journal of the American Medical Association 2006 PMID 16926360.

8. Expanded Newborn Screening for Inborn Errors of Metabolism by Electrospray Ionization-Tandem Mass Spectrometry: Results, Outcome and Implication PMID 12777559 [2]<

9. Cost-Benefit Analysis of Universal Tandem Mass Spectrometry for Newborn Screening. Pediateics 2002 PMID 12359795.

10. Smith L. Updated AAP Guidelines on Newborn Screening and Therapy for Congenital Hypothyroidism. Am Fam Physician. 2007; 76(3).

11. Newborn Screening for Metabolic Disorders. Journal of the American Medical Association 2006 PMID 16926360.

12. Expanded Newborn Screening for Inborn Errors of Metabolism by Electrospray Ionization-Tandem Mass Spectrometry: Results, Outcome and Implication PMID 12777559 [2].

Chapter Outline

Pathophysiology:

Mortality/Morbidity:

Causes:

Lab Studies:

Treatment:

Management

HAEMORRHAGIC DISEASE OF THE NEWBORN

The more appropriate term for hemorrhagic disease of new-born is vitamin K deficiency bleeding (VKDB). Historically, all bleeding disorders in the newborn were grouped together under the diagnosis of hemorrhagic disease of the newborn (HDN). With methods available today for the accurate diagnosis of other factor deficiency states and immune thrombo cytopenias, VKDB can be distinguished from other disorders by exclusion and appropriate ana-lysis of these other factors involved in coagulation.

Vitamin K is a fat-soluble vita-min that can be absorbed from the GI tract in the presence of bile salts. Vitamin K is required for the production of coagulation factors II, VII, IX, and X in the liver. Because of the short half-life of these factors, and the small amounts of vitamin K that can be stored in the body, inadequate intake of vitamin K can result in deficiency in a short period of time. PIVKA, inactive precursor proteins induced in vitamin K's absence, are measurable and can be used as an indicator of vita-min K deficiency.

Pathophysiology:

Newborns are relatively vitamin K deficient for a variety of reasons. Factors that can contribute to this deficiency include low vitamin K stores at birth, poor placental transfer of vitamin K, low levels of vitamin K in breast milk, and sterility of the gut. Because standard commercial infant formulas contain supplemental vitamin K, VKDB is almost exclusively a problem of breastfed infants. Infants with inadequate intake are at higher risk.

The most common sites of bleeding are the umbilicus, mucous membranes, GI tract, circumcision, and venipunctures.

Hematomas at sites of trauma, such as large cephalo hematomas and bruising, are also common findings. Intracranial bleeding can occur and is the main cause of mortality and long-term morbidity.

Mortality/Morbidity:

Intracranial hemorrhage (ICH) is uncommon in classic VKDB but can be observed in more than 50% of infants with late-onset VKDB. ICH is

responsible for nearly all mortality and all long-term sequelae resulting from VKDB.

Age: VKDB can occur in 3 general time frames.

Early onset, at less than 24 hours after birth, rarely occurs and is almost always associated with maternal medications that interfere with vitamin K, such as anticonvulsants, anticoagulants, and antibiotics. Postnatal administration of vitamin K has no effect in preventing early-onset disease. Maternal vitamin K supplementation that is administered prenatally may prevent this form of VKDB. The classic onset of VKDB is 2-7 days after birth in breastfed infants.

Late onset VKDB occurs after 2 weeks of life. In addition to breastfeeding, risk factors include diarrhea, hepatitis, cystic fibrosis (CF), coeliac disease, and alpha1antitrypin deficiency or absence of prophylaxis in otherwise healthy infants. Late onset VKDB tends to be more severe than early-onset or classic disease and has a high frequency of ICH.

Physical: The findings from the physical examination are normal except for findings at the sites of bleeding.

Symptoms of hemorrhagic disease of the newborn - The following are the most common symptoms of hemorrhagic disease of the newborn. However, each baby may experience symptoms differently. Symptoms may include:

- blood in the baby's bowel movements
- blood in urine
- blood oozing around the umbilical cord

The symptoms of hemorrhagic disease of the newborn may resemble other conditions or medical problems.

There are a number of complications which can lead to bleeding problems in the neonate.

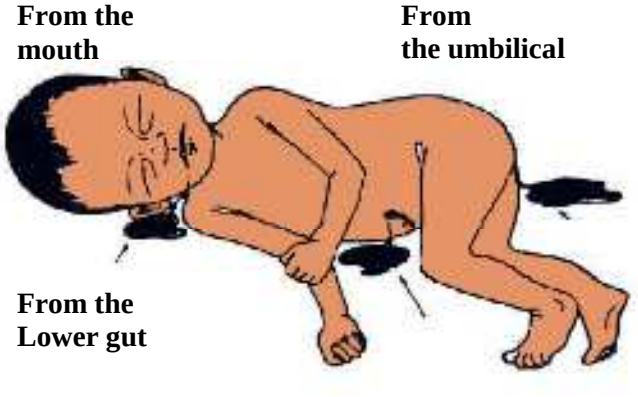


Fig14.1: sowing baby bleeding from umbilical area, mouth and rectum

Causes - In the newborn some of the important causes of bleeding are vascular accidents, and disseminated intravascular coagulation. This is a very serious complication and should be kept in mind while evaluating a newborn with sepsis, which starts to bleed.

A number of clotting factors such as factor II, VII, IX, and X are Vitamin K dependant. The levels of these clotting factors are normal at birth but decreases within 2 to 3 days after delivery. In vitamin K deficient infants, these levels may be very low and result in prolonged bleeding time. Small amount of vitamin K is sufficient to correct such clotting factor defects. All newborns should therefore receive 1 mg of vitamin· K intramuscularly on admission to the nursery.

Vitamin K deficiency in the newborn, which can be present for a variety of reasons, causes VKDB

Maternal medications that interfere with vitamin K stores or function, such as carbamazepine, Phenytoin, barbiturates, some cephalosporins, rifampin, isoniazid, and warfarin, can result in VKDB in the infant.

In addition to breastfeeding, risk factors for late onset VKDB include Diarrhea, Hepatitis, Cystic fibrosis, Celiac disease, Alpha1-antitrypin deficiency.

Lab Studies:

- Include prothrombin time (PT), activated partial thromboplastin time (APTT), fibrinogen levels, and a

  platelet count in the initial workup for bleeding in a newborn. A thrombin clotting time (TCT) is optional.

- A prolonged PT usually is the first laboratory test result to be abnormal in VKDB; however, no laboratory test can confirm the diagnosis of VKDB.
- Vitamin K direct assay is not useful because levels normally are low in newborns.
- Levels of protein induced by vitamin K antagonism (PIVKA) II are increased in VKDB, but this test generally is not available outside of research laboratories.
- Infants with VKDB typically have a prolonged PT with reference range platelet counts and fibrinogen levels. Thrombocytopenia or a prolonged aPTT should prompt workup for other causes of bleeding.
- The diagnosis of VKDB is confirmed if administration of vitamin K brings a halt to the bleeding and reduces the PT value.

Imaging Studies: Intracranial bleeding is rare and usually associated with other causes of bleeding, particularly the thrombo cytopenias; however, ICH has been reported in VKDB and can be fatal. Investigate any neurologic symptoms with a CT scan.

Treatment:

Medical Care: Prevention of VKDB with intramuscular vitamin K is of primary importance in medical care. A single dose of intramuscular vitamin K after birth effectively prevents classic VKDB. While oral vitamin K prophylaxis improves coagulation tests at 1-7 days. It has not been tested in randomized trials for its effect on either classic or late VKDB.

- Immediately administer vitamin K subcutaneously for any infant in whom VKDB is suggested or who has any sort of bleeding until a diagnosis is established.

  - IM administration can result in a hematoma because of the coagulopathy.

  - IV administration of vitamin K has been associated with anaphylactic reactions.

- Fresh frozen plasma may be considered for moderate to severe bleeding.

- Life-threatening bleeding may also be treated with prothrombin complex concentrates (PCC).
- Because the bleeding in classic VKDB usually is not life threatening, a single dose of parenteral vitamin K is sufficient to stop the bleeding and return PT values to the reference range.

Vitamin K is the mainstay of treatment for VKDB. Other coagulation factors are rarely needed. Severe bleeding may warrant the use of fresh frozen plasma. No other drugs or treatments are acceptable substitutes for prompt vitamin K dosing. SC administration is preferred over the IM route in symptomatic infants.

Drug Category: Vitamin K is required to correct the deficiency that defines VKDB. Prophylaxis with IM vitamin K at birth is an effective means of preventing VKDB in the newborn.

Deterrence/Prevention - IM vitamin K prophylaxis at birth is the standard of care in the United States. Commercial infant formulas in the United States contain supplemental vitamin K.

These measures have served to make VKDB a rarity. However, parental refusal of prophylaxis and an increasing frequency of breastfeeding may cause a resurgence of VKDB in developed countries.

Gastro-intestinal Bleeding - This may occur in the newborn as a result of trauma, or because of pathological lesions such as peptic ulcer, duplication of the bowel, Meckel's diverticulum, intussusception and volvulus. The bleeding from gastrointestinal tract can be generally managed with frequent oral milk feedings, but occasionally blood transfusion may have to be given.

Intracranial Hemorrhage - Generally vascular bed in the preterm infants is very delicate and fragile. The premature infant is therefore more susceptible to intracranial hemorrhage with rupture of small blood vessels. The hemorrhage which occurs into the ventricles may subsequently extend into the cerebral cortex, and cause serious problems.

It has been reported that one third of the preterm births where birth weight is less than 1500 g will have hemorrhage, and two thirds of these will be asymptomatic. This complication should be carefully evaluated in all preterm births.

Management:

The extent of hemorrhage can be established by the help of an ultrasound or a CT scan during the third to seventh day of life. If ventricular dilatation is noted serial ultrasound examinations of the brain should be done at weekly intervals. In mild hemorrhage, the blood is usually reabsorbed.

If no further ventricular dilatation is noted there is no need for active treatment. However in hemorrhage where intraventricular dilatation is present, progressive hydrocephalus may result. Such babies should be referred to a neurosurgical unit for treatment.

Prognosis:

The prognosis is usually favorable in infants who do not have ventricular dilatation or progressive hydrocephalus.

REFERENCE:

1. Hubbard D, Tobias JD. Intracerebral hemorrhage due to hemorrhagic disease of the newborn and failure to administer vitamin K at birth. South Med J 2006; 99: 1216-20.

2. Pooni PA, Singh D, Singh H, Jain BK. Intracranial hemorrhage in late hemorrhagic disease of the newborn. Indian Pediatrics 2003; 40: 243-8.

3. Ijland MM, Pereira RR, Cornelius EA. Incidence of late vitamin K deficiency bleeding in newborns in the Netherlands in 2005: evaluation of the current guidelines. Eur J Pediatric 2008; 167: 165-9.

4. Waseem M. Vitamin K and hemorrhagic disease of newborns. South Med J 2006; 99: 1199.

5. Bor O, Akgun N, Yakut A, Sarhus F, Kose S. Late hemorrhagic disease of the newborn. Pediatrics into 2000; 42: 64-6.

Chapter Outline

Incidence:

Physiological Jaundice:

Jaundice and Hyperbilirubinemia:

Physiologic Jaundice:

Breastfeeding Jaundice:

Pathological Jaundice:

Cause:

Blood Brain Barrier and Bilirubin:

Phototherapy:

Transfusion:

Objectives:

Follow up:

HYPERBILI-RUBINEMIA

Definition:

Hyperbilirubinemia is a condition in which there is too much bilirubin in the blood.

Pathophysiology of Jaundice:

Bilirubin is a tetrapyrrole created by the normal breakdown of heme. Most bilirubin is produced during the breakdown of hemoglobin and other hemoproteins.

Accumulation of bilirubin or its conjugates in body tissues produces jaundice (ie, icterus), which is characterized by high plasma bilirubin levels and deposition of yellow bilirubin pigments in skin, sclerae, mucous membranes, and other less visible tissues.

Because bilirubin is highly insoluble in water, it must be converted into a soluble conjugate prior to elimination from the body.

In the liver, Uridine diphosphate (UDP)-glucuronyl transferase converts bilirubin to a mixture of mono-glucuronides and Di glucuronides, referred to as conjugated bilirubin, which is then secreted into the bile by an ATP dependent transporter. This process is highly efficient under normal conditions, so plasma unconjugated bilirubin concentrations remain low.

A large number of disease states lead to bilirubin accumulation in plasma. Diseases that increase the rate of bilirubin formation, such as hemolysis, or diseases that reduce the rate of bilirubin conjugation, such as Gilbert syndrome, produce unconjugated hyperbilirubinemia.

Diseases that reduce the rate of secretion of conjugated bilirubin into the bile or the flow of bile into the intestine produce a mixed or predominantly conjugated, hyperbilirubinemia due to reflux of conjugate back into the plasma. Elevated conjugated bilirubin levels usually indicate hepatobiliary disease.

