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PERINATAL OUTCOME OF HIGH RISK PREGNANCIES IN TWO HOSPITALS IN KHARTOUM STATE

<u>By</u>

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Dedication

To

The soul of my father

TO

My lovely mother

&

To my sisters and brothers

ACKNOWLEDGMENT

Definitions

- **Stillbirth:** is the dead foetus weighing at least 500 grams and delivered after completed 24 weeks of gestation.

- **Early neonatal mortality rate:** is the number of deaths in the first week of life per 1000 live births.

- **Perinatal mortality rate:** is the number of stillbirths plus the early neonatal deaths per 1000 total births.

- **Low birth weight:** is a weight at birth of <2500 grams (up to and including 2499 grams) irrespective of gestational age.

- **Pre-term:** is the one who is delivered with a gestational age of less than completed 37 weeks.

- **Post-term:** is the one who is delivered with a gestational age of more than completed 42 weeks.

- **Obstructed labour:** A labour in which progress is arrested by mechanical factors and delivery often requires caesarean section.

LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Meaning</u>
ANC	Antenatal Care
APH	Antepartum haemorrhage
C/S	Caesarean section
ENND	Early Neonatal Death
FSB	Fresh still birth
HC	Head circumference
IUFD	Intra uterine fetal death
IUGR	Intra uterine growth retardation
KTH	Khartoum teaching hospital
LBW	Low birth weight
MCH	Maternal and Child Health
MCM	Maternity Care Monitoring
NICU	Neonatal Intensive Care Unit
NNMR	Neonatal Mortality Rate
OMH	Omdurman Maternity Hospital
PE	Pre eclampsia
PG	Primigravida
PHC	Primary Health Care
PIH	Pregnancy Induced Hypertension

PNMR	Perinatal mortality rate
PPH	Postpartum haemorrhage
PROM	Premature ruptured of membranes
RDS	Respiratory distress syndrome
SB	Stillbirth
SUH	Soba University Hospital
TBA	Traditional birth attendant
UK	University of khartoum
UNFPA	United Nation Fund for Population Activities)
U/S	Ultra sound
WHO	World Health Organization

ABSTRACT

This is a prospective and descriptive hospital based study aiming to study the association between the sociodemographic and reproductive profiles of mothers of high-risk pregnancy to pregnancy out come. A total of 400 maternity patients, identified as having high-risk pregnancy and their pregnancy outcome, in (OMH) and (SUH) were studied.

The objectives of this study were to determine the perinatal mortality and to assess the perinatal morbidity of fetuses of high-risk mothers, to study the effect of current obstetrical intervention on perinatal mortality and morbidity of fetuses of high- risk mothers and to assess the admission to NICU among neonates of high–risk pregnancies.

Sample size was taken as 1:6 SUH to OMH according to the delivery rate in each hospitals/year (in SUH= 3,000 vs. OMH 18,000 delivery). Mothers were identified during labour or soon before delivery, delivery was attended and a questionnaire on mother and newborn was completed with follow up till day 6. The outcome was 92%, 88.2% were live births in OMH and SUH respectively, while perinatal deaths were 8 newborns in SUH compared to 28 newborns in OMH and overall PMR of 117.6/1000 births in SUH to 79.8/1000 births in OMH. Adverse effects of

previous pregnancy affect on the outcome of the current pregnancy, such as history of four or more pervious stillbirths carried 100% chance of the current pregnancy to be stillbirth.

Antenatal care users were half of the mothers and 75% of the mothers received tetanus toxoids.

The main maternal illnesses associated with perinatal losses were APH, PIH and anaemia. Multiple gestation and breech presentation carried high risk for both mothers and babies, while foetal distress and prematurity were the main foetal causes of perinatal losses. Type of delivery and obstetrical intervention were selected according to the risk factor, although C/S was the major type of delivery in this study.

Admission to NICU was appropriate and according to the need of the newborn (19.8%). Majority of the newborns completed their first week of life without complications (75.8%), while 8.4% developed neonatal sepsis and 6.9% developed neonatal jaundice.

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(%92) (%88.2)

1000/117.6   8

.   1000/79.8   28

.(%19.8)

%8.4   %75.8   .

.   %6.9

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INTRODUCTION AND LITERATURE REVIEW

1. General consideration:

1.1 Definition:

High-risk pregnancy is defined as pregnancy with a significant chance that the outcome may be less than Ideal for either the mother or the infant or both.[1]

The incidence of high-risk pregnancy varies according to the criteria used to define it. A great many factors are involved (classification of high-risk pregnancy). Each of them differs from patient to patient. Ten to twenty percent of pregnant women can be identified as high risk, less than half of all perinatal mortality and morbidity is associated with these pregnancies, especially in developing countries.

In assessing pregnancies to determine the risk, several key concepts may offer tremendous insight. Human reproduction is a complex social, biochemical and physiological process.[2] Child bearing has been shown to depend on age, health, and the quality of medical care and improvement of socioeconomic standards.

High parity, short pregnancy interval and pregnancy at both extremes of reproductive period, are factors likely to be associated with adverse outcome, as well as the mode of delivery and the delay

in transfering sick neonates to NICU may all jeopardize the outcome. So identifying high risk pregnancies is important, not only because it's the first step toward prevention, but also because therapeutic steps may often be taken to reduce the risk to the fetus or neonate, if the physician knows of the potential for difficulty. [3]

Perinatal mortality, in particular, may be considered as reflecting the standards of obstetrics and paediatric care as well as the effectiveness of social and public health measures.[4]

1.2. Alarming statistic:

The WHO estimation of 1990 had shown that, there were global basis of 500.000 maternal deaths every years, 300.000 of which are obstetrical related and the bulk of it has take place in the developing world.

Infant mortality ranges from 80 to over 200/1000- live births in developing countries, compared to 7 in wealthier societies. It was also found that neonatal mortality is responsible for half of infant deaths.[4]

Infant mortality fell by 25% globally, between 1980-93. The 47 least developed countries, of which 29 are in sub-Saharan Africa, suffered the highest mortality rates (perinatal 80, neonatal 50, infant 100 and under 5 years 150 per 1000 live births).[5]

In the U.K, there is a national scheme for the investigation of perinatal and infant death, which was established in 1992 and began formal data collection and evaluation in 1993. The report concentrates on intrapartum-related death in infancy, which is of relevance to perinatal care and identified several common issue which require attention by relevant professional and managerial bodies.[6] Those issues were:

1. An Issue related to training of staff.

2. An Issue for guidelines for all aspect of perinatal care.

3. Continuous needs for particular attention to standards and training in neonatal resuscitation.

4. Recognition of the central position of the perinatal autopsy in clinical care.

The WHO, 1993 identified poverty as biggest single, underlying cause of death, disease and suffering in developing countries. More recently, WHO has emphasized the special importance of the risk approach in the presence of limited resources; the basic rationale is that "All pregnant women need prenatal and intrapartum care some need more, few very much". Providing antenatal care that: [7]

1. Improves nutrition, control malaria and identifies mother at risk.

2. Affords facilities for clean deliveries and simple means of resuscitating the newborn and promotes breast-feeding.

3. Identification and care of babies at special risk.

4. Second international congress for maternal and Neonatal health (23-25 Nov. 1984) achieved the goal of "Health for All by the year 2000" by identifying cost effective strategies such as growth monitoring, oral rehydration therapy, breast feeding and immunization and they highlight more to maternal and perinatal survival. UNFPA spends 1.5 billion dollars to support projects in 146 countries regarding the primary health care and mother and child health.[1]

1.3 Maternal and child health programmes:

1.3.1 The primary health care programme (P.H.C):

One of the major programmes for both mothers and child, so as to prevent their morbidity and mortality by offering a good antenatal care, obstetrical care, family planning and postnatal care.[8]

1.3.2 Safe motherhood programme:

This was set by WHO. The goal of this programme is to reduce both maternal and neonatal morbidity and mortality. These are achieved by eliminating neonatal tetanus, reduction of neonatal

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deaths due to hypoxia, hypothermia and control of early neonatal blindness by controlling the gonococcal ophthalmia neonatorum.[9]

1.4 Scoring system:

1.4.1 MCM score for high-risk pregnancy:

As a pregnancy outcome indicator, perinatal death was chosen. Nine factors chosen as parameters in the MCM 903. From these a scoring system was designed by Fortney and Whitehorn.[10,11] Factors are:

I. Antepartum factor (1 - 6).

II. Intrapartum (7 - 9).

1. Mother age:

Age (in years)	Score
< 16	2
16 -17	1
18 - 19	0
30 - 34	1
35+	2

2. Parity

Parity	Score
0	1
1 – 3	0
4 – 6	1
7+	2

3. Gravidity:

Gravidity	Score
0	1
1 – 3	0
4 – 6	1
7+	2

4. Obstetrical history:

The number of previous stillbirths, spontaneous abortion and C/S, added together and score is made as follows:

Sum	Score
None	0
1	1
1+	2

5. Antepartum condition:

No pathological condition during pregnancy is scored = 0, if any condition is scored = 1.

6. Antenatal visits:

No.	Score
None or 1	2
2 - 5	1
6+	0

7. Presentation during labour:

- Vertex occiput / anterior position = 0.

- Other position / presentation = 1.

8. Duration of labour:

- No labour (elective C/S) = 1.

- Up to 18 hours = 0.

- 18 hrs + =1

9. Estimated gestation:

Gestation (in weeks)	Score
20 – 27	5
28 – 35	4
36 – 39	1
40 – 42	0
43+	1

- Adding the score of the individual factors produces an index that range from (0 - 9) when the antepartum factors used a lone, and the range become (0 -18) when both ante and intrapartum are added together (which give better predicative value). The benefit of this scoring system is that the high figure reflects the more risk of the mentioned pregnancy for both mother and baby and vise-versa.

- The reason why this scoring system not used or ineffective in the developing countries is that:

    I. The scoring system has to fulfill the requirement of simplicity and easiness to be administered.

    II. The value assigned to each individual factor is arbitrary to improve the effectiveness of high-risk indices and each individual factor on pregnancy outcome should be studied.

1.5 Studies done in Sudan:

Ibrahim (1994)[12] conducted a cohort study of risk factors of perinatal mortality. A total of 13060 deliveries were monitored over a period of six years resulting in 12685 live births, 263 stillbirths (SB), 233 early neonatal deaths (ENND) and 78 late neonatal deaths (LNND) with males constituting 57.5% of all deaths.

The risk of an unfavourable outcome (SB or NND) in multiple pregnancies was more than nine fold that of singletons. Among twins who survived the neonatal period, 17(37%) were first born, and 9(20%) were second born twins.

Teenage mothers and mothers over 34 years of age ran nearly twice the risk of having an unfavourable outcome of pregnancy compared to mother aged 20 - 29 years. First pregnancy and grand multiparty (greater than eight previous pregnancies)

carried a similar risk of an unfavourable outcome compared to mothers with 1-4 previous pregnancies.

The most serious risk factor was the adverse outcome of the previous pregnancy. Compared to mothers whose last outcome had resulted in live birth surviving at least 30 days, mothers with a previous SB had seven times the risk (adjusted for age and parity) of SB and more than twice the risk of NND in the current pregnancy. Maternal illiteracy was associated with significant higher risk of NND, and this rate decreased with increasing years of education. Socioeconomic factors, diet and iron/vitamin supplementation during pregnancy did not seem to affect the outcome.

Initially, the frequency of antenatal visits had a marginally significant effect on the outcome of pregnancy. Following intervention, this effect became highly significant. Similarly the PNMR and the NNMR improved significantly (from 38.4 to 28.2 per 1000 births and from 21.8 to 17.5 per 1000 live-birth, respectively). There was also progressive significant reduction in the overall death rate from the third year onwards.

Birth asphyxia was directly responsible for 121 (46.0%) and 117(50.2%) of the stillbirths and the early neonatal deaths, respectively. Thirty-six of the ENND (15.5%) and 5 (2.1%) of them

were due to low birth weight and congenital malformations, respectively.

Abdalaziz[13] (1979) studied a total of 8858 maternity patients in three major hospitals in Khartoum in a period of 4 years. The sographicociodem and reproductive profiles of those patients were related to maternal health and pregnancy outcome. He found that (41.5%) were multiprarous and (23.1) were primiprous.

The total number of premature deliveries in the study was (9.1%), occurred more frequently in grandmultiparous (9.5%) compared to (8.1%) in multiparous. Regarding the mode of delivery among study population, it was spontaneous in 88.6%and induced in 6.9%, while elective C/S was performed in 4.2%. Spontaneous delivery found to be more (88.5%) among grandmultiparous compared to (77%) in primparous. While instrumental delivery (forceps mainly) was less frequent in multiparous (2.1%) vs (8.5%) in primparous. The majority of foetal presentation during labour was occipito-anterior or lateral in 89.2%. Occipito-posterior in 4.4% and breech presentation in 4.8%. Complications experienced by the women during delivery classifying, 86% had no complications, 6.4% had obstructed labour, 2.2% had postpartum haemorrhage and 1.9% had pre-term labour.

Regarding the outcome of the current pregnancies, 3.4% of the women had twins, while 0.1% had triplet. When multiple births excluded, (12.4%) of the newborns weighed (less 2.5 kg) (36.2%) of them weighed between (3.01-3.5 kg), only (1%) weighed 4.5kg, and the mean of the birth weight for all infants found to be 3.097 kg and the author explained these findings to the large number of private patient's in his study.

In this study, 94.9% of infants were born alive, while 5% were stillbirth and he found that 97.4% of all infants were discharged in a good condition, while 2.6% died during their stay in hospital. Overall, perinatal mortality rate was 100/1000 birth in Khartoum Teaching Hospital when the mothers' age was under 20 years and 81/1000 birth when the age was 20-29 years and 216.3/1000 birth for those above 30 years, thus the perinatal mortality increase with increasing age.

Ibrahim (1995)[14], studied 1891 deliveries, in 22 villages of Elgeily health area as community based study in one year period, to evaluate family planning as a child strategy in Sudan. The majority of women involved in these study in there twenties and thirties from which 37.7% were grandmultipparae, while 9.9% of women in their teens from which 34.2% were primiparae and 2.6% of women in there forties. Most of them were illiterate (610) while those educated

more than 12 years were 157 mothers, and parity decreased with increasing level of education (52.3% for illiterate to 2.9% of those educated 12 years or more) having 5 sibling or more. On the other hand, 1373 mothers of the study group were working mother while 76 mothers were housewives and the parity increased among housewives (96.3%) had 5 sibling or more compared to 3.7% of working mothers. Length of the gestation completely known by 1348 mothers of which 20.6% delivered prematurely and 79.4% were term while 418 mothers were not sure of their dates. Regarding the illness occurred during pregnancy, malaria was reported by 61%and anaemia by 13%. Most of the mothers in these study 37%did not received ANC during their pregnancy or attended just once or twice. Home delivery reported by 83% mothers while 16% of delivery occurred at hospital, 1.2% occurred at health center and 2 deliveries occurred in the road.

The outcome of deliveries was, multiple births (1.5%) for 2 such deliveries, one of the twins was a stillbirths and one delivery was a triplet delivery. Of 1919 livebirth outcomes, 51.3% were male. 9.9% of the mothers who delivered alivebirth were teenagers, 14.6% aged 34years or more, regarding their parity and the outcome, 22.6% of primiparae and 33.3% of grandmultiparae delivered alivebirth.

Birth weight was missing for 125 newborns, for those available, 82% of the newborn were normal weight and 18% were low birth weight, for which 49.8% were term 22% were preterm 28.2% of unknown gestation. The author found that, the incidence of LBW was highest for teenagers (22%) followed by mothers over 34 years (16.9%) while mothers aged 30-40 years had 14.5% rates of LBW.

Babiker (2000)[15] studied the risk factors of perinatal mortality in two hospitals (Ibrahim Malik H, Abayazeed H).A total of 350 deliveries were studied in each hospital, the outcome was 358 live birth, of whom low birth weight gave a relative risk of PNM. Prematurity carries 16 times the risk of PNM compared to maturity. Also maternal age < 20 and > 30 carried a higher risk. When compared with 20 - 29 years of age. Maternal illiteracy was found as a risk factor of perinatal mortality, the risk was also found to be decreasing with increasing years of education. Lack of antenatal care, also carried a higher risk in the two hospitals. Moreover previous history of ENND was found to be a risk factor of PNM. The main maternal illnesses was associated with perinatal loss were found to be PIH, malaria, APH and anaemia.

1.6. Risk approach for complicated deliveries:

Table Ia: Classification of risk factors in high-risk pregnancy:

Pre-existing risks:	Pre-existing pathology:
• Age: < 18, > 35.	• Poor general health.
• Parity: 1st, 5th and over.	• Anaemia, malnutrition.
• Interval: short pacing of less than 2 years.	• Diabetes, hypertension.
• Social: low status.	• VD, AIDs, TB, Chronic infection.
• Marital: the unmarried.	• Cardio-renal disease
• Education: the illiterate.	• Structural abnormalities.
• Weight: Obesity.	• History of fetal loss.
• Personal hygiene: Poor.	• History of obstetric difficulty.
• Neighborhood: Rural and urban.	Smoking and drug abuse

Source: Omran AR, Jean M, Bashir H. Investigating high risk pregnancy. In: Omran AR, Jean M, Bashir H (editors) High Risk Mothers and Newborns, detection, management and prevention. 3rd ed. Switzerland: ISBN; 1987. P. 13 – 25.[1]

Table Ib: Classification of risk factors in high-risk pregnancy:

Risk during pregnancy	Risk of labour and delivery:

• Anaemia of pregnancy.	• Premature labour.
• Poor maternal weight gain.	• Premature rupture of membrane.
• APH.	• Prolonged labour.
• PIH	• APH, post partum haemorrhage.
• Abortion.	• Mal presentation.
• Multiple pregnancy.	• Operative intervention.
• Malpresentation.	• Anaesthesia.
• Cephalo-pelvic disproportion.	• Sepsis.
• Rh-incompatibility.	
• Drug abuse, alcohol, smoking.	
• Infection especially viral.	
• Gestational diabetes.	
• Radiation exposure.	

Source: Omran AR, Jean M, Bashir H. Investigating high risk pregnancy. In: Omran AR, Jean M, Bashir H (editors) High Risk Mothers and Newborns, detection, management and prevention. 3rd ed. Switzerland: ISBN; 1987. P. 13 – 25.[1]

Awan and others[16], studied that affect the perinatal outcome of 1000 high risk pregnant mothers, it was found that, pregnancy loss is directly influenced by the biologics effect of " age gravidity"

state of the mothers, the death rate being higher in the high risk state as expressed by primigravidity or sixth and multigravidity, or teenage motherhood or when aged 35 years or more. This is shown in contrast to low-risk rate, as seen in second to fifth gravida who are aged 20-34 years. On the other hand, 76% of the mothers had no history of fetal loss, while 21% had 1-2 past fetal losses and 3% had 3-6 fetal loss, so among women who had history of one or two previous fetal deaths, the pregnancy wastage rate was 1.4 times as high, and among respondent with a history of three to sixth fetal death, the rate was almost four times higher. Study also shown that, respondents who had ANC experienced lower pregnancy wastage rate than those without ANC. Also this study demonstrated that pregnancy wastage rate has an inverse relationship with the socioeconomic status.

1.6.2 The effect of Antenatal Care (ANC):

Antenatal care is essential for the promotion of maternal and fetal health. There is general agreement among physicians that many complications can be prevented or successfully treated if the pregnant women regularly attend the antenatal clinic. [1]

Common reasons why pregnant women may not receive adequate ANC are, inability to pay for health care, fear or lack of

confidence in health care professionals, lack of self-esteem and religious or cultural prohibitions.[17]

The fetus may be at high risk of perinatal mortality or morbidity either due to congenital malformation, genetically inherited disorders, infections, radiation, drug ingestion or maternal medical disorders. So it's important to obtain a detailed medical and family history, past obstetrical history, which would suggest the high-risk nature of the pregnancy besides doing a detailed clinical examination. Therefore, not only initial surveillance, but continued care is important to identify those at risk. [18]

Elkhatim (1995) did a prospective analytic cohort study in OMH to compare the pregnancy outcome of ANC user and non-user and to measure the effectiveness of ANC among 411 ladies. It was found that 84% of the women studied attended the ANC, while 16% failed to do that. PG and grandmultiparous have the least percent to attend these clinic 34.3% and 21.4% respectively. Also he found that ANC attendance increased with increased level of education and with improvement of the economical status. Urban women utilized ANC more than rural women (96% vs. 73%). The study also showed that, the incidence of prematurity, low birth weight and fetal loss were higher among the non-attendant. [19]

Vause and others used records of 20771 women with singleton pregnancy in Northern England and North Wales to explore the relationship between number of ANC visit and adverse perinatal outcomes. The result revealed an inverse association between number visits and delivery of lowbirth weight, infant admission to NICU and perinatal mortality, beside the high risk of delivery by C/S.[20]

1.7 Maternal risk factors before pregnancy:

1.7.1 Age and parity:

Extremes of maternal age increase risk of maternal or fetal morbidity and mortality. Women age 35 years or more are at higher risk of PIH, DM and obesity and multiple pregnancy as well as other medical conditions at the time of delivery. They are more prone to C/S, pre-eclampsia, placenta praevia, and their outcome has high risk of IUGR and chromosomal anomalies. [2]

Mohamed (1998) studied one hundred women $\geq$ 40 years compared with one hundred women 20 - 29 years old in OMH and Khartoum Teaching Hospital, she found that women $\geq$ 40 years have a significantly high C/S rate (30% vs. 23%), pre-eclampsia (17% vs. 9%), postpartum haemorrhage and significant high stillbirth rate (56 vs. 38 per 1000 deliveries). Their babies were heavier

(11.7% vs. 6.5%) and have an increased incidence of congenital malformations (4% vs. 0.5%). There was no difference regarding pre-term labour (4.1% vs. 4.1%), low 5 min Apgar score (4.8% vs. 4.7%), instrumental deliveries (4.8% vs. 3.5%). More over advanced maternal age carried a risk for pre-existing disease, which make it more for both mother and baby.[21]

Ahmed (1994)[22] did a prospective-Cohort study on sixty-four elderly PG (above 35 years) who delivered at Soba University Hospital. She found that, elderly PG showed significantly increased incidence of PIH, IUGR, APH, malpresentation, prolonged labour and premature delivery. The incidence of C/S was 64% compared with only 6% in younger age group (4 times), elderly PG also showed high incidence of perinatal morbidity and mortality (14%), which was three times more than younger PG (4.6%).

Naseem and others (2004), made a comparative study between elderly PG and young PG with regard to complications, delivery mode and fetal outcome. They studied 150 from each group; PIH, diabetes, malpresentation and premature labour were found to be more frequent in elderly PG (30.76%) compared to (16.02%) in younger group, these mostly due to higher rate of obstetrical complications in the elderly group. Congenital malformations of the fetus were common in the elderly group.

Seventeen babies were stillbirth in the elderly group compared to babies in younger group.[23]

Most of the evidence dangers of high parity has been gathered in industrialized societies in which, it can be argued, the reproductive pattern, the cultural setting and the maternity care system differ fundamentally from those of developing countries. About 40% of women in developing countries, compared to 6% in developed countries, have four or more children.[24] Sudan is a developing country where tradition is still calling for a large family. Girls marry at an early age and continue to have children until the end of their reproductive life, so this has lead to a large proportion of grand multiparas.

Torok and others (1999) compared the obstetric and neonatal complications among great grandmultiparous, grandmultiparous and multiparous women. They found that the incidence of malpresentations, maternal obesity, anaemia, preterm delivery and meconium stained amniotic fluid, all increase with higher parity, while the proportion of induction, instrumental delivery and labour complication was significantly lower with increasing parity. [25]

Maternity care monitoring study (MCM) in 12 teaching hospitals in Indonesia, revealed aperinatal mortality of 76/1000 live

births, and the lowest perinatal mortality was found in the 20 - 29 age group and in the low parity group. [10]

1.7.2 Maternal education and work:

In most societies, there is inverse correlation between education and family size. Education is usually expressed by number of years spent at school. In the Sudan, any number of years over 12 is in the realm of higher education.[13]

Abdil Aziz *et al* (1982) made a conclusion about maternal education that every additional year in schooling is associated with a reduction of PNM by 0.036, so that five-year education will be accepted to reduce child mortality by 18%. [26]

On the other hand, maternal work (especially that require standing all day long) was significantly related to reduce fetal growth without increasing fetal or neonatal deaths.[27]Preterm neonate whose mothers worked till the time of delivery, had a much lower frequency of RDS, so it seemed that maternal work accelerate the fetal lung maturation   by reducing the uteroplacental blood flow during the work period. But hard work may be harmful and lead to pre-mature delivery.[28]

Yassin (1997) studied the impact of maternal employment during pregnancy on birth weight and duration of pregnancy. He studied 517 pregnant women, of whom 131 had been employed,

and he found that employed women were of older age, had better education and housing condition than housewives. Both groups did not differ significantly in terms of parity, maternal height and medical history, but there were significant difference in birth weight and premature delivery.[29]

1.7.3 Maternal social class and ethnicity:

In the Sudan, most families depend on the husband's income as their main and only resource. The highest income group is composed of professionals, followed by mangers and farm owners, clerks, craft-man skilled labourer and lowest of all, are the unskilled labourer. [13]

Ibrahim (1996) did a study in OMH through comparing 404 pregnant women with low social class and 108 from high class, and he assessed the foetal outcome between two groups. He found that, there was no significant difference in terms of birth weight (mean weight for low social group 3.04 kg vs. 3.35 kg in higher group), length, head circumference and 5 min Apgar Score, so he concluded that intrauterine life is the best media for growth and protection of the fetus. [30]

Differences in birth weight between various ethnic and racial groups have been well documented. Low mean birth weight (<3 kg) is very common in developing nations, whereas high means (> 3.3

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kg) occurs mainly among residents of the affluent, industrial nations. Those of low birth weights are associated with high fetal/neonatal mortality. [31]

Denham *et al.,* (2001) investigated the neonatal size of term babies of low social class (Black and White) in Albany country (as socioeconomic status is highly correlated with races in U.S.A). Beside birth weight, they measured length, head and arm circumference with skin folds, and then they compared between Black and White births. They found that, White neonates were significantly larger than Blacks in weight, length, head and arm circumference. [32]

The same finding was detected in other studies, [33] in USA Blacks are found to be growth retarded at birth comared to Whites. So they have higher prinatal mortality, which can be explained by their personal practices that lead to more pre-term deliveries and preterm rupture of membranes.