Jaundice and Hyperbilirubinemia:

Jaundice most common Neonatal “Problem” which Occurs in 50-60% of newborns duration of jaundice varies by ethnic group in Caucasians there is earlier peak and earlier decline whole in Asians/native Americans the debase occurs later and higher peak and later decline.

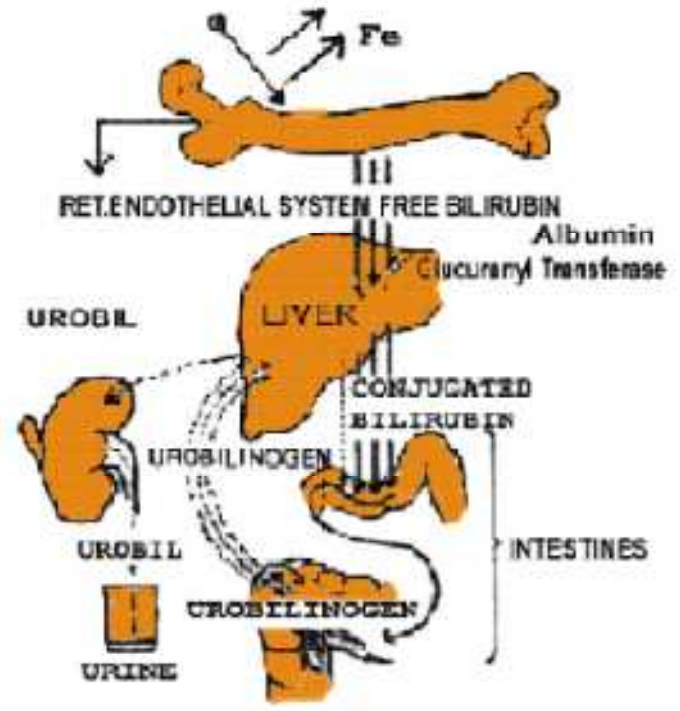


Fig 15.1 shows bilirubin production process

Assessing Jaundice Clinically: Yellow coloration will be visible at 5-7mg/dL of bilirubin level with blood. It Progresses in cephalocaudal (head-to-toe)

Incidence - One of the most frequently encountered complications in the neonatal period is Jaundice. The red blood cells undergo hemolysis; the iron and protein are stored, while the porphyrin ring is reduced to bilirubin. This bilirubin IC; unconjugated and is also referred to as indirect bilirubin, while conjugated is referred to as direct.

The degree of jaundice depends upon factors such as the rate of red cell hemolysis, the bilirubin load, the rate of conjugation, the rate of excretion, and the amount of bilirubin reabsorbed from the gut. In full term normal infants, the average capacity of the liver to conjugate bilirubin in the first few days of life is almost equal to the bilirubin load.

Physiological Jaundice - When the bilirubin conjugation system in preterm babies, the bilirubin excretion is affected, therefore jaundice is rarely severe enough to warrant treatment.

In this type of jaundice unconjugated bilirubin co reticulocyte count is increased. This occurs in cases of isoimmuniza1ioti-bility and with positive Coombs test.

Physiological Jaundice - When the bilirubin conjugation system in preterm babies, the bilirubin excretion is affected, therefore jaundice is rarely severe enough to warrant treatment.

In this type of jaundice unconjugated bilirubin co reticulocyte count is increased. This occurs in cases of isoimmuniza1iotibility and with positive Coombs test.

The neonates with negative are jaundiced because they have abnormal red cell shapes, pyknocytosis and stomatocytosis. They may have red cell abnormalities such as glucose 6 phosphate dehydrogenase, pyruvate deficiency Jaundice may be due to decreased rate of conjugation of bilirubin or unconjugated bilirubin level elevation.

This type of jaundice in any of the following ways, Classic pattern, Rise in bilirubin on day 3 while it decline to normal by 10-12days.
Physiology RBCs have shortened life span erythrocyte precursors degrade post birth Increased enterohepatic circulation relatively deficient hepatic transport and system resultant retention of unconjugated hyperbilirubinemia will be present.

The onset of Pathologic jaundice is occur in the 24hrs post birth rate of increase in bilirubin of 0.5mg/dl/hr will be found conjugated hyperbilirubinemia will be

present. There is usually an underlying disease process present. The baby will have bruising/polycythemia Inborn error of metabolism earthy present blood group incompatibility will need to be ruled Infant may be starving and thus dehydrated Infection as cause of jaundice is common.

Breastfeeding Jaundice: This condition is al normal: It has early onset and exaggeration of physiologic jaundice occurs. If result in suboptimal frequency and volume of feeding. In this condition it is common to see weight loss and decreased number of stools there will be high levels of bilirubin in meconium. Here will also be increased enterohepatic circulation.

Breast-milk containing pregnane - 3 alphas,-20-beta diols may be a cause of severe and prolonged unconjugated hyperbilirubinemia in some breast fed infants. Such breast-milk consistently inhibits glucuronyl transferase activity.

Hemolytic disease of the Newborn:

Historic Perspective: A French midwife was the first to report hemolytic disease of the newborn (HDN) in 1609. In 1932, Diamond and colleagues described the relationship of fetal hydrops, jaundice, anemia and erythroblasts in the circulation, a condition later called erythroblastosis fetalis. Levine later determined the cause after Landsteiner and wiener discovered the Rh blood group system 1940. In 1953, clown subsequently confirmed the pathogenesis of Rh alloimmunization to be the result of package of Rh positive fetal red blood cells after transplacental hemorrhage into maternal circulation that lacked this antigen.

ABO incompatibility: Abo incompatibility is limited to type O mothers with fetuses who have type A or B blood in type O mothers, the antibodies are predominantly lgG in nature. Because A and B Antigens are widely expressed in a variety of tissues besides RBCs, only small portion of antibodies crossing the placenta is available to bind fetal RBCs. In addition, fetal RBCs appear to have less surface expression of A or B antigen, resulting in few reactive sites hence the low incidence of significant hemolysis in affected neonates.

Hemolytic disease due to ABO incompatibility often occurs in the first born arid cannot be predicted by any prenatal testing even in subsequent pregnancies.

The diagnosis of hemolytic disease due to ABO incompatibility is made after delivery, often on the basis of exclusion of all other possible causes for the child's condition. The direct antiglobulin test performed on cord blood or on blood drawn in the first 24 hours of life is usually positive. Blood drawn after 24 hours of age usually shows a negative direct antiglobulin test.

Hemolytic disease of the- newborn due to ABO incompatibility is almost always mild and the baby very rarely requires an exchange transfusion.

With the exception of ABO incompatibility, the finding of a negative direct antiglobulin test on a baby with jaundice, anemia and a rising bilirubin suggests that these clinical signs are due to causes other than blood group incompatibility. Regardless of the cause of the child's condition the goal of treatment is the same; i.e. correction of anemia and the management of excess bilirubin to prevent kernicterus.

Common cause for HDN Rh system antibodies ABO system antibodies. Uncommon causes are Kell system antibodies. Rare causes Duffy system antibodies MNS and S System antibodies.

No Occurrence in HDN due to lewis system antibodies of P system antibodies.

Rh Incompatibility: Rh antigens exit in 3 loci: Cc, D.D. and EEE. Expression is limited to RBCs. Rh incompatibility is a condition which develops when there is difference in Rh blood type between that of the pregnant mother (Rh negative) and that of the fetus (Rh positive). After the initial exposure to a foreign antigen, the maternal immune system produces antibodies of the immunoglobulin M (lgM) isotype that traverse the placental barrier. After sensitization, maternal anti-D antibodies cross the placenta into fetal circulation and attach to Rh antigen on fetal RBCs, which from rosettes on macrophages in the reticuloendothelial system, especially in the spleen. These antibody-coated RBCs are lysed by lysosomal enzymes released by macrophage and nature killer lymphocytes and they are independent of the activation of the complement system. Rh antibodies cause destruction of the red cells and result in Anemia which if severe a lead into heart failure and fetal death.

Kell system: HDN due to Kell sensitization results in hemolysis, suppression of erythropoiesis, low reticulocytes and normoblast and low bilirubin compared with HDN due to anti-D.

Risk of homotypic disease of the newborn: Placental abruption, spontaneous or therapeutic abortion, toxemia, after cesarean delivery, ectopic pregnancy, amniocentesis, chorionic villus sampling and cordocentesis.

Prevention:

Before birth workup: Identify woman at risk, ABO –Rh – (Du) – Antibody screen, based on result continue testing (handout), IgM antibodies are insignificant, lgG antibodies – titer – freeze and store – rattier with a second sample – looking for a 1:32 rise or change in titer. Titer identifies mothers who need amniocentesis The attending physician should check Titer every 4 week until 24th week – then every 2 weeks. Amniocentesis is performed after 21st week on high titer – high mortality.

Physical Signs

The first manifestation commonly is a brownish discoloration of the urine. Although sclera icterus also may be present, this typically reflects the unconjugated fraction of bilirubin that binds tissues much more avidly.

- If sufficient unconjugated bilirubin is present, the skin, sclerae, and mucous membranes take on a yellow cast, although this may be difficult to detect if tissues are pigmented naturally.

Symptoms of hyperbilirubinemia?

The following are the most common symptoms of hyperbilirubinemia. However, each baby may experience symptoms differently. Symptoms may include:

- yellow coloring of the baby's skin (usually beginning on the face and moving down the body)
- poor feeding or lethargy

The symptoms of hyperbilirubinemia may resemble other conditions or medical problems. Always consult your baby's physician for a diagnosis.

Differential Diagnosis

The timing of the appearance of jaundice helps with the diagnosis. Jaundice appearing in the first 24 hours is quite serious and usually requires immediate treatment. When jaundice appears on the second or third day, it is usually

"physiologic." However, it can be a more serious type of jaundice. When jaundice appears on the third day to the first week, it may be due to an infection. Later appearance of jaundice, in the second week, is often related to breast milk feedings, but may have other causes.

Diagnostic Procedures - Diagnostic procedures for hyperbilirubinemia may include:

- **Direct and indirect bilirubin levels** These reflect whether the bilirubin is bound with other substances by the liver so that it can be excreted (direct), or is circulating in the blood circulation (indirect).
- Red blood cell counts
- Blood type and testing for Rh incompatibility (Comb's test)

Laboratory Evidence of Hemolytic Disease - A direct antiglobulin test (direct comb's test) on blood of the infant provides valuable information for making diagnosis of hemolytic disease, especially where mother has received no prenatal care. Routine collection and refrigerated storage of 10 ml. of cord blood, should be practiced in all modern hospitals. If there are signs of trouble, cord blood is available for investigation.

Maternal Antibody (Anti Rh-D) - Not uncommonly one sees a baby suffering from hemolytic disease of the newborn whose mother's serum contains potent anti Rh-O; the direct antiglobulin test on the baby appears to be negative, in such a situation it should be established that the maternal serum contains only anti Rh-O and, if this is found to be the case, one must assume that the child is Rh positive. The maternal antibody acts as a physical barrier or block between the antigen sites and the Anti Rh-O reagent used in testing.

Rh typing of an infant who has received intrauterine transfusion for Rh (0) hemolytic disease may also be misleading. The baby may appear to be Rh negative at birth since transfused Rh negative blood survives and the production of the baby's Rh positive cells, is often suppressed.

A positive direct antiglobulin test does not indicate the severity of the disease process. Hemoglobin and indirect bilirubin levels are better reflectors of the extent of red cell destruction and elimination.

Cord Hemoglobin - Cord hemoglobin value below 14 gm/100 ml, is considered abnormal and suggestive of a hemolytic process. Severely affected infants may have cord hemoglobin levels as low as 3 or 4 gm/lo ml.

Serum Bilirubin level in normal full-term infants seldom exceed 13 mg/lo ml, at 48 hours of age but premature babies with physiological jaundice may have serum bilirubin as high as 30 mg/l00 ml. By the third or fourth day the liver of the full-term infant produces sufficient glucuronyl transferase to convert bilirubin to its excreta ble form; bilirubin glucuronide.

Tests for Assessment of Disease Process:
Serial Hemoglobin Determinations - There is hardly any great change in hemoglobin concentration in severe hemolytic disease in the critical first two days of life. Actually, the hemoglobin level may not only fall during the first two days of life, but also remain high

These infants are in special danger of developing kernicterus. To wait for falling hemoglobin as an indication for exchange transfusion in hemolytic disease may be dangerous. Comb's Test It is only a diagnostic test. Many infants with a positive Coombs test do not require exchange transfusion. On the other hand, some with a negative Comb's Test (as, for example, cases of erythroblastosis due to

ABO incompatibility) do require transfusion to prevent kernicterus. Therefore this test should never be the sole criteria for exchange transfusion.

Intrauterine transfusions:
Bilirubin: Hb is below 11 g/dl: The blood group used for intra – uterine transfusions, usually O and compatible with mother's antibody, the blood must be screened for CMV, Hb S and leukocyte negative, immediate correction of anemia and resolution of fetal hydrops, reduced rate of hemolysis and subsequent hyperinsulinemia and acceleration of fetal growth for non hydropic fetuses who often are growth retarded.