1.8 Maternal risk factors during pregnancy and labour:

1.8.1. Hypertensive diseases during pregnancy:

Hypertensive state in pregnancy includes pre-eclampsia-ecalmpsia-chronic hypertension and gestational hypertension. [2]

Severe pathology leading to important maternal and neonatal effects, contributes to a high percentage of perinatal mortality,

resulting from pre-maturity, small for gestational age and fetal hypoxia. It mainly increases the incidence of low birth weight, low Apgar Score at 5 minutes, necrotozing enterocolitis and polythycemia.[34] In U.K over all perinatal mortality in pre-eclampsia is around 35 per 1000 total birth, but may reach 160 per 1000 in severe diseases.[35]

Elias (1994) who studied the inci and out come of eclampsia at Omdurman Maternaty Hospital during the year. He studied 82 cases and controls, the incidence of eclampsia per 1000 births was found to be 28(56%), and most of them were nulliparous. Majority of patients were less than 20 years of age. The maternal mortality (26.5%), while perinatal mortality was (14.28%). C/S rate was found to be high (48.8%). Prematurity was found to be the commonest cause of perinatal mortality.[36]

In King Faisal University, Al-Mulhim (1992 - 2001), studied the maternal risk factors and perinatal outcome of pre-eclampsia by aretrospective study of all women delivered at King Fahad Hospital, among study population, 685 women were found to have PE, 42% of them were nulliparaous, 40% at extreme age (< 20 and > 40 years), and more women with PE delivered prematurely (30.2%). Concerning the mood of delivery, spontaneous vaginal delivery found in 69.2%, instrumental deliveries in 15.9% and induced

deliveries in 22.8%. Placental abruption was the most common complication (12.6%). The perinatal outcome of pregnancies shown that, stillbirth occurred in 2.3%. Overall mortality rate was found to be 33.6 per 1000 birth.[37] Selvaggi and others (1972 - 1982) studied 66 patients who had pregnancy complicated by hypertension in a retrospective study. They found that the group of women with high blood pressure have high rate of abortions (31.7%), premature delivering (17.8%) and perinatal mortality (21.4%) and those women are suspected to a high risk (65.5%) of developing hypertension in successive pregnancies.[38]

1.8.2 Gestational diabetes:

Is defined as any degree of glucose intolerance with onset or 1st recognition during pregnancy. The prevalence is 5-7%.[39] Preexisting diabetes affect 1-3 pregnancies per 1000.[2]

If deaths from congenital anomalies excluded, women with pre-existing diabetes, have no longer greater risk of a perinatal death than does a woman without diabetes, it's found that increased perinatal mortality occurs mainly among poorly controlled diabetic pregnancies (20 -25%).[40]

In contrast to mortality, neonatal morbidity is still relatively common among babies of diabetic women. Complications include:

IUFD, congenital anomalies, respiratory distress, macrosomia, hypoglycemia, hypocalcaemia and hyperbiluribinaemia.[40]

A study done of diabetic patient during pregnancy, in (OMH) and Omdurman New Hospital by Gamal (1999), who found that PIH and polyhydramnios were found in 27% and 37% in diabetic group in comparison to 23% and 12% in non-diabetic patients respectively. The overall rate of infant morbidity was greater among those of diabetic mothers. Complications such as respiratory distress syndrome, prenatal loss were significantly higher in diabetic group.[41]

Dapnote and others (1999) in their study of 170 pregnant diabetic patients in a tertiary center in South Africa found that the perinatal mortality rate was 37/1000 total births and that this rate was reduced to 30/1000 total births after using insulin.[42]

Chia and others (1993-1996) studied the relationship between gestational diabetes and congenital malformation in a Singapore Hospital. They found that perinatal mortality rate among infants of diabetic mothers was five times the overall, and the incidence of congenital malformations among group was 15.7%.[43]

1.8.3 Multiple pregnancy:

Multiple pregnancies now comprise 3% of all pregnancies. Monozygotic twining occurs in about 2.3 - 4 of 1000 pregnancies in all races.[2]

Complications associated with it include, polyhydramnois,pre-eclampsia prolonged rupture of membranes, abnormal presentations and premature labour. Compared with the first-born twin, the second is at increased risk of respiratory distress syndrome and asphyxia. Twins are at risk of IUGR, which occurs in (25%) of multiple birth neonate. Twin to twin transfusion and congenital anomalies occurs predominantly in monozygotic twin. [44]

Other anomalies are due to uterine compression deformation from crowding, vascular communication with embolization. [45]

Mode of delivery depends on their presentation, most obstetrician advice vaginal delivery, while in triplet or higher, elective C/S is frequently performed.[46]

Elamin (1997) studied the incidence of twin pregnancy at Soba University Hospital. They found that dizygotic twins occurred more than monozygotic, but associated with more adverse outcome. More twin pregnancies were found among multiparous (74.6%) with low social class. Family history was found to be a strong determinant of the incidence (61%). The predominant maternal age

was similar to that of the general obstetric population (20-29 years). Higher rates of preterm, low birth weight, mal presentation mainly of the second twin, all accounted for the higher perinatal mortality rate among twin births (77.5/1000) live birth. C/S for the malpresenting fetuses was found to have a slightly better effect on the perinatal outcome. [47]

Hepp and others (1982-1999) studied the maternal and fetal outcome of multifetal pregnancies by a retrospective review of 112 multifetal pregnancies, including triplet, quadruplets and quintuplets who delivered at a mean gestation 31 - 38 weeks. The results were that, the perinatal mortality was 14% for triplets and 36% for quadruplets no quintuplets. In the perinatal period, RDS occurred in 23% of triplets, 65% of quadruplets and 75% of quintuplets.

Intracranial haemorrhage was diagnosed in 14% of triplets, 15% of quadruplets and 10% of quintuplets. Retinopathy of prematurity was found 10% of triplets, 9% of quadruplets and 25% of quintuplets. They concluded that, the higher morbidity and mortality among multiple gestations, related mainly to prematurity.[48]

Kleiman and others studied the perinatal mortality among multiple and singletons births between 1960 and 1983 using the linked birth/infant death data sets. They found that, the twin mortality rates were four to five times that of singletons.[49]

Western and others (1985) studied 2.9 million births collected retrospectively in Oxford Hospital. They found that, twins tended to weigh less than singletons at a given gestational age.[50]

1.8.4 Pre-term delivery:

Delivery before completed 37 gestation[39] and it is the primary predictor of perinatal morbidity and mortality. Risk factors associated with prematurity include multiple pregnancy, cervical shorting, infection, fetal fibronectin in the cervicovaginal secretions and PROM which account 30-40% of causes of pre-term deliveries. Also it is more common in black races and with a history of previous preterm deliveries.[51, 52]

Dyson and others (1998) studied the early monitoring of women at risk of preterm delivery that was done by frequent contact between nurses and pregnant women or by home monitoring. 2422 women were being under the study and were divided in groups. They found no significant difference between groups in incidence of birth at less than 35 weeks. Two thirds of preterm deliveries occur near term (34 to 37 weeks) and these carried minimal fetal or neonatal morbidity. The remaining third accounted for all of perinatal morbidity and mortality. The foetal risk of prematurity such as intracranial haemorrhage, retinopathy and bronchopulmonary dysplasia more common among ex-pre mature. [53]

Maternal administration of corticosteroids and enhancement of fetal lung maturity has been established since 1972.[54]

Elshibly (1980) studied 194 LBW infants, 65.5% of them were preterm and 35.5% were IUGR. Thirtyone (16%) of the LBW infants died. He also found that the highest percentage of morbidity was due to infection, RDS and associated with high mortality.[55]

Yousif (1996) studied 254 patients by a prospective, case control study at Soba University Hospital. She found that among study population, the incidence of pre-term births was 4.92% and the risk factors of prematurity include, low social class, inadequate ANC, illiteracy, primigravidity and multiparity, history of previous preterm delivery and abortions, APH during current pregnancy, ruptured membranes, multiple pregnancy, fever more that 38°C and history of chloroquine treatment during the current pregnancy.

Vaginal delivery was performed in 58%, while C/S in 41%. Mean gestational age found to be, 32.4 weeks, while mean birth weight was 1.84 kg. Stillbirth rate was 12.8%, while early neonatal death was 12.2%. Perinatal mortality was mainly due to RDS (15.4%), and other causes were chest infection, haemorrhage and jaundice. The total perinatal mortality was found to be 240/1000 births.[56]

Jose Villar and others studied the contribution of prematurity and foetal growth retardation to low birth weight in developing and developed societies. They used records in 25 regions in developed world and 25 in developing world. The results showed that, in developing countries a straight correlation was observed between total LBW incidence and IUGR, while prematurity was not significantly associated with total LBW incidence. While in developed population, when the incidence of LBW is higher than 10%, it's almost exclusively due to IUGR, when the LBW incidence is less than 10%; preterm infants represent the major component of LBW. They reflected this result to the environmental factors and difference in socioeconomic conditions. [57]

1.8.5 Post-term:

This term denotes a pregnancy, which has gone beyond 42 weeks gestation calculated from the 1st day of the last menstrual period.[58]he incidence is less than 5%, which is though small, but associated with an increased risk of perinatal mortality, through increased risk of uteroplacental insufficiency, oligohydramnios, hypoxia, macrosomia and its sequalae of birth injuries.[59]

Elamin (1999) did a case control study at OMH in a period of 6 months. She used case group of 126 women (gestation $\geq$ 42 weeks) and control group 252 women (gestation 37- 41 weeks). She

found that prolonged pregnancy was found in 3.6% of the total, and it varies with age. In women more than 35 years incidence was (18.25%), while in women less than 20 years, it was (18.7%) and there was no significant association between parity and prolonged pregnancy. The rate of C/S was 7.9% for case group and 15.8% control, and this was statistically significant macrosomia being the main cause for C/S in both groups. The rate of stillbirth, neonatal deaths, congenital malformation and malpresentation were all more prevalent among the study group. Perinatal loss was 5.5% for case compared to 0.79% for control. [60]

Tunon and others in (1999) studied the adverse fetal outcome in the post-term. They used 11510 women who were accurate about their last menstrual period and assessed their fetal outcome in sense of 5 minutes Apgar Score and admission to NICU, compared with women not sure about their date, but labeled as post term by U/S estimation. They found that, there was a significant difference in Apgar Score <7 in 5 min between 2 groups, while there was no difference in necessitating admission to NICU. [61]

1.8.6 Breech presentation:

Occurs when the fetal pelvis or lower extremities get engaged in the maternal pelvic inlet, and complicates 3-4% of all pregnancies. It occurs when spontaneous version to cephalic is prevented as term

approached or in preterm labour.[2] There is a well-recognized association with foetal abnormalities, such as hydrocephalus, familial dysautonomia and spine bifida. And it's more in multiple pregnancies, 25% chance in first twin and 50% in the second twin and the percentage become higher with additional fetuses.[62]The handicapped rates are no higher than vertex (30-65%), vaginal delivery in breech carry the risk of cord compression/prolapse and traumatic delivery (1-2% risk of trauma).[63]

Elamin-Elawad, studied 76 PG with singleton, term, alive, breech presentation at OMH, KTH and SUH in one-year period. He found that 70% of cases were frank breech, 22(29%) delivered vaginally, 26(34.2%) by emergency C/S and 28 (36.8%) by elective C/S and the overall C/S rate was 71%.[64]

Low Apgar Score (<7) at 5 min was recorded in 9.2% in vaginally delivered, 13.6% had low score compared to 15.4% in emergency C/S and (7.4%) in those delivered by emergency C/S.[64]

Birth trauma was found in 1.4% of emergency C/S group and was mainly due to hurried and rough manipulation ENND occurred exclusively in emergency C/S (1.35%) and this was explained by associated risk factors and by operator skills. FSB occurred only in two cases that were delivered vaginally and they seem to be avoidable. Admission to NICU (5.6%) was recorded in C/S groups.

Corrected perinatal mortality was 90/1000 births in vaginal delivery 38/1000 birth in C/S. Perinatal morbidity occurred only in emergency C/S group (11.5%). [64]

1.8.7 Anaemia and pregnancy:

Defined as, a haemoglobin (Hb) of less than 11 gm/dl or ahaematocrit of less than 33%, one of the conditions that may adversely affect maternal health, and also the outcome of the pregnancy.[65]

Idris (1996) studied the impact of anaemia in both mothers and foetus in KTH by taking blood sample for haemoglobin and packed cell volume from each woman in first stage of labour. Total of 203 subjects had been seen, anaemia was detected in 97(47.8%), 95% of them had moderate anaemia, 59% of the newborn also had anaemia. Majority of anaemic mothers reside in the peripheral areas of Khartoum (60.8%). There was a significant association between anaemia and low level of education, low socioeconomic status, parity and irregular or inadequate iron/folat supplements. Anaemic mothers commonly attend health centers and supervised by midwives, while non-anaemic mother attended private clinics and were supervised by specialists. [66]

Lone and others (2002) studied the relationship between maternal anaemia and perinatal morbidity and mortality through a

cohort study of 629 during one-year period. They found that 313 women were anaemic. The risk of preterm delivery and LBW among exposed group was 4 and 1.9 times higher among anaemic women respectively. Low Apgar Score at 1 and 5 min found to be 1.8 time in anaemic and IUFD 3.7 times. [67]

1.8.8 Antepartum haemorrhage (APH):

This term is used to describe any bleeding from the genital tract after 24th week of pregnancy. It complicates 2-5% of all pregnancies.[2]

Abruptio placentae and placenta praevia are the two most single causes, over 50% of perinatal deaths attributed to abruptio, are still birth, other affection of APH on the foetus, include, IUGR, prematurity and anaemia. [68]

Shodum and others (2002) studied the risk factors for the occurrence of abruptio through a retrospective comparative study in a period of eight years in singleton, preterm deliveries with or without placental abruption. They concluded that, abruption was associated with significant perinatal morbidity and mortality and factors, which were independently associated with abruption, were PIH, grandmultiparity and malpresentation.[69]

Chan (1999) studied 718 cases of singleton pregnancies with APH, and found that these with APH ran a higher risk of

spontaneous preterm labour and more babies with congenital abnormalities. [70]

1.8.9 Premature rupture of membranes (PROM):

Premature rupture of membranes carry arisk for preterm labour, beside chorioamnioitis, umbilical cord prolapse compression and oligohydramnios with its hazards, and abruptio placentae all consider as sequel of it which occurs more (two or four fold) in mothers with previous PROM. [71,72] Mode of delivery depends on obstetrician skills, but is more hazards with instrumental deliveries, so it carry high incidence of C/S.

The MRC (ORACLE) meta analysis of previous trials has suggested a possible benefit of using of antibiotic as prophylaxis in PROM and preterm labour. [73]

1.8.10 Oligohydramnios and polyhydramnios:

It complicates 1 - 5% of all pregnancies.[2] Trying to evaluate the effect of oligohydramnios on the outcome of the pregnancy.

Toso and others (2004) in Milano, Italy, studied all uncomplicated pregnancies between 40 - 41.6 weeks in a three years period. They took serial samples of amniotic fluid to measure the biophysical profile of the foetus. They found that 349 women (12%) had significant reduction of the amniotic fluid throughout their pregnancies. They found that gestational age at delivery, rates of

nulliparity and induction of labour all were significantly higher among women with oligohydramnios, also rates of C/S and birth weight 10th percentile (8.2% and 13.2% respectively). There was no difference between oligo-group and normal group with regard to meconium stained amniotic fluid and 5 min Apgar Score (≤ 7) and umbilical artery pH <7. In fact that the amniotic fluid volume gradually increases at a rate of less than 10 ml/day until about 34 week, after which it slowly diminishes. Polyhydramnios can occur acutely hence, and precipitates pre term labour. [74]

Cliver and others (1999) reviewed 370 women with singleton pregnancies beyond 20 weeks gestation with polyhdramnios being diagnosed by U/S, with a control group of pregnant women with normal amniotic fluid volumes. They found that, the incidence of polyhydramnios was 1%, the perinatal mortality rate was 49/1000 births compared with 14/1000 births in the control group, women with polyhydramnios has 25 times more, anomalies than controls (8.4% vs 0.3%). The C/S rate was 3 times higher in hydramnios group. [75]

1.8.11 Iso-immunization:

Regarding the Rh-isoimmunization and its impact in perinatal outcome, Mustafa (1998) used one-year study at Soba University Hospital in 1868 ladies of whom 62 were Rh-ve mothers with Rh.

(+ve) babies. The incidence of sensitization was found to be 11.3%. The incidence of Rh. (-ve) blood grouping was found to be 3.7%, he found that, the major defect in our system is that, the blood group of mothers is frequently not noticed, leading to miss taking anti-D injection in many occasions, especially in women delivered at home. So good antenatal care can reduce the incidence of sensitization and good medical care can reduce the perinatal mortality up to zero.[76]

1.8.12 Infertility:

It is the inability of a couple to conceive within a certain period of time,[2] to evaluate the obstetric and neonatal outcome in women who had history of infertility, Mamoun (1999) studied 104 women with previous history of infertility and regularly attended antenatal care clinic. The result showed increased tendency to hypertensive disorders (23.1%). Neonatal outcome was not significantly different except for relative small birth weight, which was attributed to their older age and low parity, but these does not explain the increase rate of C/S (82%). [77]

1.8.13 Malaria during pregnancy:

Maternal malaria influences the birth weight by inducing preterm labour or by retarding the intrauterine growth, and this are related to impairment of the placental function through its thickening

and damage by malarial pigment deposition.[78,79] In other hand, pregnancy is believed to reduce immunity to malaria and to increase susceptibility to severe clinical illness.[80] Beside these, malaria causes anaemia, which affect the birth weight by impairing oxygen transport to the fetus. [81]

Elgazali, investigated 172 Sudanese pregnant ladies with a definite history of malaria that was documented with a positive blood film. He found that, 36.5% were primiparous and most of them were from urban domicile, and although no significant incidence of preterm was found, the proportion of LBW (39.5%) was significantly high. [82]

The link between malaria and perinatal mortality was explored by 117 studies published between 1948 and 2002. The mean perinatal mortality rate was higher in malaria endemic countries (61.1/1000 births) as well as fetal mortality rate (40.1/1000). Placental malaria was significantly associated with a higher risk of stillbirth. [83]

1.8.14 Medical illnesses during pregnancy:

Maternal illnesses affect the foetus either by the disease itself or by the medication used during pregnancy.

Maternal cardiac disease: prediction of good foetal outcome in mothers with heart problem requires accurate assessment of

cardiac disease progress. The best way of delivery is through induction. [84]

1.8.15 Adverse effect of drugs during pregnancy:

Some drugs are known to have teratogenic effects (e.g. lithium), mainly when used in the first trimester. They interfere with organogensis, so they lead to congenital malformation, beside high rate of abortion. While in second and last trimester, drug may interfere with fetal growth and development, increasing the preterm deliveries and stillbirths. [85]

1.9 Obstetrical intervention:

1.9.1 Normal, spontaneous vaginal delivery:

In his classic studies of labour in 1967, Friedman presented data describing the process of spontaneous labour overtime with its continuous three stages:[86]

- Stage one: from onset of labour to full cervical dilatation (8 - 18 hours in primiparous).

- Stage two: delivery of the infant (2 - 10 hours in primiparous.

- Stage three: delivery of the placenta (30min-3 hours in primiparous).

1.9.2 Induction and augmentation of labour:

Is the process of initiating labour by artificial means? Before induction, foetal maturity should be confirmed (by date or by U/S). Cervix should be evaluated (effaced and soft) and lastly strong indication should be present. [87]

Soto and others, studied maternal and fetal complications following induced labour, through acase-control study of 210 Israeli women who were induced for various indications and compared with general parturient population. They found that, there was no significant difference between the two groups in the rate of C/S, the uses of instrumental delivery or the foetal outcome. The only difference revealed by comparison of different mode of induction. There were elevated intrapartum complications with the use of oxytocin as a method of induction with more tendencies toward C/S and low Apgar score to the infant. [88]

1.9.3 Instrumental deliveries:

1.9.3.1 Forceps delivery:

The obstetric forceps is an instrument designed to assist the delivery of the baby's head and should be applied after ensuring all of the following:[89]

- Fully dilated cervix.

- Ruptured membranes.

- Engagement of the head of the foetus.

- Corrected position of the head (occipito-anterior).

- No significant cephalopelvic disproportion.

- Empty bladder.

1.9.3.2 Vacuum extractor:

Designed by a suction cup attached to the foetal scalp. Possible complication, include cephalohaematoma, scalp laceration and intracranial haemorrhage. [90]

1.9.4 Cesarean section (C/S):

Referring to the delivery of foetus, placenta and membranes through an incision in the abdominal and uterine wall. In the past 20 years, the rate of C/S had steadily increased from 5% to more than 20% and it should not be taken lightly, unless strongly indicated, so as to consider its risk versus its benefit. [91]

1.9.5 Obstructed labour:

It accounts 8% of maternal deaths in the developing countries. The most serious effects on the fetuses are intrauterine fetal death, birth asphyxia, birth trauma and neonatal sepsis. [92]

1.10 Pregnancy outcome:

1.10.1 Live birth and stillbirth:

The desire of each expectant mother is to give birth to a healthy infant. This is not always fulfilled and stillbirth is a sad event. Among pregnancies, which reach at least 20 weeks gestation, nearly one in every hundred infant is born dead. [93]

1.10.2 Early neonatal death:

By definition, the neonatal period is the four weeks following delivery and early neonatal death is that occurring during the first week of life.[85]

Study conducted in London by Webb and others (2004) when investigated the effect of obstetric, paediatric and demographic factors on rated of hospital stillbirths and neonatal mortality. They collected data covering 540.834 live births and stillbirths and they concluded that birth weight adjusted stillbirth rate were significantly lower in units that took a more interventionist approach and those with higher level of consultant obstetric staff, but these fact did not implement in ENND. [94]

1.10.3 Meconium stained infant:

Meconium stained amniotic fluid is found in 5-15% of births and usually occurs in term or post term infants, 5% of such infants develop meconium aspiration pneumonia, 30% of these require mechanical ventilation and less than 5- 10% expire. [95]

Katz and other evaluated the effect of meconium stained fluid on perinatal outcome. They found that, the rate of meconium stained was 18.1% of those 78(13.3%), patients had thin and 28(4.8%) had thick meconium. The rate of oligohydramnios was significantly higher among pregnancies complicated with thick meconium (95%). They also found than, heart rate pattern during the first and second stage of labour, low Apgar Score at 1 min and high risk of C/S, all were related to the thickness of the meconium, beside high admission rate to NICU. [96]

1.10.4 Neonatal tetanus:

Is an important public health problems in many parts of the world today, affects 950,000 neonates annually of whom 800,000 die, which represent that of all neonatal deaths in some developing countries. Most of the cases occur in home deliveries that are not properly attended. [97]

In Pakistan, rural survey, prenatal care was completely taking 68.4% of mothers, TBA attended 26.5% of deliveries, and while 1.4% was assisted by mother-in-low only 3.7% were attended by a physician or trained midwives. [1]

The meeting held by WHO [97] in Lahore in February 1982 addressed itself to setting some feasible targets and a greed the recommendation that disease reduction targets should be adopted

by each country and should aim for neonatal tetanus mortality rate of less than 1 per 1000 live birth by 1990 and zero by year 2000. The elimination of neonatal tetanus is easy to be achieving by: [98]

I. Increasing the immunization coverage of women of childbearing age, especially pregnant women with tetanus toxoid.

II. Improving maternity care and increase the percentage of deliveries attended by trained persons.

1.10.5 Neonatal resuscitation:

American Academy of Paediatric (AAP) and American Heart Association (AHA) recommended an outline for neonatal resuscitation, which should be established at every delivery room for any depressed neonate by at least two people skilled in all aspects of neonatal resuscitation with a complete equipment need for these purpose beside Apgar Score record to evaluate the effectiveness of resuscitation. Starting by initial steps, such as warming and providing the ABCs-ventilation chest compression and medications.[99]

1.10.6 Transport of the neonate and admission to NICU:

Ideally, high-risk mother should be transported to and is specialized neonatal unit delivered at centers where they're intensive care units. Neonatal transport should include consultation

about infant problem and care before transport and transport team should be available. [1]

Securing an airway, providing oxygen, assisting with infant ventilation, providing antimicrobial therapy, maintaining the circulation, providing a warmed environment, all these should be established before transport.

Infant and maternal records, laboratory reports and a tube of clotted maternal blood should be provided. Not to forget reassure the mother and allowed her to see her stabilized baby and if possible, father should follow the infant. [100]

All units delivering babies (including community midwives) should be able to provide resuscitation and temporary mechanical ventilation (at least bag-mask ventilation) and they should have policies for postnatal referral to eliminate bias in doing that. [101]

There are three levels for referral system [102]

I. In utero-referral: for those with a problem known from the previous obstetric events such as Rh-sensitization, frequent-fetal loss and in utero-referral to high unit should be consider in:

- Spontaneous pre-term labour.

- Premature rupture of membranes.

- Placental dysfunction.

II. Neonatal referral: to high-risk infant.

III. Ex-utero-referral: in cases of:

- Uncomplicated preterm infants.

- Pre-term infants with respiratory failure.

- Infant with recurrent apnea.

- Infant with birth suppression.

- Infant with surgical condition.[103]

There are data from the U.K, which indicate that, mortality is increased where transfer is requested but is unavailable.[104] Similarly infants moved between tertiary units to cope with peaks of demand have been reported to have a poorer outcome.[105] The findings are not surprising as in both cases; care is being determined by bed availability rather than the choice of the clinician. However, the most recent evidence from the U.K suggests that infants are not jeopardized by well-planned transport.[106]

In the past, any high risk has the right to be admitted in the nursery, time has shown that for such infants admission was not only unnecessary but was harmful in terms of the mother-child relationship. It's now broadly accepted that admission rate representing the national average. [107]

Regarding the referral system and services provided by NICU to high risk infants, the Australian and New Zealand neonatal network have collected information from 22 NICU from 1994 for

babies < 32 weeks gestation or < 1500 gm birth weight. In the 1st year of data collection 2723 infants were registered, the power achieved by these network, is the narrow confidence intervals of survival rate with gestational age of the infant. [108]

High-risk obstetric and perinatal advisory working group in Sidney, studied the antenatal transfer of rural women to perinatal centers and among transferred women, they determine the predictors of preterm and imminent births-during 1997- 1998. From 453 transferred women, 408(90%) were emergency transferred, 64% delivered and 58% of preterm transfers delivered preterm. So the main reason for antenatal transfer is the possibility of preterm birth.[109]

Another study of transferring system done in U.K, retrospective data collection from 37 largest perinatal centers in the U.K, 258 in utero-transfers recorded during a three-month census. Result is that 58% transferred to higher-level centers in preterm labour and 38% with coexisting disease necessitating early delivery. 61% delivered at receiving hospital and 12% were transferred into 3rd hospital. One mother delivered during transport and nine within one hour of arrival. Data of 273 babies were available (82%). The median age at delivery was 34 weeks. Six infants were stillbirth and 187(71%) infants were admitted to a neonatal unit. They conclude

that the majority of referral due to shortage of neonatal cots and the national standard for the delivery of high-risk perinatal services are needed to uphold good clinical practice. [110]

1.10.7 Birth asphyxia and low Apgar Score:

Apgar score is a practical method for immediate assessment of the newborn after birth. It does not reflect the neonatal mortality or subsequent cerebral palsy. At 1- min is important to determine the need of resuscitation and other scores, to detect the benefit of resuscitation. [99]

Asphyxia is an important cause of permanent insult of nervous system, which leads to death on 20 - 50% in the neonatal period and 25 - 30% of neurodevelopmental disabilities. [111]

1.10.8 Prematurity and low birth weight:

Low birth weight includes babies weighing less than 2500 grams at birth. [85] Its difficult to separate causes of both prematurity and low birth weight.