Amniocentesis: Analyze pigment that indicates increased hemolysis, Measure OD from 350 – 700 and plot as a function of wavelength, Draw straight line and obtain difference in OD at 450.

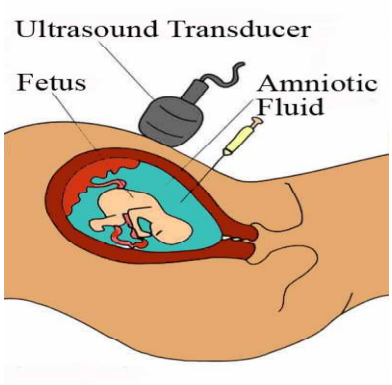


Fig 15.2: Shows amniocentesis under ultrasound scan directed needle

After Birth: Antibodies causes destruction of the red cells and cause. Anemia which can in turn cause heart failure. When build up of bilirubin is controlled ar treated by either phototherapy or exchange transfusion. Kernicterus can occur and result is severe retardation. Bilirubin has been postulated to cause neurotoxicity via 4 distinct mechanisms:

Clinical signs of bilirubin encephalopathy typically evolve in 3 phases. Phase 1 is marked by poor suck, hypotonia and depressed sensorium. Fever and Hypertonia are observed in phase 2. Phase 3 is characterized by high- pitched cry hearing and visual abnormalities, poor feeding.

Blood Brain Barrier and Bilirubin Encephalopathy: This barrier prevents free union gusted bilirubin from crossing from blood to brain. The barrier is less effective in premature infants and in unwell infants, In bilirubin encephalopathy there will be Hypotonia, High pitched cry and Seizures, Long term sequelae of encephalopathy will result in Athetoid CP or Endoneural deafness.

Prolonged Jaundice: Common in breast fed infants; around 20% It is very common in premature breast fed
Infants where it is >30%

Investigations of persistent jaundice for more than 2 weeks: Blood for split bilirubin, check urine for WBC' S, urobilinogen and Screen froths.

Investigations of persistent Jaundice for more than 2 week: Blood for split bilirubin
Check urine for WBC 'S, urobilinogen
Screen for TSH.

Phototherapy: The efficacy of phototherapy depends on the spectrum of light deviled, the blue – green region of visible light being the most effective; irradiance (mW/cm2nm); and surface area of the infant exposed. Nonpolar bilirubin is converted into 2 type of water-soluble photo isomers as a result of phototherapy. The initial and most rapidly formed configurational isomer 4z, 15e bilirubin accounts for 20% of total serum bilirubin level in newborn undergoing phototherapy and is produced maximally at conventional levels of irradiance (6-9 mW/cm2/nm).

The structural isomer lum rubin is formed slowly and its formation is irreversible and is directly proportional to the irradiance of phototherapy on skin. Lum rubin is the predominant isomer formed during high-intensity phototherapy. Decrease in bilirubin is mainly the result of excretion of these photoproducts in bills and removal via stool. In the absence of conjugation, these photo isomers can be reabsorbed by way of the enterohepatic circulation and diminish the effectiveness of phototherapy.

Indications of Phototherapy - It should be used only when significant unconjugated (indirect) hyperbilirubinemia is present. Its use with elevated conjugated (direct) bilirubin levels is contraindicated. Skin jaundice is not a reliable indicator of serum bilirubin level, therefore determination of serum bilirubin level of infants receiving photo therapy is necessary.

The eyes of the babies receiving photo therapy should be protected from intense light. Conjunctivitis and corneal abrasion may occur if eyes are not protected. Water intake should be increased during photo therapy.

Exchange Transfusion - Neonatal mortality can be reduced to less than 5 per cent and kernicterus, almost eliminated by this method. Anemia as well as excess fluid containing antibodies and bilirubin can be removed along with the bulk of the infant's vulnerable red cells and substituted with red cells that are compatible with the maternal antibodies.

Nearly a third of the total bilirubin in the body can be removed with the infant's blood. I n case of congestive heart failure more blood is removed than given. The aim should be to reduce the venous pressure to normal.

Venous pressure can be measured by the same plastic tubing inserted into the umbilical vein for exchange transfusion. Normal venous pressure is usually less than 7 em. of water. About 10 ml. of blood is transfused at a time to prevent overloading and cardiac embarrassment. Fresh albumin can also bind bilirubin that is liberated as a result of subsequent hemolysis.

The volume of blood required for a seven pound baby is about 500 mL. Three, and sometimes more, exchange transfusions are usually needed.

Pre-requisites for Exchange transfusions: Severe anemia (Hb < 10 g/dl), rate of bilirubin rises more than 0.5 mg/dl despite optimal phototherapy, hyperbilirubinemia and DAT.
Objectives: Decrease serum bilirubin and prevent kernicterus, provide compatible red cells to provide oxygen carrying capacity, decrease amount of incompatible antibody and remove fetal antibody coated red cell.

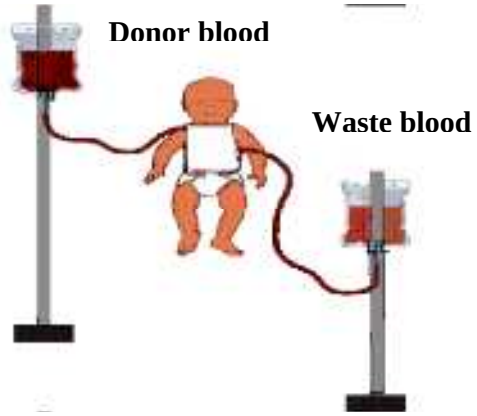


Fig 15.3 Showing exchange transfusion under process

Potential complications of exchange transfusion: Cardiac – Arrhythmia, volume overload, congestive failure and arrest. Hematologic – Over heparinization, neutropenia, thrombocytopenia and graft versus host disease. Infectious – bacterial, viral (CMV, HIV, hepatitis) and malarial.

Metabolic – Acidosis, hypocalcemia, hypoglycemia, hyperkalemia and hypernatremia. Vascular – Embolization, thrombosis, necrotizing enterocolitis, and perforation of umbilical vessel and systemic – hypothermia.

Reserve Albumin Binding Capacity - It has been reported that when the reserve albumin binding capacity is 50 per cent of normal, jaundiced infants can escape brain damage even when the serum indirect bilirubin concentration is as high as 30 mg. per 100 mi. Unfortunately there is no way of being sure that in which neonate and at what critical value of bilirubin in the serum the brain damage will occur. Kernicterus is preventable by exchange transfusion.

The higher bilirubin levels still have some statistical validity in causing brain damage therefore the levels should be followed closely, and repeated exchange transfusions should be done to control high and increasing bilirubin concentrations.

Follow Up: TSB that needs photo therapy should mandate an investigation for cause. History, physical examination, lab tests, etc. etc.

Recommendation: Adequate follow-up should be ensured for all infants who are jaundiced. Infants under phototherapy should be investigated for determination of the cause of jaundice. Prior to the discharge of every newborn, there should be a process and protocol in place for assessing the risk for development of significant hyperbilirubinemia in all newborns nurseries. There should be a systematic approach to the assessment of all infants before discharge for this risk and program and follow up should be in place if the infant develops jaundice. All newborn infants who are visibly jaundiced, near (between 35 – 37 weeks) and full (>38 weeks) term should have a bilirubin level determined. Infants, although not visibly jaundiced but with two or more risk factors should have at least one bilirubin level preformed prior to discharge. Serum bilirubin may be done on either capillary or venous blood sample. Infants with severe or prolonged jaundice should have further investigations including an analysis of the conjugated component of the bilirubin. A Transcutaneous Bilirubin measurement may be used if available as a screening device.

Inhibition of Conjugation - Certain physiologically produced steroids i.e. pregnanediol, pro-Gest erone, and others inhibit conjugation of bilirubin. Successive infants of certain apparently normal mothers have been found to develop high levels of unconjugated bilirubin which lead to kernicterus. The mechanism of jaundice production is probably an exaggeration of physiological inhibition of conjugation. (Lucey-Driscoll Syndrome). In survivors the resulting jaundice disappears within a month as normal conjugation mechanisms appear.

Novobiocin has also been shown to inhibit conjugation in vitro, and there is an increased incidence of unconjugated hyperbilirubinemia in infants receiving this drug, which is now seldom used and is not available in Pakistan.

Vitamin K - Association between large doses of Vitamin-K analogues and hyperbilirubinemia in premature newborns is also due to enzymatic inhibition, but appears to have a different mechanism since it is strictly dose-related.

Enzyme Induction - Glucuronyl transferase is localized in the smooth endoplasmic reticulum of the liver parenchymal cells. Treatment with barbiturates and other drugs can cause a striking proliferation of the endoplasmic reticulum and marked increase in the activity of the enzyme.

Hyperbilirubinemia can be treated in infants with phenobarbitone with

remission of jaundice and decrease in blood bilirubin levels. This effect is proved to be related to enzyme induction.

Crigler-Najjar Syndrome - In this syndrome abnormal enzymatic conjugation of bilirubin is found. Crigler-Najjar type of hyperbilirubinemia in which affected infants are severely jaundiced and have kernicterus, usually die in the first year of life.

Disturbance of Bilirubin Transport (Gilberts Disease) - This is the commonest form of familial, non-hemolytic jaundice and is probably inherited as autosomal<TL dominant. This is characterized by mild intermittent jaundice from childhood. Deepening jaundice is accompanied by malaise. Nausea and liver discomfort. This picture is commonly confused with infective hepatitis. The unconjugated bilirubin seldom exceeds 3 mgm/1 00 ml and is unaffected by corticosteroid therapy. The likely mechanism in this defect is in transport from serum to microsome.

Disturbance of Bilirubin Excretion:

The difficulty lies in the path-way between conjugation in the microsoma of the hepatic cell and entry of bilirubin into the duodenum. Commonly there is evidence of mechanical obstruction to bile drainage. Miscellaneous Causes of Jaundice - Hepatitis due to viral, parasitic, bacterial or toxic agents may be responsible for jaundice. Metabolic abnormalities such as galactosemia and glycogen storage disease can be the causative factor. Similarly infant of diabetic

Mother may have jaundice. There may be biliary atresia or obstruction at ampulla of Vater. Sepsis as a cause of jaundice is quite common in Pakistan. We have seen a number of cases where cord sepsis was responsible for jaundice. In our opinion, the cord should be cut with sterile scissors and by a nurse who is wearing sterile gloves.

Investigations - Serum level of indirect bilirubin should be determined regularly on all jaundiced infants. There is great danger of neurosensory hearing loss and kernicterus in babies with higher levels of bilirubin.

Postnatal Management - The success of treatment of the severely affected newborn lies in the aggressive management which should include respiratory assistance, correction of acidosis and immediate exchange transfusion. In mild or moderate disease other modes of treatment can yield good results.

Management of Mild Hemolytic Disease

Phenobarbital - The administration of phenobarbital to newborn infants in doses of approximately 8 mg. per kilogram per day has been shown to result in substantially lower serum bilirubin levels and earlier clearing of bilirubin from the serum. The effect of phenobarbital is apparently, to activate the UDPGT (Uridine diphosphoglucuronyl transferase) enzyme system in the liver, which is needed for conjugation of bilirubin and thus making it non toxic.

Small blood Transfusion - Erythroblastotic babies, who have not been treated by exchange transfusion, may develop severe anemia during the second, third, or fourth week of life.

They usually have significant amounts of circulating antibody which slowly main-tains the hemolytic process. Simple transfusions of compatible blood can be given in such cases to maintain the hemoglobin level above 7 grams per 100 ml.

Treatment of Hyperbilirubinemia - Early milk feedings and glycerin

suppository have been shown to decrease the serum bilirubin level, presumably by enhancing early evacuation of gut contents, including bilirubin. In infants with hemolytic processes, regular check up of hematocrit and reticulocyte count is necessary.

Treatment depends on many factors, including the cause of the hyperbilirubinemia and the level of bilirubin. The goal is to keep the level of bilirubin from increasing to dangerous levels. Treatment may include:

Prevention of Rh Sensitization - Usually large fetomaternal bleeds which are enough to produce Rh sensitization occur during delivery, after abortion and separation of placenta. With Kleihauer acid elution and staining technique an actual count of the number of fetal cells in the maternal circulation, can be made.

It has been observed that dose of more than 0.25 ml. of fetal Rh-positive cells is needed to produce immunization. When ABE incompatibility between mother and child, is present the frequency of Rh-sensitization is diminished, because the maternal anti-A and Anti-B destroys the fetal Group-A or B. Rh positive cells before a maternal response can occur. Avoidance of unnecessary intrauterine manipulation can also help to lower the incidence of sensitization.

Anti-D Gamma Globulin - Rh-immune globulin is produced from plasma of highly sensitized men and women.

This plasma is pooled and clear fraction is separated which contains highly concentrated IgG, Anti Rh-D and is free of the hepatitis virus. The antibodies are concentrated and distributed in 1 ml dose containing approximately 300 mcg. of Anti-D, and is given intramuscularly, within 72 hours after delivery. This 72 hour period is specified because the clinical trials which tested the efficiency of this immune globulin included limited follow up period of 72 hours only.

Prognosis - Toxic levels of bilirubin can cause damage when it passes from the serum into the basal ganglion cells of the brain. Neurosensory hearing loss is the most common sequela of excessive serum bilirubin. Kernicterus is a clinical syndrome where deposition of unconjugated bilirubin in certain nuclei of the brain, affects central nervous system. The albumin binding capacity is decreased in conditions where there is acidosis or history of Sulpho amide administration and or where free fatty acid levels are elevated. These conditions predispose the neonate to Kernicterus even with lower levels of bilirubin.

The baby, who develops kernicterus, suddenly becomes lethargic and stops feeding.

His cry becomes high pitched. The respiratory rate becomes slow. Apnea, respiratory, arrest, and even convulsions may occur in severe cases. Infants who survive, have severe motor impairment, including hypotonia, spasticity, and athetosis. Mental retardation may occur but it is generally less severe. In terminal stages, the babies have irregular gasping respirations, bloody discharge from the nose and mouth. Most babies die within 48 to 72 hours.

Mortality/Morbidity:

- Unlike unconjugated bilirubin, conjugated bilirubin does not bind significantly to neural tissue and does not lead to kernicterus or other forms of toxicity.

- The morbidity and mortality associated with conjugated hyperbilirubinemia result from the underlying disease process.

- In certain disease states, such as alcoholic hepatitis or primary biliary cirrhosis, bilirubin levels correlate strongly with, but do not contribute to, short-term mortality.

REFERENCES

1. American Academy of Pediatrics. Practice Parameter: Management of Hyperbilirubinemia in the Healthy Term Newborn. PEDIATRICS, Volume 94, 558-566, 1994.

2. UpToDate a. “Pathogenesis and etiology of unconjugated hyperbilirubinemia in the newborn”. b. “Clinical features and management of unconjugated hyperbilirubinemia in term infants”. c. “Bilirubin metabolism”.

3. The HSC Handbook of Pediatrics (9th edition). 304-307.

4. MCCQE 2002 Review Notes. Pediatrics, P59-P60.

5. “In House Guidelines”. Level 2 Nursery, McMaster University Medical Centre.

Chapter Outline

What is Neurological?

Examination?

Motor system:

Sensory system:

Deep tendon reflexes:

Rooting Reflex:

Sucking Reflex:

Traction Response:

Grasp Reflex:

Dubowitz Method for Clinical:

Estimation of Gestational Age:

NEUROLOGIC EXAMINATION

The practicing physician should practice and familiarize himself with a detailed and systematic neurological examination of the newborn.

Traditional Neurologic examination includes measurement of head circumference, inspection of sutures, fontanelles, and cephalhematoma.

The special neurological examination is very important and should be done when the baby settles in the nursery. The newborn should be observed while he is resting. The need for thorough and careful observation which involves screening of various areas and systems will provide invaluable information of great importance. .

The skull, face, jaw and extremities should be examined for any asymmetry due to intrauterine pressure.

The Neurological Exam - The human nervous system is an intricate and complex network of fibers that impenetrate the entire body and functions in complicated and often mysterious ways. Sophisticated imaging and laboratory tests do not always provide sufficient information about how the nerves are functioning -- or not functioning, as the case may be. The neurological examination is a series of simple questions and tests that provide crucial information about the nervous system. It is an inexpensive, noninvasive way to determine what might be wrong.

The neurological examination is divided into several components, each focusing on a different part of the nervous system: Mental status, cranial nerves motor system, sensory system, the deep tendon reflexes, coordination and the cerebellum gait. The examination requires skill, patience, and intelligence on the part of the physician, and cooperation from the patient. Incomplete or in-accurate examination can lead to incorrect diagnoses.

Cranial nerves - The cranial nerves are a set of 12 nerves that relay messages between the brain and the head and neck and control motor and sensory functions, including vision, smell, and move-ment of the tongue and vocal cords.

The cranial nerve examination involves testing the function of all 12 sets of cranial nerves. It is an essential part of the neurological examination, and helps localize central nervous system dysfunction and aids in diagnosing systemic disease. Some of the functions that are

commonly tested as part of the cranial nerve examination include: eyelid strength and function; visual function; peripheral vision; pupillary light reflexes; eye muscle movements; strength of facial musculature; the gag reflex; tongue and lip movements; ability to smell and taste; hearing and sensation in the face, head and neck.

Motor System – The motor system includes the brain and spinal cord motor pathways, and all the motor nerves and muscles throughout the body. Abnormalities in the motor system can often be detected by assessing muscle strength and tone and by looking for a variety of characteristic signs.

Evaluating Babinski response is an important part of testing the motor system. The neurologist strokes or scratches, heel-to-toe, the outer side of the sole of the foot and in patients over the age of 2, the toes normally curl downward in response. If the toes fan upward, a brain or spinal cord injury is indicated. A number of neurological disorders can lead to Babinski response.

Sensory System:

Sensation depends on impulses that occur as a result of stimulation of receptors located in the skin, muscles, tendons, and so on, and are sent along nerve fibers to the central nervous system (brain and spinal cord). The sensory examination is used to determine areas of abnormal sensation, the quality and type of sensation impairment, and the degree and extent of tissue involvement.

A sensory examination involves evaluating different types of sensation, including pain, temperature, pressure, and position. For example, pinpricks may be used to test the patient's response to pain and compare the response in different parts or opposite sides of the body. A cold or warm object may be used to test the sensation of temperature. To test position, patients may be asked to close their eyes and determine in which direction the examiner is moving a part of their body (e.g., big toe). Patients also may be asked to identify objects with their eyes closed or identify numbers or letters traced on their body. All this can be done in grown ups as they can respond to command but not in the neonate who can only feel.

The sensory examination should be repeated to provide accurate results. Responses may be affected by how alert, aware, and well-rested the patient is, so this part of the neurological exam is usually performed early in the course of testing.

Deep tendon reflexes - Reflexes are actions performed involuntarily in response to impulses sent to the central nervous system. Alterations in reflexes are often the first sign of neurological dysfunction. Observing reflexes is the most objective part of the neurological exam, since the reflexes are not under voluntary control and testing does not depend on the patient's cooperation, attitude, or awareness.

Crawl reflex

Fig10.1: Showing crawl reflex

Hundreds of reflexes have been identified, but the neurological exam generally involves testing only the deep tendon reflexes. Deep tendon reflexes, also known as muscle stretch reflexes, are reflexes elicited in response to stimuli to tendons. Normally, when a specific area of the muscle tendon is tapped with a soft rubber hammer, the muscle fibers contract. Abnormal responses may indicate injury to the nervous system pathways that produce

the deep tendon reflex. Many of these tests can be done on older children and not the neonate.

Step reflex

Fig10.2: Showing step reflex

Muscle Tone - The muscle tone tests should be carried out thoroughly to assess gestational age of the neonate. In order to test recoil of the extremities, extend and then release; both legs return promptly to the flexed position in the term babies. Extend arms alongside the body; upon release, there is prompt flexion at the elbow of the term infant.

The amount of flexion and extension around joint is at the neck, trunk, shoulders, elbows, wrists, hips, knees and ankles.

Fig10.3: Showing Tonic neck reflex

The tone of muscle may be increased in cases of hypertonic babies, these babies are Jittery and startle easily. Their fists are tightly closed, the arms tales are stiffly and extended.

On the other hand the tone may be decreased in the hypotonic or lethargic infant who is floppy and has little head control.

Rooting Reflex - This reflex is very useful for assessing neurological development of the neonate and can be elicited in 4 areas; at both corners of the mouth and on the upper and lower lips at the midline. The mouth opens or the head turns toward the side of the stimulus.

Rooting reflex

Fig10.4: Shows rooting reflex

Sucking Reflex - This can be obtained by placing a finger in the baby's mouth. A hypertonic or irritable infant makes biting rather than sucking movements.

Sucking reflex

Fig10.5: Showing sucking reflex

Traction Response - (Head flexion and extension). The infant is pulled gently to a sitting position by traction on the hands and wrists.

In the term infant, there is at first a head lag and then active flexion of the neck muscles, so that the head and chest are in line when the infant reaches the vertical position.

Grasp Reflex - When the palm of the neonate is stimulated with a finger, the infant's fingers will close on it. A term infant's grasp should be so strong that the infant could be lifted from the table by

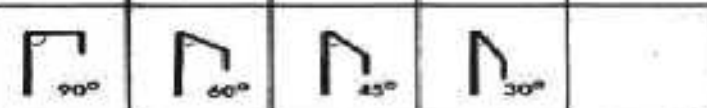
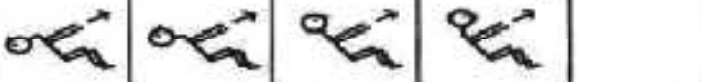
NEURO-LOGICAL SIGN	SCORE 0	1	2	3	4	5
POSTURE						
SQUARE WINDOW						
ANKLE DORSI-FLEXION						
ARM RECOIL						
LEG RECOIL						
POPLITEAL ANGLE						
HEEL TO EAR						
SCARF SIGN						
HEAD LAG						
VENTRAL SUSPEN-SION						

Table 10.6: Shows estimation of gestational age by Neurologic Criteria

holding onto the examiner's finger.

The examination takes only five to ten minutes. Each physical characteristic of the baby is given a score from 0 to 5. Similarly, selected neurologic characteristics are examined that reflect the infant's muscle tone and strength.

Fig10.7: Showing grasp reflex

These are also scored from o to 5. The total score achieved on this "Maturity rating" is correlated with the clinical gestational age given in the figure above.

Discrepancies in maturation between the physical and neurologic characteristics often reflect a problem in the intrauterine growth of the fetus. Infants with intrauterine growth retardation due to nutritional deficiency may show diminished growth or absence of breast tissue and in the female diminished labia majora.

Dubowitz Method for Clinical Estimation of Gestational Age - This is very useful for identifying potentially high risk neonates.

The rational of Dubowitz method is based on the principle that in case of growth retardation weight is affected first, followed by decreased growth in length and , the head circumference, however neurologic examination is least affected and is usually appropriate for the actual gestational age.

REFERENCES

1. Amess PN, Wylezinska M, Lorek A, et al. Early brain proton magnetic resonance spectroscopy and neonatal neurology related to neurodevelopmental outcome at 1 year in term infant after presumed hypoxicischaemic brain injury. Dev Med Child Neurol 1999;41:436-445.

2. Mercuri E, Guzzetta A, Haataja L, et al. Neonatal neurological examination in infants with hypoxic ischaemic encephalopathy: correlation with MRI findings. Neuropediatrics 1999;30:83-89.

3. Fenichel GM. Neurological examination of the newborn. Brain Dev 1993;15:403-410.

4. Brazelton TB. Neonatal behavioral assessment scale. In Clinics in Developmental Medicine. London: William Heinemann, 1973:1-35.

5 Morgan A, Koch V, Lee V, Aldag J. Neonatal neurobehavioral examinat ion: a new ins t rument for quant i tat ive analys i s of neonatal neurological status. Phys Ther 1988;68:1352-1358.

6. Camann W, Brazelton TB. Use and abuse of neonatal neurobehavioral testing. Anesthesiology 2000;92:3-5.

7. Jaynes ME, Gingold MK, Hupp A. The plantar response in normal newborn infants. Clin Pediatr 1997;36:649-651

Chapter Outline

Developmental Milestones:

Developing skills:

In the First 4 weeks:

Between 4 and 8 weeks:

Between 8 and 12 weeks:

Between 12 and 16 weeks:

Between 16 and 20 weeks:

Between 20 and 24 weeks:

Between 24 and 28 weeks:

Between 28 and 32 weeks:

Between 32 and 36 weeks:

Between 36 and 40 weeks:

Between 40 and 44 weeks:

Between 44 and 48 weeks:

Between 48 and 52 weeks:

DEVELOPMENTAL MILESTONES

Developmental Milestones

Developmental milestones are a set of functional skills or age-specific tasks that most children can do at a certain age range. Each milestone has an age level; the actual age when a normally developing child reaches that milestone can very because every child is different.

Development is different than growth. Growth only refers to the child getting bigger in size. When we talk about normal development, we are talking about developing skills like:

1) **Gross motor Development:** using large groups of muscles to sit, stand, walk, run, and, keeping balance, and changing positions involves gross motor activity.
2) **Fine motor:** using hands to be able to eat, draw, dress, play, write, and do many other things involves fine motor function.
3) **Language:** speaking, using body language and gestures, communicating, and under-standing what others say. Shows normal development of a large number of organs and their function. Same happens in cognitive and social behaviour.
4) **Cognitive:** Thinking kills: including learning, under-standing, problem-solving, reasoning, and remembering.
5) **Social:** Interacting with others, having relationships with family, friends, and teachers, cooperating, and responding to the feelings of others.

When the baby is developing normally it does the following in a set time and order:

Between 1 and 4 weeks; Baby looks at face of caregiver, makes small, throaty noises, responds to sounds, has asymmetrical posture and quiets when picked up.