Francis (1999), Amsterdam, used 200 pregnant ladies considered as high risk of uteroplacental insufficiency and he scanned those ladies in the third trimester for several times (6 scans) for each pregnancy, so as to assess the foetal growth rate and he also assessed the outcome, he found that, the average antenatal growth rate of 24.2 gm/day of pregnancy with adverse

outcome (foetal distress, operative delivery or admitted to NICU), compared to 20.9 gm/day for those of normal outcome and these was suggestive of growth failure of those with adverse outcome.[112]

1.11 Admission to Neonatal Intensive Care (NICU):

1.11.1 Admission rate:

Adopted from American Academy of Paediatric (1997), general consideration for admission to NICU to only necessary cases (high risk infant) and recommendation for early discharge (48 hours).[99]

1.11.2 Causes of admission:

From general care of any sick neonate to life supporting procedures. Newborn admitted to the nursery for observation, feeding, hypothermia, hypoglycemia, fetal distress, apnea, birth asphyxia, birth injuries, congenital malformation, prematurity, infections, seizures, and maternal illness or due to social factor. [85]

1.12. Respiratory distress syndrome (RDS):

This is an acute illness, occurs primarily in premature infants, incidence is inversely proportional to the gestational age and birth weight.[39] It occurs in 60-80% of infants less than 28 weeks of gestational age, in 15 - 30% of those between 32 and 36 weeks, in about 5% beyond 37 weeks, and rarely at term.[113] Increased

frequency is associated with infants of diabetic mothers, multifoetal pregnancies, C/S deliveries, precipitous deliveries, asphyxia, cold stress and a history of prior affected infants.[85]

Chamberlain, *et al* (1975) found that, 2% of all babies and 20% of babies weighing < 2.5 kg had some form of breathing difficulty, with twice as many boys affected as girls and three times as many boys dying. [114]

1.13. Congenital anomalies:

Congenital anomalies are a major cause of stillbirth and neonatal deaths and important causes of physical defects and metabolic disorders, so early recognition of anomalies is important for life saving (e.g. tracheosophageal fistula) and to elevate the anxiety and feeling of guilty of the parents by counseling. [85]

Ibtisam in a study of 4152 newborns at Soba Hospital and Khartoum North, she found that, the incidence of congenital malformations was 18/1000 live births, and that, the case fatality rate was 14.7%.[115]

1.14. Neonatal sepsis:

Is systemic response to infection in newborn infant. Perinatal infection is uncommon in healthy, term, breast fed infants nursed by their mothers in a clean environment, the reverse is correct which

run a significant greater risk of infection, especially by bacteria. Pre-term more prone to infections due to immaturity of the immune system, it may be categorized as early or late onset, 85% of newborns with early onset infection present within 24 hours, 5% present at 24 - 48 hours, and a smaller percentage of patients present between 48 hours and 6 days of life. Early-onset sepsis syndrome is associated with acquisition of microorganisms from the mother.[39]

Organisms that colonize in the mother's genitourinary tract may cause transplacental infection or an ascending infection from the cervix. The most common microorganisms in the early onset-infection are, group B Streptococcus (GBS), *E. coli*, *Haemophilus influenzae* and *Listeria monocytogenes*. Late-onset sepsis syndrome occurs at 7 - 90 days of life and is acquired from the care giving environment. Organisms that have been implicated are, coagulase-negative staphylococci, *Staph. aureus*, *E. coli*, *Pseudomonas* and other. Pneumonia is more common in early onset sepsis, whereas meningitis and/or bacteria are more common in late onset sepsis. [116]Ibrahim (1994) studied the neonatal infections among newborns in both Soba and Khartoum Teaching hospitals, through taking cultures from blood, skin, umbilicus and

conjunctiva. The most common organisms isolated were
Staphylococcus, *Group B Streptococcus* and *E. coli*. [117]

JUSTIFICATIONS

- Newborn outcomes of high risk pregnancies are common in Sudan and comprised an important cause of morbidity, mortality and residual handicap.

- Deficiency of information on high-risk pregnancies and newborns in Sudan.

- Lack of documentation and record system that monitor pregnancy and childbirth.

- Anticipation and early detection of complications related to high-risk pregnancy to be documented to prevent unfavorable outcome.

- Many of essential risk factors in developing countries are preventable.

OBJECTIVES

The objectives of the study were to:

1) Determine the perinatal mortality and assess perinatal morbidity of the fetuses of high-risk mothers.

2) Study the effect of current obstetrical intervention on perinatal mortality and morbidity on foetuses of high-risk pregnancies.

3) Assess the admission to NICU among neonate delivered to high-risk pregnancies.

MATERIALS AND METHODS

2.1 Study Design:

Prospective, descriptive hospital based study.

2.2 Study Area:

The study was conducted in two hospitals:

1. Soba university Hospital, which lies in Soba area. It has been classified as a tertiary hospital, containing a Department of Obstetrics and Gynaecology with full activities with a rate of deliveries of 3,000 deliveries per year, and an established neonatal Intensive Care Unit, which contains two parts (septic and aseptic).

    A) The aseptic: contains two resuscitator machines, seven incubators, one portable incubator, three heating units, six phototherapy apparatus, modern weighing machines, 10 beds, essential apparatus (laryngoscopes, endotracheal tubes, ambubag) and all essential life supporting drugs.

    B) The septic: contains one resuscitator table, one incubator, two heating units, two photo-therapy apparatus and eight beds, beside some essential drugs.

Staff: from well trained highly qualified sisters and residant doctors beside nurses and nutritionists.

Omdurman Maternity Hospital:

It in Omdurman Province, classified as specialized hospital for maternal and child health. All its services are directed towards mothers and their newborns. Delivery rate is 18, 000 per year. It contains a well-established nursery, which has 2 parts (Septic and aseptic). Each of them is composed of four incubators, one heating unit, four phototherapy apparatuses and modern weighing machine and essential apparatus (larynscope, ambubage) and most of life saving drugs.

2.3 Study Period:

The data was collected from October to December 2004 in a three months period.

1.4 Study Population and sample size:

1.5 Case Definition:

1.6 High risk pregnancies[27]: is an identified complicated pregnancies with certain criteria that include:

1.7 Pre existing medical illness.

1.8 Previous poor pregnancy performance such as, perinatal mortality, pre term labour, foetal growth restriction, malformation, placental accident and maternal haemorrhage.

1.9 Evidence of maternal under nutrition

1.10 Study Population:- Newborns and stillbirths whom delivered to mothers with high-risk pregnancy born at Soba University Hospital and Omdurman Maternity Hospital during the study period.

The statistical formula used to calculate the sample size:

$$N = z^2pq/d^2$$

Where:

N = Sample size = 400 deliveries from both hospitals.

Z = Statistical certainty = (1.96 at 95% level of confidence).

P = Prevalence = 0.028. [3]

Q = Probability of failure.

D = Designed margin of error (0.02).

2.5 Inclusion Criteria:

All newborn of mothers suspected to have high-risk pregnancies seen in labour room in the above hospitals (including stillbirth) on 3-day/week basis, from day 1 to end of day 6.

2.6 Exclusion Criteria:

- Loss of contact of the newborn within 6 days.

- Parent refusal.

- Mothers who are not sure about their dates.

2.7 Study Technique:

Ethical consideration:

- Informed verbal consent was obtained from the parents.

- Logistic approval from the hospital administration and Departments of Obstetrics and Gynaecology and from those in the Neonatal Intensive Care Units.

2.8. Research Tools:

Standardized Questionnaire containing:

This provided an account of:

- Maternal data: age, education, social status, medical and obstetrical history, evaluation of mother risk factors).

- Mode of delivery and any obstetrical intervention.

- Infant data: history of perinatal period, newborn examination and anthropometeric measurement (weight, length and head circumferences).

2.9 Methodology:

Sample had been divided between two hospitals in a ratio of 1: 6 according to the delivery rate in each hospital (3,00 0 in Soba vs 18,000 in maternity). The author used to spend three days/week in each hospital (sat, sun and Monday at SUH and tues, wednes and thursday at OMH). After obtaining the consent from parents, the author identified the high-risk mothers according to the

classification.[1] Completed the questionnaire, attended the delivery and assessed the newborn. For normal ones, author did full examination and anthropometric measurement (weight, length and head circumference). For ill newborns, the author attended the resuscitation, and admission to the NICU after informing the staff there. For stillbirths, the author did an autopsy clinical examination. Follow up of newborns till the end of day six was done by the author either for those admitted to the nursery or by home visits for those who were discharged before completing the first week of life, if they failed to attend the referral clinic on the two hospitals. For those who died at home, full description of the early neonatal death events was entailed and interpreted using the verbal autopsy technique. [112]

2.9.1 Verbal autopsy:

The verbal autopsy technique depends on the diagnosis of diseases associated with deaths in children from retrospective maternal interviews, by interpreting the description of symptoms and signs of the diseases according to a constructed framework pointing to specific anticipated diagnosis.

A study done by Ronald H.G, to assess the validation of verbal autopsy technique, they found that verbal autopsies could diagnose major illnesses contributing to death in children with acceptable sensitivity and specificity. [112]

The author followed this verbal autopsy technique. According to the full description of the symptoms and signs, the framework was as follows:

- Fever and convulsions could be taken as intracranial infections.

- Fever with refusal of feeding and with or without convulsions regarded as neonatal sepsis.

- Fever and abnormal posture after the first 72 hours of life regarded as neonatal tetanus.

- Respiratory distress accompanied with fever or not could be taken as chest infection.

- Cessation of breathing especially in a preterm infant (noticed by the mother) regarded as apnoea.

- Diarrhoea and vomiting was interpreted as gastroenteritis.

2.9.2 Classification of socioeconomic level:

The author had classified socioeconomic level according to the family monthly income as follow:[*]

< 10,000 Sudanese dinars (low social class).

10,000 - 19,999 Sudanese dinars (moderate social class).

20,000 - 30,000 Sudanese dinars (high social class).

---

[*] According to Diwan Elzaka classification (the author personal contact).

2.10 Research Team:

- Researcher: Who selected, interviewed mothers, completed questionnaire attended delivery and examined babies monitor and follow-up till the end of day 6.

- Obstetric registrar on duty.

- Paediatric registrar in NICU.

2.11 Statistical Analysis:

Computer using SPSS software analyzed the data; X^2 test at 0.05 level of significance was used. Bivariate analysis was used to determine the effect of risk factors in the outcome among the study group.

2.12 Inputs of the author:

The investigator's role in the study was as follows:

a. Team leader.

b. Identified mothers at risk.

c. Completed the questionnaires.

d. Examined the newborns.

e. Regular follow up.

2.13 Funds and grants:

The research was self-funded.

RESULTS

As shown in **Fig. 1**, 400 high-risk pregnant women and their pregnancy outcome, had been studied in Soba University Hospital (SUH) and Omdurman Maternity Hospital (OMH) in ratio of 1: 6 to evaluate their outcome and the results obtained are described below:

3.1. Maternal characteristics

3.1.1. Maternal age:

As shown in **Fig. 2** the predominant age group was 25 - 29 years were 22 (33.3%) mothers in SUH, 89(26.6%) in (OMH), those aged 20 - 24 years were 12(18.2%) among mothers in SUH and 71(21.3%) among OMH. Those aged less than 20 years were 2(3.0%), and 23(6.9%) mothers in the two groups respectively. Those aged 30 - 34 years were 19(28.8%) mothers in SUH and 89(26.6%) mothers in OMH. Those aged 35 - 39 years were 10(15.2%), 52(15.6%) mothers in the two hospitals respectively. The least category was those from 40 years, only 1(1.5%) mother in SUH and 10(3.0%) in OMH. There was no statistically significant relation in the age distribution of mother in the two hospitals (P= 0.702).

Fig. 1: Distribution of the study group according to the study area (n=400)

66(16.5%)

334(83.5%)

- Soba University Hospital
- Omdurman Maternity Hospital
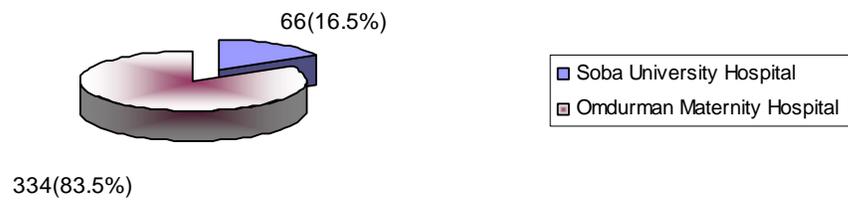
Fig. 2: Distribution of the study groups according to maternal age (in years)
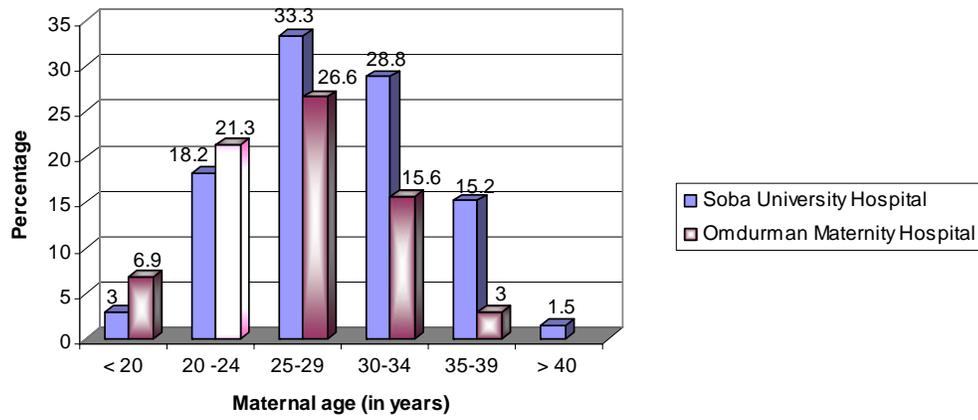
3.1.2. Maternal education:

As shown in **Fig. 3** the predominant group, was those educated for 7 - 12 years, which were 37 (56.1%) mothers in SUH and 176(52.7%) in OMH. Those educated for 1- 6 years were 6 (9.1%) in SUH and 62(18.6%) in OMH. The illiterate mothers were 8(12.1%) in SUH and 42(12.6%) in OMH, while those educated for 13 years and above were 15(22.7%) and 54(16.1%) in two groups respectively.

Therefore, the difference in education between mothers in the two groups was statistically insignificant (P = 0.221).

3.1.3. Maternal occupation:

As shown in **Table 1,** the majority of mothers in the two groups were housewives 55(83.45) and 283(84.7%) mothers respectively. Employees were 3(4.5%) in SUH and 31(9.3%) in OMH. Those who were skilled labourers were 1 (1.5%) mother in SUH and 8 (2.4%) mothers in OMH.

Others group were 7(10.6%) in SUH, 12(3.6%) in OMH include student, unskilled labourer. There was no statistical difference in occupation of mothers in the two hospitals (P = 0.061).

3.1.4. Parity:

The parity distribution among study groups is shown in **Table 1**. Those who had no living babies (primigravida or frequent

losses) predominated in the two hospitals; they were 30(45.4%) in SUH, 149(44.4%) in OMH. Those who had 1- 3 previous living babies were 28(42.4%) in SUH, 108 (35.3%) in OMH, and by those who had 4-6 previous births were 4(6.1%), in SUH and 57(17.1%) in OMH, while those who had seven or more previous births were 4 (6.1%) and 10(30%) mothers in SUH and OMH respectively. There was no statistical significance in parity distribution of mothers in the two hospitals (P = 0.085).