Between 4 and 8 weeks; Gives social smile, babbles spontaneously, gives facial response to sound, holds head sometimes erect and reacts to feeding positions.

Sound response

Fig17.1: Baby gives fascial response to sound and sucking reflex.

Between 8 and 12 weeks; Baby recognizes mother visually, can utter single vowels, glances at rattle in hand, rolls partway to side and anticipates lifting.

Between 12 and 16 weeks; Baby smiles at mirror image, coos / chuckles, shows anticipatory excitement, actively holds rattle and regards own hand.

1. Raising Legs 2. Sitting 3. Trying to crawl 4. Crawling 5. Trying to stand 6. .Standing

Fig17.2: Shows Developmental Milestones

Between 16 and 20 weeks; baby is aware of novel situations, laughs, vocalizes excitement, takes rattle to mouth, baby's hands engage in midline, anticipates feeding on sight.

Between 20 and 24 weeks; shows displeasure over loss of toy, can manifest spontaneous social vocalization, carries visual pursuit of dropped object, holds head erect and steady, pats or fingers bottle or breast.

Between 24 and 28 weeks; baby plays simple interaction games, attends to music, singing, and bangs objects on tabletops, rolls to prone and drinks from cup with assistance.

Between 28 and 32 weeks; child shows anxiety to strangers, polysyllabic vowel sounds, shakes rattle, transfers objects between hands and holds objects voluntarily.

Between 32 and 36 weeks; child imitates simple adult sounds, single syllables (da, ba, ka), plays with two toys at same time, pivots while in prone position and feeds self cracker or cookie.

Between 36 and 40 weeks; waves bye-bye, says "dada" or "mama" (nonspecific), uncovers toy hidden by cloth, sits alone with no support, and responds to "pick up" gesture.

Between 40 and 44 weeks; inhibits activity on command, says "dada" or "mama" (specific), combines toys in play, uses index finger to secure object and co-operates in social games.

Between 44 and 48 weeks; "gives" toy to mirror image, one word besides "mama" and "dada", preference for certain toys over others, rolls ball while sitting and gives toy to others without release.

Between 48 and 52 weeks; initiates games with adult, two words besides "mama" and "dada", uses crayon to "dot" imitatively, takes two steps independently and releases toy to others.

Reference:

1. Kail RE (2006). Children and Their Development (4 ed.). Prentice Hall. ISBN 978-0131949119.
2. Bronfenbrenner, U. (1979). The Ecology of Human Development: Experiments by Nature and Design. Cambridge, MA: Harvard University Press. (ISBN 0-674-22457-4)
3. Smith PK, Cowie H and Blades M, Understanding Children's Development, Basic psychology (4 ed.), Oxford, England: Blackwell
4. Segal, Marilyn (1998). Your Child At Play: Three to Five Years. New York: Newmarket Press. pp. 292. ISBN 1-55704-337-X.

Chapter Outline

Definition

Benefits of circumcision

Risks of circumcision

Surgical Methods of circumcision

Premedication

The Plasti Bell Method

The Gomco and Mogen Method

Care of the circumcised penis

Management of circumcision

Oral/Intranasal medications

Antagonists

Topical analgesia

Lidocaine injection

Sucrose analgesia

Practical considerations

Newborn Circumcision

Definition: Circumcision is a surgical procedure in which the foreskin that covers the tip of the penis is removed. After circumcision the tip of the penis is always uncovered.

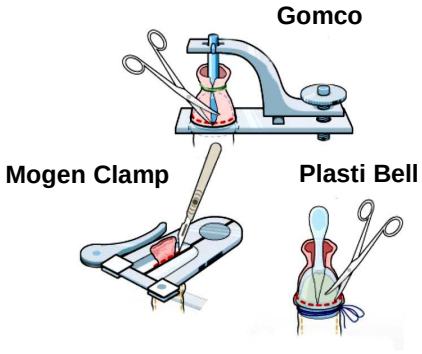


Fig 18.1 Shows tools used for circumcision

Benefits of circumcision:
The long-term benefits of Circumcision include: Lower risk of cancer of the penis and lower risk of bladder or kidney (urinary tract) infection. It may help prevent sexually transmitted diseases, such as HIV.

The latest statistics show that just over half of baby boys in the United States are circumcised.
The procedure should be done when the baby is still a new born. Circumcising the baby after the newborn period has more risks, because general. Anesthesia may be needed.

Risks of circumcision: The risks of the circumcision procedure include: Infection, Bleeding, Pain and Injury to penis the complication rate is less than 2 percent. Serious complications are very rare (one in 500 circumcised newborns). The effect of circumcision on men's sexual activity and enjoyment later in life is not fully known. Some studies have reported equal sensation between circumcised men and uncircumcised men and no decrease in sexual functioning with circumcision.

Surgical Methods of circumcision: There are several methods of circumcision. The three most common methods are the Plasti Bell, Gomco, and Mogen methods.

Premedication: Anesthetic cream is used on the base of baby's penis for pain relief. A sucrose pacifier may also be given to the baby for pain relief. Baby may have some mild pain during and after surgery.
The pain after surgery usually does
not last more than a day.

A: The Plasti Bell Method:
A plastic ring is tied around the end of the penis. The foreskin is removed. The plastic ring stays on the end of the penis and prevents bleeding after the surgery.

Fig 18.2: Showing newborn penis before and after circumcision

B: The Gomco and Mogen Method:
The foreskin is removed from the Penis using the Gomco or Mogen Devices. These methods do not use a plastic ring.

Care of the circumcised penis:
For the Plasti Bell Method: Petroleum jelly can be put on The Plasti Bell ring after cleaning The ring should fall off 4 to 10 days after the circumcision.

Do not pull the Plasti Bell ring off, because this can cause bleeding. Clean baby's penis by gently washing with water 3 times a day or during diaper changes.
For the Gomco or Mogen Methods: Take off the gauze and Petroleum dressing 48 hours after the circumcision.

If you notice baby has any of the following after circumcision: Urine dripping out of his penis. More than a few drops of blood on the penis. Redness, pain, and swelling around or on the penis after the first couple of days., a fever (more than 100.4ºF rectal) and Plasti Bell ring has not fallen off by 14 days after the surgery. Call the doctor who performed surgery.

Management of pain: Pain is a subjective experience and is incomparable. There is no direct relationship between "pain experience" and pain intensity or between physical pathology and pain intensity. By 29 wks of gestation, pain pathways and cortical + sub-cortical centers involved in the perception of pain are well developed. As are the neurological systems for the transmission and modulation of pain sensation. Pain sensitivity in neonates may be more profound than that of older individuals; their nervous system may be less effective at blocking painful stimuli than those of adults. Adolescents who had poorly managed pain procedures show increased level of anxiety in subsequent pain situations.

Oral/Intranasal medications: Oral Transmucosal Fentanyl (lozenges cause high rate of emesis (>30%). Intranasal Sufentanil is 7 times more potent than Fentanyl. The nasal delivery is painless, there is no vomiting. Mean time to sedation is 20 min. Oral Ketamine: is reliable.

Antagonists: Naloxone was introduced in 1960 and is proven to be safe in children. It is antagonist of choice. Flumazenil: was introduced in 1987. It is proven to be safe in children. Nalmefene: is a new opioid antagonist, Introduced in 1995. It is proven to be useful in adults and has long acting (3.5h) effect.

Fig 18.3: Showing local anaesthetic cream in tube and injection in bottle.

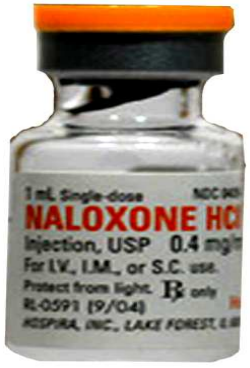


Fig 18.4: Showing anaesthetic injection

Fig 18.5: Showing sucrose pacifier

Topical analgesia: Topical anesthetics do not reduce needle phobia, Strategies used by parents proved to significantly reduce stress (e.g. favorite toy, books and singing songs).

Mixture of 2.5% lidocaine and 2.5% prilocaine in a cream base is very effective. The specific concentration gradient promotes penetration of intact skin. Depth of anesthesia ranges from 3mm after 60 min.

Lidocaine injection:

Subcutaneously injected buffered lidocaine 1% (1/10 with Bicarbonate solution of 1meq/ml) using 30-gauge needle, reduces struggling during LPs in newborns ± EMLA or Ametrope (>1mo) prior the procedure if possible Buffering decreases onset time for analgesia without affecting efficacy or duration. To reduce pain: Distract the patient and use buffered lidocaine warm the anesthetic to body temperature prior to administration, and avoid intradermal injection.

Sucrose analgesia: All studies found sucrose to be safe and effective in reducing neonatal procedural pain (using various neonatal pain rating scales). Most studies used 24% sucrose, 30% sucrose or 30% glucose. Sucrose elicits analgesia in neonates when administered prior to a painful procedure

Two minutes prior to procedure put the pacifier soaked with sugar solution in baby's mouth. Coat the pacifier with the solution repeatedly during the procedure or two minutes prior to procedure, Slowly administer 2cc of the solution to the tongue, then allow him to suck the pacifier during the procedure.

REFERENCE:

1. Circumcision Policy Statement. American Academy of Paediatric taskforce on circumcision. Paediatrics 1999;103:686-693
2. Neonatal Circumcision. SE Lerman, JC Laiao. Paediatric Clinics of North America 2001;48:1539-1557.
3. American College of Obstetrics and Gynaecology committee opinion. Circumcision, Obstet Gynaecol 2001;98:707-708.
4. Male Neonatal Circumcision: Indications, controversies and complications. Hutcheson JC. Urol Clin North Am 2004;31:461-467.
5. Neonatal Circumcision, a review of the world's oldest and most controversial operation. Alanis MC, Lucidi RS. Obstet Gynecol Survey 2004;59:379-395. New Law on Male Circumcision in Sweden.

INDEX

A

AAP *see* American Academy of Pediatrics
abdomen 30, 33, 37, 80, 87
abdominal wall 31, 33, 80
abduction 80
ABO incompatibility 102, 105
abortion 6, 37, 47, 109
ABR (auditory brainstem response) 82
absorption 50, 59
acidosis 67, 72-3, 75, 85, 88, 107-9
acids 26, 44
  ascorbic 50, 52
  folic 35, 41
activated partial thromboplastin time (APTT) 97
administration 75-6, 97, 108, 120
adolescent 46, 48-9, 119
  young 48-9
adult haemoglobin 25
adults 1, 61, 119
age 6, 8-12, 14, 48-9, 57, 61, 63, 67, 70, 76-7, 81-2, 85, 87, 96, 102
  younger 9
agencies 4, 11-12, 14
agreement 8, 11, 52-3
air 74, 85
air entry 85
air sacs 85
airways, infant's 78
albumin binding capacity, reserve 107
alcohol 37-41, 43, 62, 70
allowance 48, 53
allowances, recommended 52-3
alterations 26, 51, 112
alveoli 87
American Academy of Pediatrics (AAP) 62, 64, 68, 70, 110
American College of Medical Genetics Newborn Screening Expert Group 71, 82
American Medical Association 64, 94
amino 26
amino acids 19, 50-1, 60-1, 88, 92
amniocentesis 34, 36, 103, 105
amounts 21, 24, 26, 37, 49-51, 59, 88, 95-6, 101, 106, 113
amphetamines 42-3
analyses, amino acid 91-2
anastomose 17
anemia 2, 31, 54, 86, 88, 102-3, 105-6
antibodies 22, 29, 56, 58, 60, 68, 102-3, 105-6, 109
  mother's 105
antigen 102
Antonov 47, 54
AOP 84
aorta, dorsal 18, 20
Apgar score 66-7, 72, 82, 89
Apgar score ranging 66
Apgar scoring 66
apnea 84, 109
APTT (activated partial thromboplastin time) 97
areas, rural 5, 12, 14
arms 80-1, 86, 113
arteries 18, 25
asphyxia 66-7, 75, 85, 93
Asphyxia Livida 65-6
asphyxia neonatorum 65-7
asphyxia pallida 65-6
aspiration 78, 86
assessment 28, 32, 49, 104, 107
Assessment of Nutritional Status in Pregnancy 49
atrium, left 24
auditory brainstem response (ABR) 82
auscultation 31, 33, 35, 74
Australia 45-6
Awan 14

B

babies 2, 8, 12, 33-4, 36, 47, 56-9, 61-70, 74, 76-8, 87-9, 93, 102-4, 108-9, 115-19
  agile 70
  bottle-fed 58
  breast-fed 58
  female 79
  growing 56
  healthier 89
  high risk 92-3
  human 68
  hypertonic 113
  long 70
  low birth weight 46
  mature 61, 63
  nursing 58
  post-term 92
  pound 35, 106
  premature 73, 104
  proportion of 46-7
  sensitized 62
  sick 63
  sowing 96
bacteria 2-3, 56, 60, 87
barbiturates 43, 97, 107
barrier 105
basal lamina 16
Bathing 37, 67
Begley 22
benzodiazepines 40, 43
bile 100

bilirubin 17, 81, 100-9
  conjugated 100, 109
  split 105
  unconjugated 103, 107-9
bilirubin accumulation 100
bilirubin encephalopathy 105
bilirubin excretion 101, 108
bilirubin levels 101, 106-9
  indirect 104
bilirubin load 101
birth 1, 3, 6-12, 14, 19-20, 37-8, 47, 57, 65-7, 75-6, 79-82, 85, 87-8, 95-9, 104-5
  pre-term 48
  premature 47, 89
  registration of 14
  total 6-7, 11
birth asphyxia 8, 75
birth injury 76, 93
birth Rate 6-7, 11, 47
  crude 7, 10
  post 101
birth weight 2, 46-8, 54-5, 82, 87, 93, 98
  estimate 92
  low 37, 48-9
birthweight, low 41
blades 72-3, 117
bleeding 35, 77, 79, 95-9, 118-19
blood 2, 24, 35, 43, 50, 52, 77, 79, 88, 96, 98, 100-2, 104-6, 108, 119
  infant's 106
  placental 17-18
blood bilirubin levels 108
Blood Brain Barrier 100, 105
blood vessels 17-18, 98
  placental 16, 18
body weight 26, 87
bones 26, 40, 53, 77, 80
born babies 92
  live 93
BORN- Page 65-75, 84, 95
BORN- Page-76 76
borns 47
bottles 58, 63, 68-9, 119
bpm 72
bradycardia 65, 84, 88
brain 3, 58-9, 61, 89, 98, 105, 109, 111-12
brain damage 78, 107
branches 24
Brazelton TB 115
breast feeding 56-64, 68
breast-feeding 28, 56, 58, 62, 69
breast infections 58
breast milk 43, 57-60, 62, 64, 68-70, 88, 95
breast-milk 102
breastfed babies 56-7, 61-2, 68, 70
breastfeeding 35, 57, 61, 64, 68-9, 96-8
  exclusive 56-7
Breastfeeding Advantages 65, 68
Breastfeeding and Complementary Infant Feeding 64
Breastfeeding Jaundice 100, 102
breasts 37, 56-9, 61-3, 68-9, 102, 105, 117
  mother's 58
breathes, normal newborn 65
breathing 68, 75, 77-8, 84-6, 89
  rapid 85
breech position 80-1
Brief History of Newborn Screening 91
Burke 47, 54

C

caffeine 44, 62
caffeine intake 44
calcium 53, 59-60, 88
caloric intake 48
calories 48, 52
capacity, functional residual 86-7
carbohydrates 21, 59-60
cardiac arrest 74
care 1-2, 4, 7, 10, 13, 28, 37, 40, 63, 65, 68, 88, 92-3, 98, 118-19
  intensive 2, 93
  medical 40, 97
  shared 31
carrier 37
caution 43, 62
cell thickness 25
certificate 5, 13-14
Cervical intra-epithelial Neoplasia (CIN) 35
Cesarean Section 67, 86
Challenging Resuscitation Conditions 72
Chapter on High Risk Pregnancy 91
chemotherapy 68
chest compressions 72
Chest X-Ray 85-6
child 9, 13, 43, 48, 62, 68, 70, 85, 104, 109, 116-17
child birth 8-9, 11, 13
childbirth 5
children 5, 11-12, 31, 43-4, 47-8, 54, 61, 71, 82, 92, 113, 117, 119
  breastfed 61
child's condition 102
cholesterol 50, 59, 61
chorioamnionitis 2-3
  acute 2-3
chorion 2, 16-17
chronic lung disease (CLD) 84
CIN (Cervical intra-epithelial Neoplasia) 35
circumcision 82, 95, 118-20
clavicle 79

CLD (chronic lung disease) 84
Clin 54, 71
clindamycin 44
clinical chemistry 70, 92, 94
clinicians 49, 77-8, 82, 88
Clinics, first available 32
clotting factors 96
cocaine 39, 41, 43
coitus 37
collection 4-5, 8, 13
colostrum 56-9
Comb's Test 104
Commercial infant formulas 98
  standard 95
COMMON RESPRIATORY DISORDERS 85-90
comparison 5, 11, 13
  international 4, 12-13
Complementary Infant Feeding 64
completion 4, 13
complication 29, 38, 66-7, 80, 82, 96, 98
Complication of pregnancy 8
concentration 21, 26, 48, 50-1, 53, 90
  haemoglobin 25
  hemoglobin 54, 104
concept 1, 25, 49, 51
conjugates 100
conjugation 101, 106-8
  inhibit 107
connective tissue 17-18
consumption 49-50
contact 16, 31
copy 14
cord 16-17, 65, 70, 82, 96, 108
cord blood 102, 104
corpus luteum 19
corticosteroids 59, 90
count, erythrocyte 25
countries 1-2, 4-8, 10-14, 29, 52, 66-7, 75, 98
  developing 1, 4, 13, 66, 85
cows 16, 57, 59-60
cows milk 59
Crude Death Rate 6-7
Curosurf 88
cycles 30-1, 84
cystic fibrosis 82, 96-7
cytotrophoblast 16-18, 20
Czeizel AE 45

D

dada 117
daily allowances, recommended 52-3
days 8-10, 14, 19, 29-30, 40, 43, 67, 77, 79, 81-2, 86, 88-9, 96-7, 119
days of life 104
death certificates 5
deaths 5-7, 9-10, 12, 14, 72
  obstetric 9
  total 8-9
Defects and Drugs in Pregnancy 45
deficiency 8, 11, 53-4, 87, 95, 97-9
degree 66-7, 101, 112
delay 67, 82, 86-7, 90
delirium tremens (DTs) 40
delivery 6, 9-10, 28, 35-6, 40-1, 43, 62-3, 65, 67, 72, 76, 80-1, 89-90, 92-3, 109
delivery room 65
demands 9, 28, 49, 52-3
deposition 17-18, 100, 109
desaturation, significant 84
DETAILED EVALUATION 76-83
development 1, 5, 13, 19, 27-8, 36, 40, 48, 56-7, 59, 107, 116-17
  normal 116
Developmental Milestones 116-17
DEVELOPMENTAL MILESTONES- Page 116
diabetes 2, 5, 31, 57, 85
diagnosis 36, 43, 51, 86, 92, 95, 97, 103
diagnostic procedures 104
diameter 17, 25, 77
diarrhea 56, 58, 62, 96-7
diet 36, 49-50, 52-3
  balanced 50, 58
  mother's 47, 56
difference 24-5, 30, 103, 105
diffusion, simple 21
direct antiglobulin test 102, 104
  negative 102
Disadvantages of Breast Feeding 56-7
discharge 21, 36, 81, 107
disease process 50, 102, 104, 109
diseases 5, 9, 31, 47, 58, 71, 85, 90, 92, 95, 100
disorders 84, 91-2, 95
  medical 2, 28-9, 31
distance 30
District Health Officer 14
disulfiram 40
doctor 5, 28-9, 32, 69, 87, 119
doi 22, 70-1, 93
dosage 75, 88-9
doses 35, 43, 108-9
  single 82, 97-8
drinking 40
drug abuse 28, 39-40, 44
drugs 17, 22, 32, 38-45, 62, 75, 98, 107
Drugs Abuse 39
Drugs in Pregnancy and Lactation 45
DTs (delirium tremens) 40
duration 8-10, 30, 67, 120
dysplasia, hip 80

E

Early Neonatal Mortality Rate 6

EDC 30
edema 32, 36, 76-8
  pulmonary 39, 42-3
editors 3, 27
education 12-13, 48-9
effect, cidal 60
Effect of Cocaine on Pregnancy 41
effort 28, 49, 51, 66, 88-9
elbows 113
Electrospray Ionization-Tandem Mass Spectrometry 94
embryo 16, 18, 38, 44
emotional disturbances 47
empties 24
endotracheal tube 67, 73-4
engorgement 58
enterohepatic circulation, increased 101-2
enzyme induction 107-8
enzyme systems 40, 53, 108
enzymes 20-1, 53, 59, 107
epidemiological studies 3-4
epinephrine 72, 74-5
Equipment for Neonatal Resuscitation 72
errors 34, 36
Erythroblastotic babies 108
estimation 30, 33-4, 114
estriol 19, 26
estrogens 19-20
evaluation 2, 29, 65-7, 76, 80-1, 92, 99
  immediate 76, 78
evidence 14, 20, 35, 44, 46, 51, 54, 64, 81, 108
examination 29-30, 32-4, 39, 66, 76-7, 80-1, 111, 115
  cranial nerve 111-12
  neurologic 111-15
  sensory 112
examiner 33, 77-80, 112
exchange transfusion 2, 102, 104-8
exhaustion, mother's 47
Expanded Newborn Screening for Inborn Errors of Metabolism 94
expulsion, complete 6, 8
extension 17, 33, 113
extraction 6, 8
extremities 38, 65, 76, 80-1, 111, 113
eyes 32, 67, 76, 80, 106, 112

F

Fam Physician 71, 82-3, 94
Fanaroff 90
FAS 41
FATA (Federally Administered Tribal Areas) 12
fats 21, 50, 56-8, 60-1, 68
fatty acids 57
Federally Administered Tribal Areas (FATA) 12
feeding 12, 56, 62-3, 68-9, 102-3, 105, 117
feeding bottle 63
feeding premature infants 60
females 12, 48, 53, 79, 115
  pregnant 46
fetal 21, 24, 27, 37, 51, 87, 109
  oxygen dissociation curves of 25
fetal blood 17, 21, 25-6
fetal circulation 24-5, 103
Fetal Circulation and Oxygenation 24
fetal death, intrauterine 41, 43
fetal growth 44, 48, 51, 55, 105
fetal haemoglobin 25
fetal heart beat 30
fetal maturation 90
FETAL PHYSIOLOGY- Page 24-7
fetal RBCs 102-3
fetal side 16, 21, 52
fetal sizes 33-4
fetal tissue 43-4
fetoplacental unit 26
fetoscope 34
fetus 2, 6, 8, 21-2, 25, 27-8, 33-4, 38-9, 41, 43, 46, 48-52, 67, 90, 103
  developing 16, 49
  growing 51-2
  human 27, 50
fetus weighing 6-7
fetuses 26, 102
few days, first 61, 76-7, 79, 85, 101
films 35
financiers 1
fingers 30, 33, 81, 113
  infant's 113
First Few Hours 76
first trimester 16, 35, 37, 41, 43, 52
flexes 80-1
fluid 36-7, 58, 63, 65, 73, 86, 88
  amniotic 25, 86, 88, 90
fluoride 59
fluoxetine 42-3
foetal blood 21-2, 26
foetus 4, 21-2, 24-6, 43
  human 24, 26
food 46, 48-9, 52-3, 57-8, 62, 70, 86
  insufficient 46-7
  solid 56, 61, 68-70
food habits 46, 48
foreskin 82, 118-19
formation 25-6, 59, 106
formula 57-8, 61, 63, 68-70
full-term placenta 16
functions 16-17, 19, 21, 29, 52, 97, 105, 111-12, 116
fundus 30-1, 33

G

GA *see* Gestational age
general population 8-9, 41, 93
Gershenson 47
gestation 1-2, 6, 8, 26, 30-2, 35-6, 38, 41, 61, 84-5, 90, 92-3, 119
  month of 8, 25
gestational age 2, 6-7, 30, 35, 77, 92-3, 111, 113-15
Gestational age (GA) 2, 6-7, 30, 35, 77, 84-5, 92-3, 111, 113-15
GI tract 95
glucose 17, 21, 26, 50-1, 60, 101, 120
glue 44
glycogen 17-18, 21, 60
Gomco 118-19
Gomco and Mogen Method 118-19
gram 53-4, 60, 87
gravida 5-6
growth 13, 29, 47-50, 59, 61, 105, 116
growth retardation 47-8
gut, infant's 60
Gynaec 38