Fig. 3: Distribution of the study groups according to educational level (n= 400)
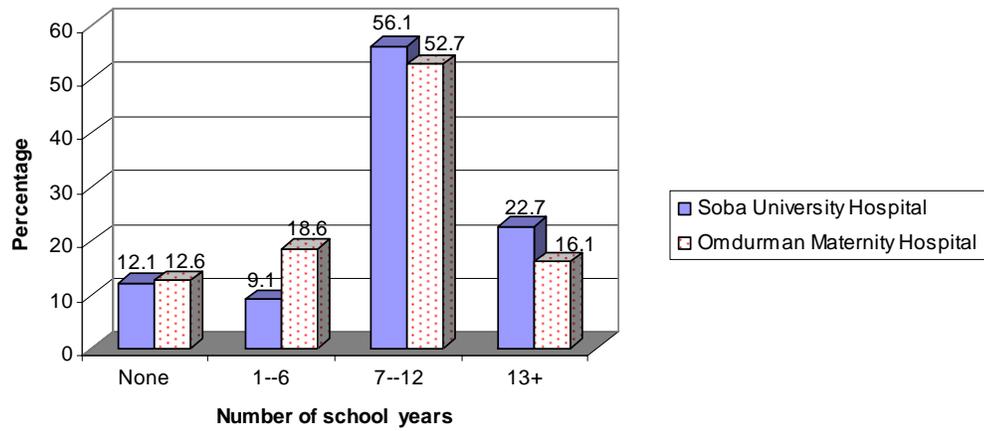
Table 1: Distribution of study groups according to maternal occupation and parity

Indicators	Soba University Hospital		Omdurman Maternity Hospital		Total	
	N	%	N	%	N	%
1- Occupation*						
House-wife	55	83.4	283	84.7	338	84.5
Worker	01	1.50	08	2.40	09	2.30
Employee	03	4.50	31	9.30	34	8.50
Others	07	10.6	12	03.6	19	4.80
Total	**66**	**100**	**334**	**100**	**400**	**100**
2- Parity **						
None	30	45.4	149	44.6	179	44.7
1 – 3	28	42.4	118	35.3	146	36.5
4 – 6	04	6.10	57	17.1	61	15.3
7 +	04	6.10	10	03.0	14	3.50
Total	**66**	**100**	**334**	**100**	**400**	**100**

* $X^2 = 7.363$ P = 0.061

** $X^2 = 6.226$ P = 0.085

3.2. Infant characteristics:

3.2.1. Multiple births:

As shown in **Fig. 4**, 19 (4.7%) cases from the two study groups were twins, represented as follow: 4(6.1%) from SUH and 15(4.5%) from OMH.

3.2.2. Sex:

Sex distribution of infants delivered in SUH and OMH was shown in **Fig. 5**, Male predominated in the two hospitals, 36(51.4%) in SUH and 181(51.9%) in OMH, while females were 34(48.6%) in SUH, 168 (48.1%) in OMH. There was no statistical significant difference in infant's sex in the two hospitals (P = 0.763).

3.2.3. Gestational age:

Fig 6. Shows distribution of the outcome according to the gestational age, Among the study group, 248(74.3%) were of a gestational age of 37-42 weeks in OMH compared to 52(78.8%) of the same gestation, in SUH, while those of gestation less than 37 weeks were 69(20.7%), 12(18.2%) in OMH and SUH respectively and those who more than 42 weeks were 17(5%) in OMH and 2(3%) in SUH.

Fig. 4: Distribution of the study group according to single or multiple birth

4.50%

95.50%

6.10%

93.90%

☐ Twin

▣ Singleton
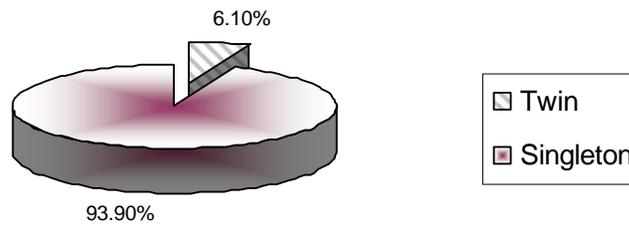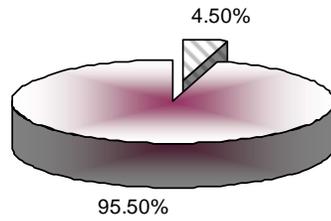
Soba University Hospital

Fig. 5: Distribution of the study groups according to gender of the newborn
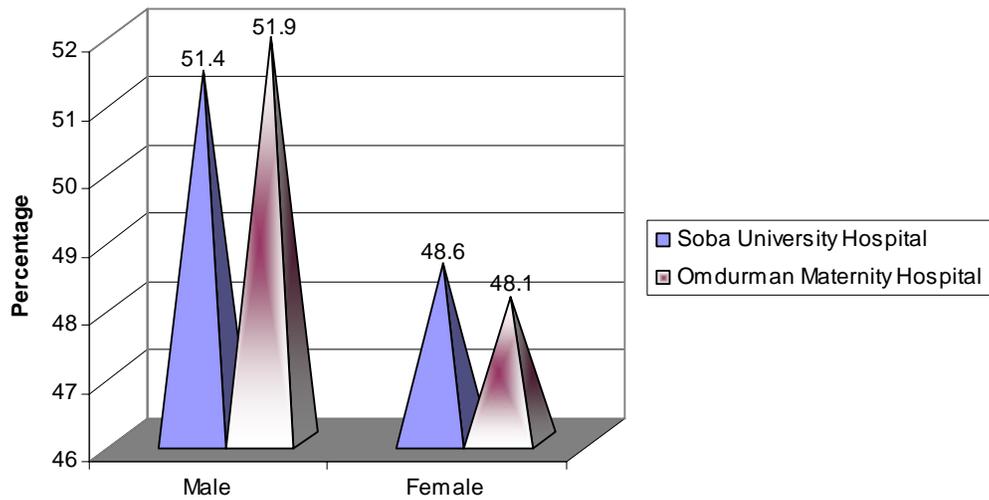
Fig. 6: Distribution of the study group according to the gestational age (weeks)

3%   18.20%

78.80%

Omdurman Maternity Hospital

5.00%   20.70%

74%

□ <37
▣ 37-42
■ >42
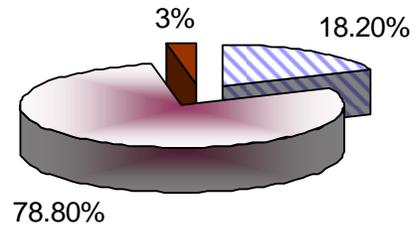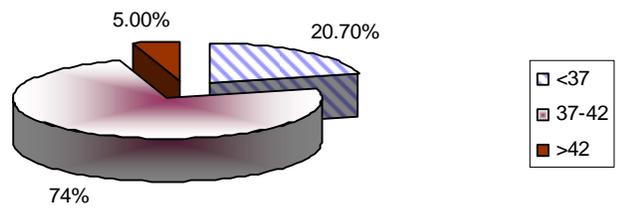
Soba University Hospital

3.3. Social characteristics:

3.3.1. Family income:

As shown in **Table 2**, the predominant group was that of monthly income of less than 40,000 Sudanese dinnars in both hospitals, representing 28(42.4%) and156 (46.7%) SUH and OMH respectively, followed by those of the monthly income of (40,000 - 59,000), and they were 20(30.3%) in SUH and 95(28.4%) in OMH. Those who had a monthly income of (60,000 - 79,900) were 10(5.2%) in SUH and 38(11.4%) in OMH. In SUH no mother with an income of (80,000 - 99,900) was reported, while there were 19(5.7%) in OMH. The least numbers of mothers in the two hospitals, 8 (12.1%) and 26 (7.8%) respectively had the monthly income of 100,000 and above. There was no difference in family income in the two hospitals (P = 0.206).

3.3.2. Parents consanguinity:

As shown in **Table 2**, the majority parent were to a first degree cousins in both hospitals, represented by 26(39.4%) in SUH and 104(31.1%) in OMH, while married to far relatives were 15(22.7%) and 46(13.8%) in both hospitals respectively. Marriage with no blood consanguinity occurred in 15(22.7%) in SUH and 118(35.3%) in OMH. There was no difference in the two hospitals (P = 0.063).

Table 2: Distribution of the study groups according to social characteristic

Indicator	Soba University Hospital		Omdurman Maternity Hospital		Total	
	N	%	N	%	N	%
1- Family income*						
< 40,000 Dinars	28	42.4	156	46.7	184	46.0
40000 – 59000	20	30.3	95	28.4	115	28.8
60000 – 79900	10	15.2	38	11.4	48	12.0
80000- 99900	00	00	19	5.70	19	4.80
100000 +	08	12.1	26	7.80	34	8.4
Total	**66**	**100**	**334**	**100**	**400**	**100**
2- Parents consanguinity **						
First degree cousin	26	39.4	104	31.1	130	32.5
Second degree cousin	10	15.2	66	19.8	76	19.0
Far relative	15	22.7	46	13.8	61	15.3
Not related	15	22.7	118	35.3	133	33.3
Total	**66**	**100**	**334**	**100**	**400**	**100**

* $X^2 = 5.914$ P = 0.206

** $X^2 = 7.039$ P = 0.063

3.4. Outcome of the current pregnancy:

As shown in **Table 3**, the outcome of the current pregnancy of the study group as follows in each hospital: live births in SUH were 60(88.2%), still births were 3(4.4%) and ENND were 5(7.4%) with perinatal mortality rate of 117.6/1000 births, while in OMH, live births were 323(92%), still births were 24(6.8%) and ENND were 4(1.2%) and perinatal mortality rate was 79.8/1000 births.

3.4.1. Relation between the outcome and the gestational age:

As shown in **Table 4,** the majority of those with a gestational age <37 weeks were alive births 64(79%), while 13(16%) were stillbirths and 4(4.9%) were ENND. For those with a gestational age of (37 -42) weeks, there were 281(93.7%) live births, 14(4.7%) still births and 5(1.7%) ENND. Those with gestational age > 42 weeks, all were live 19(100%).

There was statistical difference between the different gestational age and the outcome of the current pregnancy among the study group (P <0.001).

3.4.2. Relation between outcome and maternal characteristics:

Since there was no statistical significance in maternal characteristics between the two hospitals, the study group was compared to the outcome regardless of the study area (**Table 5**).

3.4.2.a. Maternal age:

Mothers aged (25 -29 years) had the most frequent stillbirths rate and ENND of 11(9.9%) and 3(3.7%) respectively, while their live births were 97(87.4%). Those were aged (20-24 years) had 7(8.4%) still birth, 2(2.4%) ENND and 74(89.2%) live births. Those of (30-34 years) had 5(4.6%) stillbirths, 2(2.4%) ENND and 101(93.5%) of them were live birth. Mothers aged (35-39 years) had 4(6.5%) hose of (30-34 years) had 5(4.6%) stillbirths, 2(2.4%) ENND stillbirth and only one (1.6%) ENND, while their live births were 57(91.9%). The least number of still birth and ENND were found among age group less than twenty and more than forty (0%, 4%) respectively, while their live births were 24 (96%), 11 (100%) respectively.

The differences between outcomes by maternal age were statistically insignificant (P = 0.774).

3.4.2.b. Maternal education:

Highly educated mothers (13 years and above) had the least numbers of both stillbirths and ENND, 2 (2.9%), 0 (0.0%) respectively, while their live births were 67(97.1%). The highest numbers of stillbirths were 12(5.6%) occurred in mothers educated 7-2 years, the ENND in this group was 6(2.8%) and their a live births were 195(91.5%). Those educated 1-6 years had stillbirths of 5 (7.4%), live births of 61(89.7%) and 2 (2.9%) ENND. Among illiterate

mothers, stillbirths were 8 (16%), a live births were 41(82%) and only one (2%) ENND (**Table 5**) was found.

The differences between the outcomes by maternal education were statistically insignificant (P = 0.087).

3.4.2.c. Parity:

Among study group, mothers who had seven previous births or more had no stillbirth or ENND and their live births were 14(100%), compared to mothers who had no previous live births, their outcome of stillbirths were 14(7.8%), ENND were 2(1.1%) and they had163 (91.1%) live births. Mothers who had (4-6 years) previous live birth gave 56(91.8%) live births in their last pregnancy, 5(8.2%) stillbirths and had no ENND. While mothers who had (1-3) previous live births had 8(5.5%) stillbirths, 131(89.7%) live births and 7(4.8%) ENND (**Table 5**).

The relation between parity and outcome was statistically insignificant (P=0.182).

Table 3: Outcome of the current pregnancy in the study group

Outcome / Hospital	Alive birth		Stillbirth		ENND		PMR/1000
	N	%	N	%	N	%	
SUH	60	88.2	3	4.4	5	7.4	117.6
OMH	323	92	24	6.8	4	1.2	79.8

Table 4: Relationship between pregnancy outcome and

gestational age

Outcome / Gestational age (weeks)	Stillbirth		Live birth		ENND		Total	
	N	%	N	%	N	%	N	%
< 37	13	16.0	64	79.0	4	4.9	81	100
37 - 42	14	4.7	281	93.7	5	1.7	300	100
> 42	0	0.0	19	100	0	0.0	19	100

$X^2 = 18.75$ $\quad\quad\quad$ P < 0.000

* Indicate significant relationship at 5% level of significance

Table 5: Relationship between pregnancy outcome and maternal Characteristics

Maternal characteristics	Stillbirth N	Stillbirth %	Live birth N	Live birth %	EEND N	EEND %	Total N	Total %
1. Maternal age*								
<20	0	0	24	96	1	4	25	100
20-24	7	8.4	74	89.2	2	2.4	83	100
25-29	11	9.9	97	87.4	3	3.7	111	100
30-34	5	4.6	101	93.5	2	2.4	108	100
35-39	4	6.5	57	91.9	1	1.6	62	100
40+	0	0	11	100	0	0	11	100
2. Education **								
None	8	16	41	82	1	2	50	100
1-6	5	7.4	61	89.7	2	2.9	68	100
7-12	12	5.6	195	91.5	6	2.8	213	100
13+	2	2.9	67	97.1	0	0	69	100
3. Parity ***								
None	14	7.8	163	91.1	2	1.1	179	100
1-3	8	5.5	131	89.7	7	4.8	146	100
4-6	5	8.2	56	91.8	0	0	61	100
7+	0	0.0	14	100	0	0.0	14	100

* X^2 = 6.47   P = 0.774

** X^2 = 11.04   P = 0.087

*** X^2 = 8.85   P = 0.182

3.5 Maternal obstetrical history:

3.5.1. Adverses outcome of previous:

3.5.1a. Stillbirth:

As shown in **Table 6.** The majority of the study group had only one previous stillbirth, 24(6.0%), followed by two previous stillbirth 9 (2.3%), while those who had three and four previous stillbirth accounted for 2(0.5%), and 1(0.3%) respectively. Those without history of previous stillbirth accounted 364(91%).