H

HAEMORRHAGIC DISEASE 95-9
Hb 32, 105-6
HbF 25
hCACTH 19
hCG 18-19
hCG level 19
hCS 19
hCT 19
HDN 95, 102-3
head 14, 24, 30, 33, 65, 69, 72, 77, 81, 89, 111-13, 116
  infant's 65
health 9, 13, 15, 28, 49-51, 65
  mother's 68
health care 5, 35
health indicator, positive 13
Healthy Newborns 64
Healthy Term Newborn 110
heart 6, 8, 24, 27, 32, 61, 74, 77, 87
heart disease 1
heart rate 61, 72-4, 76
height 30, 35, 47-9
  fundal 30-1, 33
  mother's 47
hematocrit 25, 109
hematological, special 25
hemoglobin 35, 100, 104
hemolysis 100-1, 103, 105-6
hemolytic disease 81, 102, 104
Hemolytic disease of the- newborn 102
hemolytic processes 104, 108-9
hemorrhage 10, 22, 32, 51, 89, 98
  intracranial 95, 98-9
hemorrhagic disease 77, 79, 95-6, 99
  late 99
hepatitis 29, 39, 96-7, 106, 108
heroin 39, 43
high risk neonates 1, 93, 115
HIGH RISK NEONATES- Page 91-4
hips 80-1, 113
Historic Perspective 24, 46, 91, 102
history 29-31, 35-6, 39-40, 57, 107, 109
History of Present Pregnancy 31
HIV (human immunodeficiency virus) 39-40, 69, 81, 106, 118
hormones 17, 19-20, 22, 51, 56, 59
  steroid 18-19, 22, 26
hospitals 10-12, 32, 67, 81
  teaching 1-2
hours 10, 12, 34, 40, 43, 49, 58, 67, 69, 77, 79, 87, 90, 96, 109
  few 37, 80-1
hours of life 84, 102
hours postpartum 36
hrs 72, 77, 82
Human Chorionic 19
Human chorionic corticotropin 19
Human chorionic gonadotrophin 18-19
human chorionic somatomammotropin 19-20
Human chorionic thyrotropin 19
human immunodeficiency virus *see* HIV
human milk 56, 58-61, 64
human milk composition 58, 60
hungry 63, 69
hydrocele 79
HYPERBILI-RUBINEMIA- Page 100
hyperbilirubinemia 81, 100, 103-4, 106-10
HYPERBILIRUBINEMIA- Page 101-10
hypertension 31, 41, 51, 68, 78
hypoglycemia 2, 73, 86, 93, 107
hypothermia 73, 86, 88, 90, 107
hypotonia 85, 105
hypoxemia 85-6
hypoxic condition 25

I

ibs 52
ICH 95-7
IEMs 92
IM vitamin 98
immature, newborn's 68
immune factors 56-7
immunization 29, 32, 109
implication 25
Implication PMID 94
impression 9-10
improvement 2, 9, 12, 48, 74, 86, 88, 93
impulses 112
Inborn Errors of Metabolism 94

incidence 6, 37, 47-9, 66, 84-6, 88, 100-1, 109
Indirect Method 49
individuals, non-pregnant 51
infancy 57
infant care 2, 13
infant feeding 64
infant morbidity 13, 48
Infant Mortality 7, 9-10, 48
Infant Mortality Infant Mortality rate in Pakistan 7
infant mortality rates 4, 6-9, 12, 49
infant mortality statistics 8
infant respiratory distress syndrome (IRDS) 89
infants 2-3, 8, 11-13, 28-9, 47-9, 58-63, 65-6, 68-74, 76-8, 80-2, 87-8, 90, 97-8, 104-9, 113
  breastfed 61, 95-6
  debilitated 63
  deficient 96
  depressed 66, 73-4
  full-term 104
  healthy 96
  irritable 113
  jaundiced 107-8
  lethargic 113
  low birth weight 48
  male 79
  mature 93
  normal 67, 101
  normal full-term 104
  preterm 2, 57, 84, 98
  preterm-born 3
  ruled 102
  stillborn 6-7
  symptomatic 98
  unwell 105
  very low birth weight 61
  very sick 2
  vigorous 66
infant's chances 89
infant's requirements 56
infection 2-3, 8, 13, 31, 39-40, 44, 56, 58, 61, 67, 76, 82, 85, 104, 118
  ear 56, 61-2
  puerperal 10
inflation 74
information 5, 11, 13-14, 29, 33, 35, 49, 104, 111
  reliable 34
institutions 4, 10-11, 14
intake
  adequate nutritional 49, 51
  inadequate 95
  mother's 62
  pre-pregnancy 48
intercostal retraction 85
interpretation 13, 92
Intrauterine transfusions 104-5
intravenous 60-1
intubation 66, 72, 74, 88, 90
Intubation of infant 90
iodine 35, 53
IRDS (infant respiratory distress syndrome) 89
iron 22, 35, 52-4, 56, 59-60, 70, 101
  mgm of 52, 59
iron supplements 52, 54, 70
irradiance 105-6
irritability 40, 76
isoimmuniza1iotibility 101
items 49-50, 70

J

jaundice 67, 76, 81-2, 100-4, 107-8
  appearance of 103-4
  persistent 105
  physiologic 100, 102
Journal 64, 93-4

K

Kcal 50, 52
kernicterus 102, 105-9
kidneys 21, 25-6, 59, 61, 80, 118

L

labor 9, 28, 41, 43, 89, 93
  preterm 2-3
Laboratory Testing in Infants and Children 71, 82
lactoferrin 56, 59-60
Lactose 59-60
laryngoscope 67, 72-3
Last Menstrual period *see* LMP
Late Neonatal Death 6-7
Late Neonatal Mortality Rate 6
Late onset VKDB 96-7
late pregnancy outcome 44
lecithin 86-8, 90
legs 33, 80, 86, 117
length 33, 47, 77-8, 92, 115
Level of HCG in Pregnancy 19
levels 2, 26, 47, 49-50, 81, 87, 96-7, 105, 107, 110
  fibrinogen 97
  mother's comfort 68
life 7-8, 40, 48, 57, 61, 68-9, 76, 82, 84, 91, 96, 98, 101-2, 104, 108
  completed days of 7
  early 59-60
  evidence of 6, 8
life expectancy 9, 12
live births 4, 6-8, 12
  total 6

liver 20, 24-5, 80, 95, 100-1, 104, 108
LMP (Last Menstrual period) 19, 29-30
London 14, 27, 115
losses 51-3, 82, 117
lung maturity 86, 88
lung surfactant 85, 87
lungs 3, 21, 66, 74, 77, 79, 86-9
  baby's 89-90
lymphocytes 60
lysozyme 60

M

macrophages 60, 103
maintenance 44, 49-50, 53
Male Neonatal Circumcision 120
malnutrition 12-13, 46, 49
mama 117
management 3, 9, 22, 39-40, 42-3, 65-7, 84, 86, 90-3, 95, 98, 102, 110
maneuvers 33, 80
manifestation 6
Marijuana 44
MAS *see* Meconium aspiration syndrome
mask 72-4
massage 70, 74
maternal 4, 9, 12-14, 17, 22, 33, 44, 48, 51, 103, 109
maternal blood 16-17, 19-21, 25-6, 50
maternal circulation 21-2, 102, 109
maternal deaths 7, 9-11, 14
maternal diet 47-8, 50
maternal medications 96-7
maternal morbidity 10, 48
maternal mortality 9-12
maternal mortality rates 7, 10-11
maternal nutrition 48, 55
maternal weight gain 47
maturation, sexual 48
MD 22, 64, 90
mechanism 21, 26, 107
meconium, passage of 43-4, 82, 85
meconium aspiration syndrome 67, 84-5
Meconium aspiration syndrome (MAS) 67, 84-5
Meconium-stained amniotic fluid (MSAF) 85
medications 38, 69-70, 72, 88
medicines 38, 45, 90, 92
Medicines and Nursing Mothers 56, 62
membranes 2, 32, 88
menarche 48
menstrual period 29-31
mental retardation 41, 89, 109
mercury 36
metabolic adaptations 51
Metabolic Disorders 94
metabolism 26, 51, 92, 94
  mother's 51
methadone 43
methods, direct 49
Methods Employed 4
metronidazole 44-5
mg/dl 60, 82, 106
mg/kg/dose 88
mgm 52-3
microgram 53
mid-pregnancy 27
midwife 1, 13-14, 58
milestone 116
milk 37, 57-60, 62-3, 70
  cow's 59-60, 63
  mother's 60
mineral contents 59
minerals 22, 52-3, 59, 68
  important 53
minutes 62-3, 65-7, 69, 80, 115, 120
mirror image 117
ml 25, 73-4, 87, 90, 104, 106, 108-9
mL/kg/dose 88
µmol/L 82
Mogen Methods 118-19
moms 68
month, first 69
morbidity 1-4, 10, 13-14, 37, 47, 90, 93, 109
mortality 4, 12-14, 43, 47-8, 88, 90, 92-3, 95-6, 109
Mortality/Morbidity 95, 109
mortality rates 5, 9-10, 13, 47
  high 8-9
  reported neonatal 8
Most babies 109
Most infants 84
mother hood 9
mother transfers 52
motherhood 13, 28, 49
Mothering 23
mothers 1-2, 4-6, 8-10, 12-13, 21-2, 26, 36-9, 43-4, 46-7, 49-51, 58, 62-6, 68-9, 89-90, 102-4
  alcoholic 41
  bottle-feeding 57-8
  children of 43, 81
  common 64
  deficient 47
  expectant 12
  healthy 70
  heroin-addicted 43
  methadone-maintained 44
  normal 107
  prospective 49
  wet 64
mother's card, based 13
Mother's fluid intake 62
Mother's Guide 64
mother's homeostasis mechanisms 51
mothers milk 64

mouth 43, 58, 65, 69, 74, 78, 81, 89, 96, 109, 113, 117
  baby's 58, 70, 113, 120
  infant's 62
movements 33, 79-81
MS/MS 91-2
MSAF (Meconium-stained amniotic fluid) 85
Multiple pregnancies 32
murmur 77
muscle tone 76, 78, 113
  infant's 115
muscles 66, 112-13, 116

N

Nägele's Rule 29-30
naloxone 43, 119
naltrexone 40
narcotic antagonists 43
nation 4, 7, 9, 11
Natural Killer (NK) 20
neck 70, 72, 78, 111-13
neonatal 19, 71, 115
neonatal care 1, 12, 14
neonatal care facilities 2, 11
Neonatal Circumcision 120
neonatal deaths 8, 31-2, 88
  early 6-7
  global 8
  world's 8
neonatal mortality 1, 106
Neonatal Mortality Rate 2, 10, 49
neonatal neurological examination 115
neonatal period 2, 76, 83, 101
neonatal respiratory distress syndrome 3, 90
neonatal resuscitation 44, 72
neonatal sepsis 60, 82
neonatal units 82, 86
neonatal withdrawal 41, 43
neonates 1-2, 27, 41, 44, 67, 72, 76-83, 85-7, 90-2, 96-9, 101-2, 107, 109, 112-13, 119-20
  most 81-2
neonatologist 1-2, 91
neonatology 1-3, 11, 84
nerves 111
  cranial 111
nervous system 111, 119
  central 109, 112
neurological exam 111-12
neurological examination 76, 81, 111, 115
newborn 1-3, 38, 46, 56, 58, 65-9, 71-2, 74-8, 81-2, 84-92, 95-9, 102-5, 107-8, 110-11, 115
  circumcised 118
  depressed 66
  full term 72
  premature 107
newborn baby 65, 76
NEWBORN CIRCUMCISION 118-20
Newborn DNA samples 71
newborn hearing screening program, universal 93
Newborn ICU design 3
newborn infants 3, 38, 85, 107-8
  convalescent 2
  normal 115
newborn infants weighing 90
newborn liver 60
newborn period 118
Newborn Resuscitation Priorities 72
newborn screening 70-1, 82-3, 91-4
Newborn Screening Authoring Committee 70
newborn screening be-came 91
Newborn Screening for Metabolic Disorders 94
newborn screening laboratories 92
  few 91
newborn screening programs 92
Newborns American Association 70, 94
newborns duration 100
newborns nurseries 107
nipples 58, 62-3
NK (Natural Killer) 20
non-pregnant daily allowance 53
non-pregnant levels 20, 51
normal biochemistry 51
Normal Newborn 65
NT 35
nullipara 6
number 1, 6-9, 11, 14, 33, 37-8, 46, 54, 70, 96, 108-9, 112
nurse 58, 62-3, 65, 69, 108
nurseries 2, 11, 96, 110-11
nursing 58, 62-3, 69
nursing mothers 56, 58, 62-3, 68
nutrients 17, 49, 51-2, 56
nutrition 16, 28, 32, 46-55, 58, 60, 69, 88, 93
  human 53-4
  mother's 60
Nutrition studies of pregnant Australian women 54
nutritional 13, 48-9, 52
nutritional status 49
  pre-pregnancy 52
  prepregnancy 52
nutritional supplements 29, 35, 54, 69-70

O

objects 112, 117
Obstet 38, 54
obstetrical 2, 12, 14

obstetrical consultants 29
obstetricians 1-3, 8, 13, 32, 34, 48-9, 64, 91
obstetrics 2-4, 9, 11, 13-14, 24, 28, 30, 40, 120
organisms 22, 60
Ortolani maneuver 80
outcome, improved pregnancy 44
Outcome and Implication PMID 94
oxygen 21, 25, 73-4, 85, 87, 89, 93, 106
oxygen consumption 21, 24-5
oxygen saturation 24-5
oxygen toxicity 88-9
oxygenation 24, 88
  adequate 25

P

pacifier 69, 81, 120
page 70-1, 94
Page 1-15, 18-23, 25, 28-45, 47-64, 66-71, 73-4, 77-83, 85-90, 96-9, 101-15, 117-20
pain 28, 36, 58, 112, 118-20
pain intensity 119
pain relief 118
Pakistan 2, 4-5, 7-14, 36, 52, 54, 56, 60, 64, 67, 85, 107-8
palate 78
pallor 76, 78
palpation 31, 33, 80
parents 34, 70, 82, 120
parity 6, 8-9
parous 6
pass 21-2, 29
Pathophysiology 3, 84, 95
patients 5, 29, 31-7, 39-40, 42, 48-9, 52-4, 63, 88, 91-2, 111-12, 120
  non-pregnant 51
  pregnant 35, 52
pauses 84
PCC (prothrombin complex concentrates) 98
peak 12, 20, 48, 84, 100
Pediatrics 11, 62, 64, 70-1, 82, 94, 99, 110
penis 79, 118-19
  circumcised 118-19
pentazocine 43-4
percentiles 31
perinatal 1-2, 9
  childbirth 7
perinatal mortality 4, 9, 11, 44, 46
perinatal outcomes 46, 90
perinatologist 1-2
perinatology 1, 3
PERINATOLOGY- Page 2-3
PGH (Placental growth hormone) 19
pH 25
phase 105
phenobarbital 43, 108
phenylalanine 91
phototherapy 100, 105-7
physical examination 31-2, 40, 65, 76-7, 96, 107
physician 2, 4, 8, 28-9, 33, 36-8, 40, 54, 63-4, 67, 72, 84, 88, 103, 111
  ordinary 28
  primary 13, 91-2
physiological changes 52
Physiological Jaundice 100-1, 104
physiology, placental 16, 24
placenta 2-3, 8, 16-18, 21-4, 26, 37, 43-4, 49-52, 60, 102-3, 109
  human 21-2
placenta acts 21, 49
placental abruption 39, 42, 103
placental barriers 17, 103
Placental blood circulation 22
Placental growth hormone (PGH) 19
PLACENTAL MORPHOLOGY FUNCTIONS 18-23
PLACENTAL MORPHOLOGY FUNCTIONS- Page 16-17
placental septa 17-18
planning, economic 4
Planning Commission Government of Pakistan 15
plasma 100, 109
  fresh frozen 97-8
Plasti Bell 118-19
Plasti Bell Method 118-19
plastic 118-19
plenty 58
PMID 22, 70-1, 90, 94
PO2, given 25
population 4-5, 7, 9-10, 46, 52
  defined 6
  total 6-7, 11
Population Size 4
position 18, 33, 65, 74, 112-13
Post Neonatal Mortality Rate 10
pregnancy 2-3, 5-6, 8-10, 13, 19-22, 28-55, 86, 88-9, 91-2, 102
  drugs effect 39
  early 19-20
  ectopic 6, 36, 103
  first trimester of 44-5, 54
  high-risk 3
  late 22, 26
  multiple 32, 36
  normal 24, 31, 36, 47, 50-1, 54
  normal intrauterine 6
  outcome of 2, 13, 49, 54
Pregnancy BMI 52
PREGNANCY- Page 40-6
pregnane 102
pregnanediol 107

pregnant Australian women 54
pregnant mice 22
Pregnant Mothers 52, 64, 103
Pregnant problem drinkers 40
pregnant state 9, 54
pregnant women 26, 28-9, 36-7, 44-5, 51-2, 54, 90
  healthy 51
  under-nourished 48
premature 63, 72, 88
premature infants 60, 85, 87-9, 93, 98, 105
prematurity 42, 47, 84-6
Premedication 118
prenatal care 28-9, 35, 41, 81, 104
PRENATAL CARE- Page 29-38
prenatal classes 12-13, 34
prenatal diet 47
prenatal period 2, 13, 49, 54
Present Pregnancy 31
presentation 29, 33
pressure 74, 87, 112
  venous 106
preterm babies 101
preterm births 8, 98
preterm delivery 44, 90
PROBIT (Promotion of Breastfeeding Intervention Trial) 64
problems 2, 4-5, 9, 12-13, 24, 28, 32, 34, 63, 84-5, 93, 95, 98, 100, 115
process 18, 20-1, 51, 100, 106-7
Process for Pregnant Mothers and Mothers 64
production 26, 87-8, 95, 104
products 8, 70
  waste 17-18
progesterone 19-20
prognosis 84, 88, 91, 98, 109
progressive hydrocephalus 98
Promotion of Breastfeeding Intervention Trial (PROBIT) 64
prophylaxis 67, 86, 96-8
protein 17, 21, 26, 35, 41, 47-8, 50, 55, 57, 59-60, 68, 87, 91, 97, 101
  additional increment of 47
protein content 47
protein intake 47-8
Protein of Pulmonary Surfactant 87
prothrombin complex concentrates (PCC) 98
provinces 14
Provincial Health Directorates 14
Pt, prolonged 97
puerperal morbidity rate 10
Puerperium 9, 37-8
Pulmonary Surfactant 87

Q

quantities 4, 26, 37, 59-60

R

races 85
rate 4, 7, 9-11, 21, 24, 32, 34, 47, 60, 75, 100-1, 106
  fertility 11
rattle 117
RBCs 102-3
RDS (Respiratory distress syndrome) 3, 84-90, 93
reactions, allergic 57
Red blood cell 22, 101-2, 104
red cells 103, 105-6
referral 29, 32, 79-80
reflexes 76, 81, 112-13, 115
  rooting 69, 81, 111, 113
  tendon 111-13
region 10-11, 13, 17
registrar 13, 32
registration 8, 14
Registration of Births and Deaths in Pakistan 14
relation 33, 48
relationship, significant 47
relieve 58
respirations 32, 65-6, 72, 74, 76
respiratory distress 76-7, 84-5, 88, 93
respiratory distress syndrome 84-5, 90, 93
Respiratory distress syndrome *see* RDS
respiratory system 24-5, 32, 66, 77
response 18, 66, 81-2, 112
responsibility 92
Restoration of Normal Biochemistry to Non-pregnant Levels 51
resuscitation 67, 72, 75
RESUSCITATION 72-5
resuscitative measures 67, 72
resuscitator 72, 74
reticulocyte count, unconjugated bilirubin co 101
Retrieved 23, 90
review 2, 13-14, 32, 35, 46, 48, 54, 120
  literature 56, 94
Rh 35-6, 102-4, 109
Rh Incompatibility 103-4
Rh Sensitization 109
Rhesus 29, 31-2, 36
risk 3, 9, 22, 31, 37-9, 41-5, 49, 61-2, 67, 70, 78, 80-1, 90-1, 107, 118
  child's 57
  high 81, 90-1
risk factors 28, 36, 80-2, 85, 96-7, 107
  birth asphyxia 75
Risks of circumcision 118
role 14, 19, 51, 57, 86, 92
room 62, 70, 72

S

salt 53
scans 35
score 66, 115
  infant's 66
screening 2, 29, 34, 71, 76, 82, 91-4, 111
screening tests 2, 37, 92
Screening Tests for Newborns American Association 70, 94
Screening Tests for Newborns American Association for Clinical Chemistry 70, 94
scrotum 79
seconds 74, 84
secrete 19-20
sensation 112, 118
serum 107-9
  mother's 104
serum bilirubin 82, 104, 106-7
serum bilirubin level 104, 106, 109
services 12-14
  countries neonatal 2
severity 3, 67, 85, 104
sexual infantilism 53
shoulders 79, 113
Showing newborn 66
Showing newborn penis 119
Showing newborn screening 91
SIDS (sudden infant death syndrome) 62
silver nitrate 67, 80
Singh 99
sinus venosus 18, 20
sites 9-10, 18, 95-6
skills, developing 116
skin 31, 70, 79, 81, 86, 100, 103, 106, 112
smell 111-12
smoking 28, 37, 62
social event 28
society 1, 9, 48, 64, 93
sodium 22, 53
solution 67, 120
sounds 116
  grunting 85-6
South Med 99
specialty 1-2, 4, 29
stalk 17
Standard supplement of non-pregnant daily allowance 53
standards 11-13, 51-2
start 12-13, 69, 74
starvation 50-1
statistics 4-5, 8-11, 15, 118
STATISTICS 4-15
status, pre-pregnancy 49
Status of Vitamin and Iron Supplements in Pregnancy 54
sternum 74
stillbirths 4, 6-8, 32
stimulus 66, 70, 112-13
stomach 66, 74-5
Stools of breastfed babies 62
stromal cells, endometrial 20
structure 21, 25-6
  placental 16, 18
subjects 8, 28, 36-7
substances 20-1, 40, 42, 44, 51, 57, 88, 104
suck 63, 69, 81, 105, 120
sucking reflex 111, 113, 116
sucrose 120
sudden infant death syndrome (SIDS) 62
sugar 21, 26, 35
suitability 31-2, 56
sulphate 26
supplements 54, 58, 61, 70
supply 24, 50-1, 59
surfactant 84, 87, 89-90
  administration of 86, 88, 90
surgery 118-19
surgical history 31
Surgical Methods of circumcision 118
swelling 2, 77, 80, 119
symphysis 30, 35
symphysis pubis 30-1, 33
symptoms 30, 32, 43, 85, 87, 91-2, 96, 103
Symptoms of pregnancy 30-1
syncitiotrophoblast 17, 19
system
  bilirubin conjugation 101
  digestive 61, 68
  health care delivery 12-13
  immune 61, 103
  motor 111-12
  neonatal care 2
  sensory 111-12
system antibodies 102-3
systemic 20, 107

T

Table Perinatal and Infant Mortality Infant Mortality rate 7
TCT (thrombin clotting time) 97
team 2
team approach 1, 35
teeth, natal 78
temperature 32, 82, 112
  identical 25
tendons 112
teratogenicity 41, 45
term 17, 20-2, 25-6, 30, 50, 52, 72, 79, 86, 89, 92, 95, 107

term babies 72, 113
  delivered 67
term infants 68, 78, 110, 113, 115
  full 2
term plan, long 12-13
termination 9-10, 40
testes 79
testing 37, 40, 82, 92, 102-4, 111-12, 115
tests 35, 82, 89, 97, 104-5, 111-13
  positive Coombs 101, 104
the- newborn 102
therapy, photo 106-7
thorax 79
thrombin clotting time (TCT) 97
Thyroid stimulating hormone (TSH) 19, 105
tips 58, 118
tissues 25, 50, 92, 100, 102-3
titer 103
tolerance 39, 41-3
tone 76, 112-13
tongue 69, 111-12, 120
toys 117
trace elements 53
trachea 73
tranquilizers 43
transfer 21
Transient Tachypnea 84
Transient Tachypnea of the Newborn (TTN) 84, 86
trauma 81, 86, 93, 95, 98
treatment 2, 9, 36, 40, 44, 78, 80, 87-8, 91, 95, 97-8, 102, 107-9
  warrant 101
trimester 32, 35-7, 43, 48, 50, 52
  second 34, 44
TSH (Thyroid stimulating hormone) 19, 105
TTN (Transient Tachypnea of the Newborn) 84, 86
tube 72, 74, 87-8, 119

U

ultrasound 30, 35, 98
ultrasound scan 29-30, 34, 105
umbilical cord 2, 6, 8, 16-18, 25, 79, 82, 96
umbilical hernia 80
umbilical vein 20, 24-5, 75, 106
umbilicus 30, 95
unconjugated hyperbilirubinemia 100-1, 107, 110
undernutrition 50-1
UNICEF report 11-12
Union Councils 14
United States 8, 98, 118
Universal Tandem Mass Spectrometry for Newborn Screening 71, 94
Updated AAP Guidelines on Newborn Screening and Therapy 83
Updated AAP Guidelines on Newborn Screening and Therapy for Congenital Hypothyroidism 94
urine 35, 40, 42, 51, 53, 67, 82, 96, 103, 105
USA 5, 9, 11, 46
USS 30
utero 2, 25, 27, 34, 44, 66-7, 79-80, 84
Uteroplacental blood flow 39
uterus 16, 19, 22, 31, 34, 36-7, 68

V

vaccination 12, 37, 61
variation 5, 10-11, 59
vena cava, inferior 24
ventricular dilatation 98
Very low birth weight babies 57
vessels 16, 18, 25
villi 17-18
  chorionic 17
viruses 22, 60, 87
Vital Statistics 4
vitamin 17, 22, 48, 54, 60-1, 67-70, 77, 95-9, 107
  additional 60, 70
  intramuscular 97
  supplemental 95, 98
vitamin K deficiency bleeding *see* VKDB
vitelline 20
VKDB
  classic 95, 97-8
  diagnosis of 97
VKDB (vitamin K deficiency bleeding) 95-8
volume, corpuscular 25

W

war 46-7, 54
water 17, 21, 26, 63, 70, 100, 106, 119
  boiled 63
WBC 105
weighing
  live born infant 7
  liveborn infant 7
weight 12, 32-3, 35, 46-9, 52, 54, 69, 77, 82, 93
  pre-pregnancy 32, 47-8
  pre-pregnant 48
weight Gain 32, 47, 52
  total 32
Weight of pregnant women 54
Wharton's jelly 18
Wilkins 45

wk 81
woman 6, 9-10, 12-13, 32, 35, 37-8, 47, 58, 62, 103
  non-pregnant 54
  pregnant 3, 37
women 9-12, 28, 31-2, 35-7, 48, 54, 57-8, 64, 68-9, 90, 109
  negative 36
world 7, 13, 23, 56, 120
wrists 81, 113

X

xiphoid 30

Z

zinc 53, 59