3.5.1b. ENND:

Table 5 shows the two groups among study population whom had either one previous ENND or without a history of ENND, which were 28(7%), 372(93%) respectively.

3.5.1c. Abortion:

Mothers who had previous history of abortion were 94 (23%), while not aborted before accounted 306 (77%) (**Table 6**).

Table 6: Distribution of the study group according to adverse outcome of previous pregnancies

Indicators	Frequency	Percentage
1- Stillbirth:		
None	364	91.0
1	24	6.0
2	09	2.3
3	02	0.5
≥ 4	01	0.3
Total	**400**	**100**
2- ENND:		
None	372	93.0
1	28	7.0
3- Abortion:		
Absent	306	77
Present	94	23
Total	**400**	**100**

3.5.2. Causes of previous stillbirths:

As shown in **Fig. 7.** The majority of the previous stillbirths in the study group were of unknown causes, 12(33.3%), while 8 (22.2%) of them were due to PIH and prematurity. Obstructed labour represented 13.9% (5) of the causes. APH, anaemia during pregnancy and febrile illness were represented 2.8% (1) of the causes of stillbirth.

3.5.3. Causes of previous ENND:

As shown in **Fig. 8** febrile illness represented the most common cause of ENND among the study group, it reported in 8(28.6%), followed by prematurity in 7(25%), congenital malformations in 5(17.8%), while obstructed labour reported in 4(4.3%) of the causes of ENND in the previous deliveries. L.B.W was the cause in 2 cases (7.1%), while neonatal jaundice and haemorrhagic disease of the newborn represented the least frequent causes for the previous ENND and reported in 1(3.6%) case.

Fig. 7: Causes of death of the previous stillbirths in the study group (n= 400)
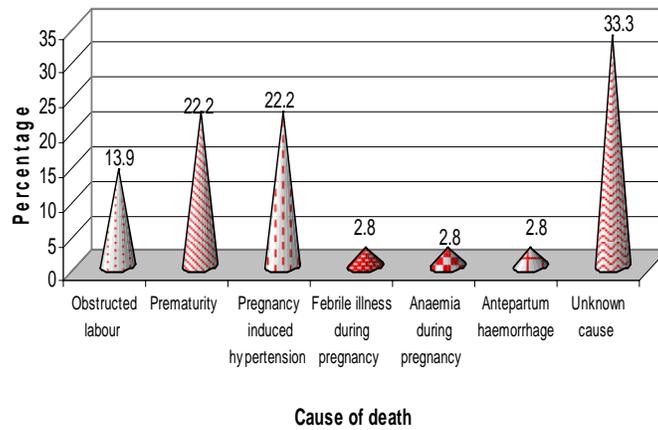
Fig. 8: Causes of the previous early neonatal deaths in the study group (n= 400)
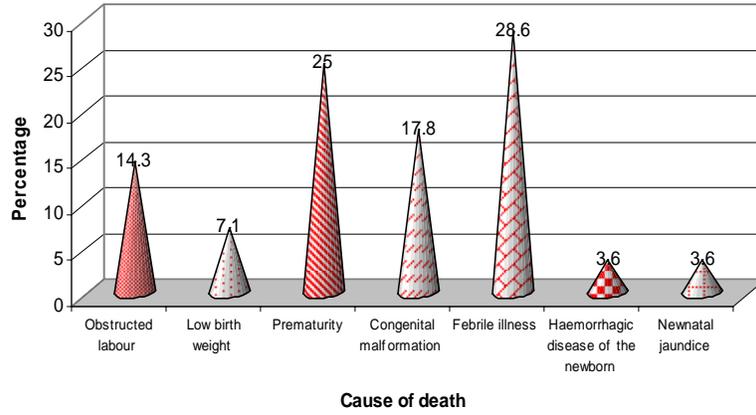
3.5.4. Relationship of the outcome and maternal obstetrical history:

3.5.4.a. Stillbirth:

As shown in **Table 7**, mothers who had previous stillbirth of four or more had (1) 100% of the outcome to be stillbirth, no live births or ENND (0%) compared to the mothers who had no past history of stillbirth, their outcome were (5.2%) stillbirths, 336 (92.6%) were live birth and (4.2%) ENND. While mothers who had previous one or two stillbirths had 6(25%) and 1 stillbirth (11.1%) as an outcome and (70.8%), (88.9%) live births and (2.2%), (0.0%) of ENND respectively. So, there was significant relationship between the previous history of stillbirth and the outcome of the last pregnancy to be as stillbirth or ENND (P<0.000).

3.5.4.b. ENND:

As shown in **Table 7**, mothers who had history of previous ENND had no stillbirth, (92.9%) live births and (7.1%) were ENND, as an outcome of the last pregnancy. While mothers who had not previous ENND had (7.3%) stillbirth, (90.9%) live births and 1.9% ENND as an outcome.

There was statistical insignificant relation between the previous history of ENND and the outcome of the last pregnancy to be as stillbirth or ENND (P = 0.073).

3.5.4. C. Abortion:

As shown in **Table 7**, mothers who had previous history of abortion, when compared with mothers who had no previous history of that, stillbirths were (12.8%), (4.9%) respectively, live birth (84%), (93.1%) respectively and ENND (3.2%), (66.7%) respectively of the outcome of the last pregnancy.

There was statistical significant relationship between the previous history of abortion and the outcome of the last pregnancy (P<0.021).

Table 7: Relationship between pregnancy outcome and obstetrical history

Obstetrical History	Stillbirth		Live birth		ENND		Total	
	N	%	N	%	N	%	N	%
Previous stillbirth:*								
None	19	5.2	337	92.6	8	4.2	364	100
1	6	25	17	70.8	1	2.2	24	100
2	01	11.1	08	88.9	0	0.0	9	100
3	0	0.0	02	100	0	0.0	2	100
≥ 4	1	100	0	0.0	0	0.0	1	100
Previous ENND:								
None	27	7.3	338	90.9	7	1.9	372	100
1	0	0.0	26	92.9	02	7.1	28	100
Previous abortion*								
Absent	15	4.9	285	93.1	06	66.7	306	100
Present	12	12.8	79	84	03	3.2	94	100

* $X^2 = 29.15$ $\qquad$ P = 0.000 ♦

** $X^2 = 5.24$ $\qquad$ P = 0.073

*** $X^2 = 7.71$ $\qquad$ P = 0.021 ♦

♦ Indicates significant relationship at 5% level of significant

3.6 Events of the current pregnancy:

3.6.1. Antenatal care:

Fig. 9 shows that mothers who attended 5-8 visits predominated among the study group consisting 214(53.4%), followed by those who attended 8 or more 89(22.3%), those who attended 1- 4 visits were 74(18.5%) and those who did not attended the antenatal clinic were 23(5.8%).

Fig. 10 shows that the majority of the mothers started their antenatal visit since the first trimester 228(57%) cases, while those started from the second trimester were 115 (28.8%) cases and those started the visit from the third trimester were 34(8.4%) cases.

The predominant group of mothers attended antenatal care which was conducted by doctors 316(79%), while there were 57(4.3%) attended ANC conducted by traditional mid-wives and about 2(0.5%) mothers attended ANC run by a traditional birth attendance and health visitor, while those who did not attended the antenatal care represented 23(5.8%) mothers (**Fig. 11**).

Fig. 9: Distribution of the study group by number of antenatal visits (n=400)

5.80%

22.30%

18.50%

53.40%

Legend:
- None
- 1--4
- 5--8
- >8
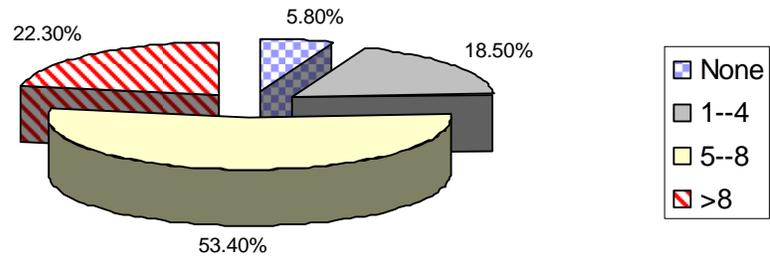
Fig. 10: Time of antenatal visit according to trimester of pregnancy in the study group
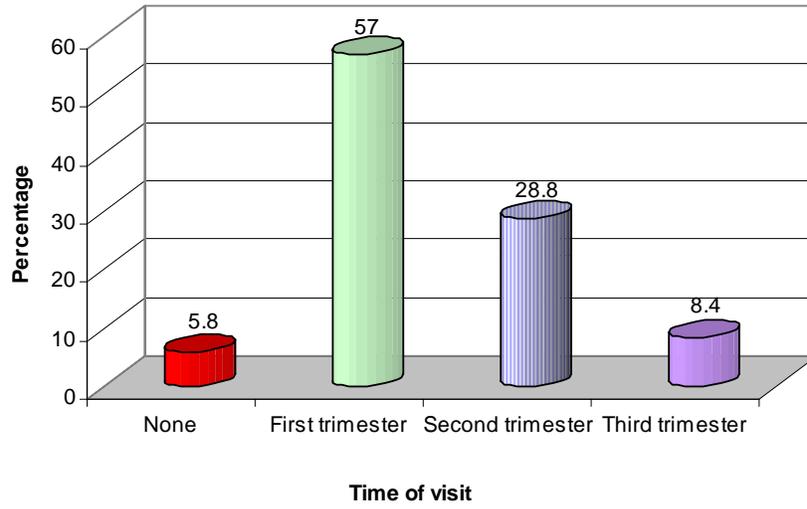
Fig. 11: Antenatal visits according to medical attendant
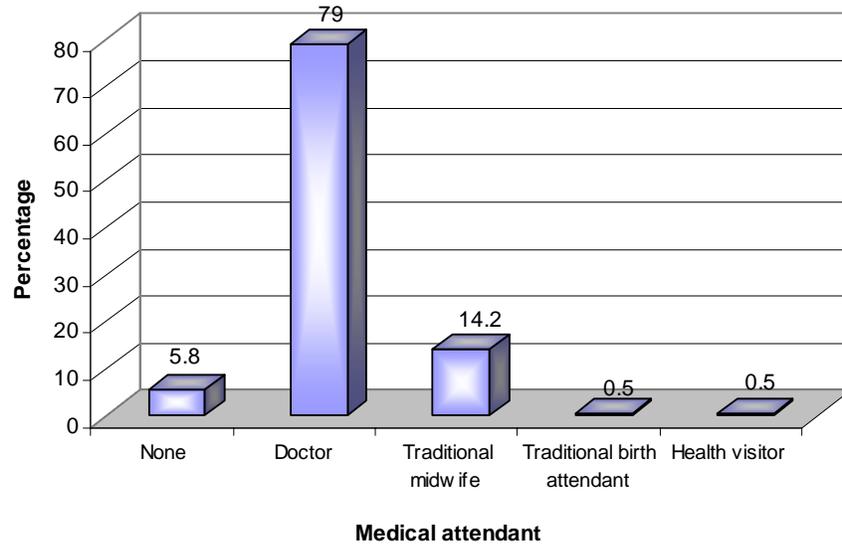
3.6.1a. Relationship of the outcome and antenatal care:

Table 8 shows that, mothers who didn't attended the antenatal care had the highest percentage of stillbirths (26.1%), while their live births represented (69.6%) and (4.3%) of ENND. Those who attended (1- 4) visits had 10.8% stillbirth, 83.8% live birth and 5.4% ENND. Mothers with ANC (5 - 8) had 4.7% stillbirth, 93.9% live births and 1.4% ENND and for attended eight and more visits had 3.4% stillbirths, 95.5% live birth and 1.1% ENND.

The difference between the outcome and number of ANC visits was found to be statistically highly significant (P<0.000).

Regarding the time of starting of ANC throughout pregnancy (**Table 8**) for mothers attended the antenatal clinic since first trimester had the least percent of stillbirth (3.9%) compared to those who never attended or attended in the third trimester, stillbirths were 26.1%, 8.8% respectively, live birth 69.6%, 88% and ENND 4.3%, 2.9% respectively. While those started the obstetrical care since the second trimester had stillbirth 7.8%, live birth 90.4% and ENND of 1.7%.

Statistically, there was significant difference between the time of starting the ANC and the outcome (P<0.007).

The majority of the mothers in the study group conducted doctors for ANC and most of them gave live births 93%, while 4.7%

of them gave stillbirths and 2.2% ENND. Those who attended traditional mid-wives had an outcome of 87% live births, 10.5% stillbirths and only one (1.8%) ENND. For those attended by traditional birth attendant and health visitors, had no stillbirths or ENND, they gave (100%) live births, but those who did not attended ANC had 83.3% live births, 26.1% stillbirths and 4.3% ENND (**Table 8**).

The correlation between conductor of ANC and the outcome of the pregnancy was statistically significant (P<0.020).

Table 8: Relationship between pregnancy outcome and antenatal care

ANC Indicators	Stillbirth		Live birth		ENND		Total	
	N	%	N	%	N	%	N	%
AN visits: *								
None	06	26.1	16	69.6	1	4.3	23	100
1 – 4	08	10.8	62	83.8	4	5.4	74	100
5 – 8	10	4.7	201	93.9	3	1.4	214	100
> 8	03	3.4	85	95.5	1	1.0	89	100
Time of visit:*								
None	06	26.1	16	69.6	1	4.3	23	100
1st trimester	09	3.9	214	93.9	5	2.2	228	100
2nd trimester	09	7.8	104	90.4	2	1.7	115	100
3rd trimester	03	8.8	30	88.0	1	2.9	34	100
Medical attendant: *								
None	06	26.1	16	69.6	1	4.3	23	100
Doctors	15	4.7	294	93	7	2.2	316	100
Traditional Midwives	06	10.5	50	87.7	1	1.8	57	100
Traditional birth attendant	0	0.0	02	100	0	0.0	2	100
Health visitor	0	0.0	02	100	0	0.0	2	100

* X^2 = 14.31   P = 0.000 ♦

** X^2 = 17.86   P = 0.07 ♦

*** X^2 = 18.11   P = 0.020 ♦

♦   Indicates significant relationship at 5% level of significant

3.6.2. Tetanus toxoid vaccination:

Fig. 12 shows the distribution of mothers who had tetanus vaccination in the current pregnancy, 76(19%) received one dose, 168 (42%) two doses and 54(13.5%) received booster doses, while those who had not received tetanus toxoid vaccine during the current pregnancy were 102 (25.5%).

The correlation between receiving tetanus toxoid vaccine and the current outcome shown in **Table 9,** for mothers who received one or two doses of tetanus toxoid vaccine live births were (92.1%, 93.5%), stillbirths were (5.3%, 4.2%), and ENND were (2.6%, 2.4%) respectively.

Those received Booster dose had 96.3% live births, 3.7% stillbirth and had no ENND (0.0%), while mothers who did not received tetanus toxoid vaccine in the last pregnancy had 83.3% live births, 13.7% stillbirth and 2.9% ENND.

The relation between the outcome of the last pregnancy and tetanus toxoid vaccine was statistically insignificant (P = 0.053).

Fig. 12: Distribution of the study group according to tetanus vaccination (n=400)

13.50%

25.50%

42%

19%

- None
- 1 dose
- 2 doses
- Booster dose
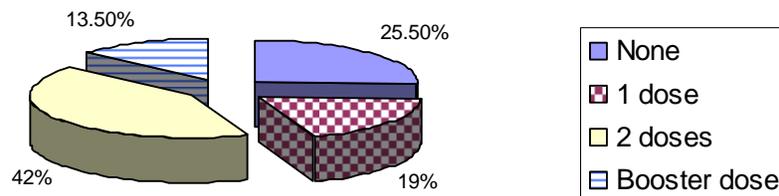
Table 9: Relationship between pregnancy outcome and tetanus toxoid vaccination

Outcome Tetanus Vaccine	Stillbirth		Live birth		ENND		Total	
	N	%	N	%	N	%	N	%
None	14	13.7	85	83.3	3	2.9	102	100
One dose	04	5.3	70	92.1	2	2.6	76	100
Two doses	07	4.2	157	93.5	4	2.4	168	100
Booster doses	02	3.7	52	96.3	0	0.0	54	100

$X^2 = 12.45$ $\qquad\qquad$ $P = 0.053$

3.6.3. Maternal illness during pregnancy:

As shown in **Fig. 13,** PIH represented the major illness of the mothers among the study group 137(34.34%) cases followed by malaria 88(21.99%) cases, APH 54(13.55%) cases, anaemia 39(9.64%) cases. Then febrile illness apart from malaria such as tonsillitis, chest infection were 30(7.53%) cases and gestational diabetes occurred in 28(6.93%) of the mothers, while 19(4.82%) of the mothers had recurrent infection (mainly U.T.I). Others illness such as hepatitis and fractures represented in 5(1.2%) of the mothers.

3.6.4. Medications used during last pregnancy:

Among the study group, those who received medication during the last pregnancy were 376(94%) and the remaining 24(6%) did not.

Fig. 14 shows the different types of drugs used by the mothers in their last pregnancy. It was found that 319(58.2%) mothers used fefol (combination of iron and folic acid), while iron alone used by 20(3.65%), folic acid alone used by 30(5.48%). Antihypertensive and hypoglycemic drugs were used by 56(10.22%), 18(3.28%) mothers respectively.

Other types of medication such as aspirin, heparin and antibiotics were used by 93(16.97%) of the mothers in the study group.

Fig. 13: Distribution of mothers by maternal illnesses during the current pregnancy (n=400)
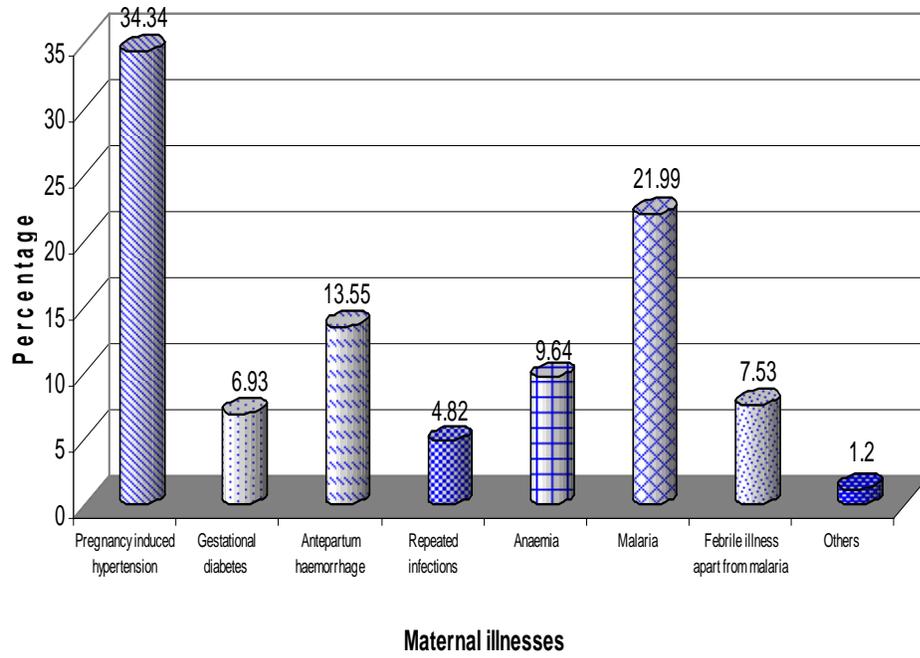
Fig. 14: Medications used by the studygroup during the current pregnancy
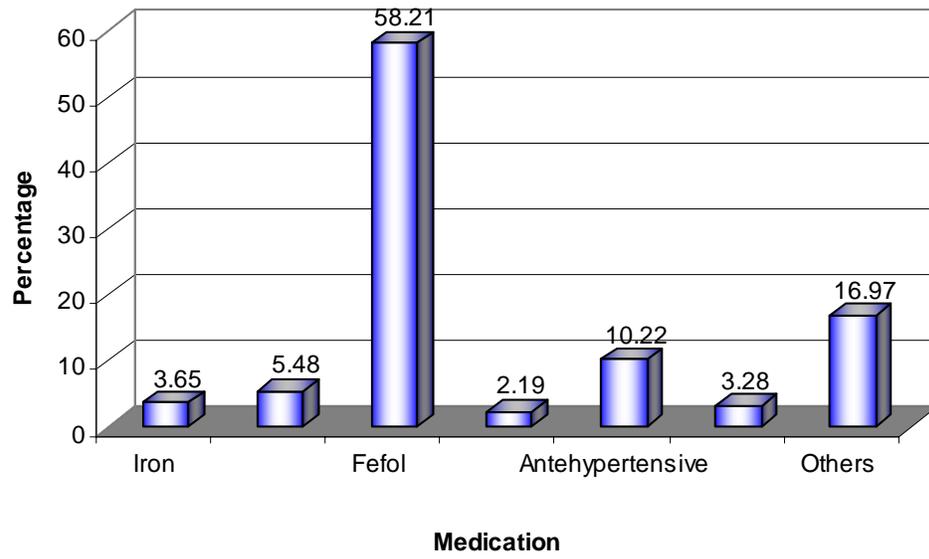
3.7. Labour:

3.7.1. Type of delivery of the current pregnancy:

As shown in **Fig. 15**, the majority of the mothers in the study group were delivered by C/S in 246(58.7%) followed by normal spontaneous vaginal delivery in 110 (26.3%) and those delivered by using different methods of induction were 42(10%), instrumental delivery was also used and 6(1.4%) mothers were delivered by ventose and 15(3.5%) mothers were delivered by forceps.

The common complications which occurred during labour among the study group were shown in **Fig. 16**, where obstructed labour in 32(7.6%) of mothers, postpartum haemorrhage in 23(6.5%), hypotonic uterine contraction (failure of progress) occurred in 10(2.4%) of mothers, cord prolapse and retained second twin occurred in 5(1.2%) of mothers for each, while retained placenta occurred in 7(1.7%) mothers. Ruptured uterus in 3(0.7%) of the deliveries, while both precipitated labour and arrested after coming head complicated 6(1.4%) deliveries for each, those whom their labour passed smoothly without complication represented in 318(75.9%) mothers.

Fig. 15: Distribution of the study group according to the type of delivery (n= 400)
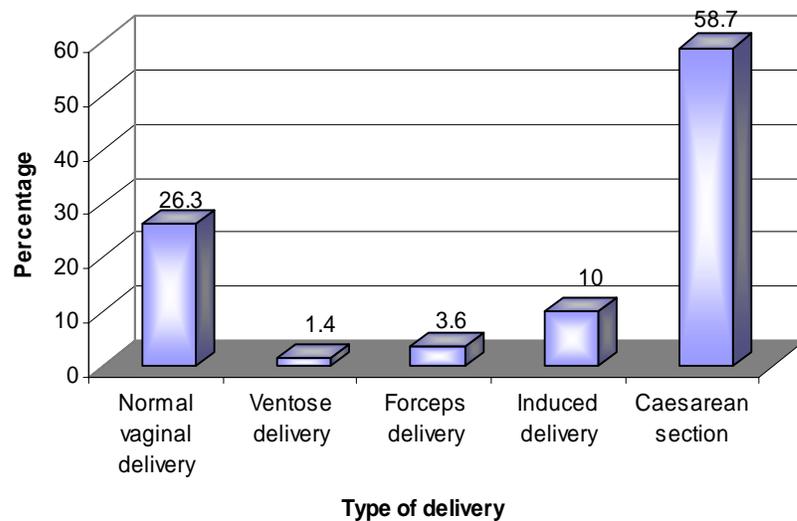
Fig. 16: Distribution of the study group according to labour complications (n=400)
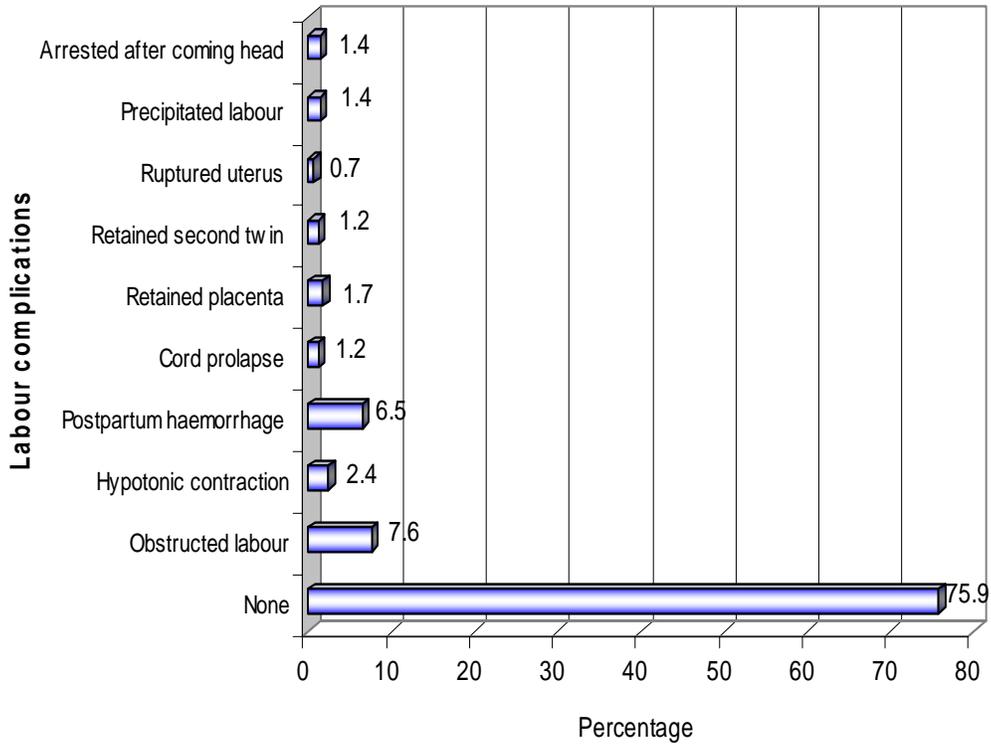
3.8. Postnatal events:

3.8.1. Foetal assessment and Apgar Score:

Fig. 17 shows the distribution of the neonate in the study group according to their Apgar Score.

Among study group, there were 36(8.6%) deaths with Apgar Scoring of zero throughout, while newborn with Apgar Score less than 7 at 1 min were 62(14.8%), at 5 min were 14 (3.3%) and at 10 min only two (0.5%). Those with Apgar Score of seven and above at 1 min were 321 (76.6%), at 5 min were 369 (88.1%) and at 10 min were 381 (90.9%).

Accordingly, there were 60(14.3%) newborns that need resuscitation, while 359 (85.7%) didn't need it (**Fig. 18**). The duration of resuscitation differs among those who need, in 7(11.7%) types of resuscitation took less than 5 min and in 50 (83.3%) it took (5-10) min and in 3 (5%) it took more than 10 min (**Fig. 19)**.

Fig. 17: Distribution of the newborns according to Apgar score (n=419)
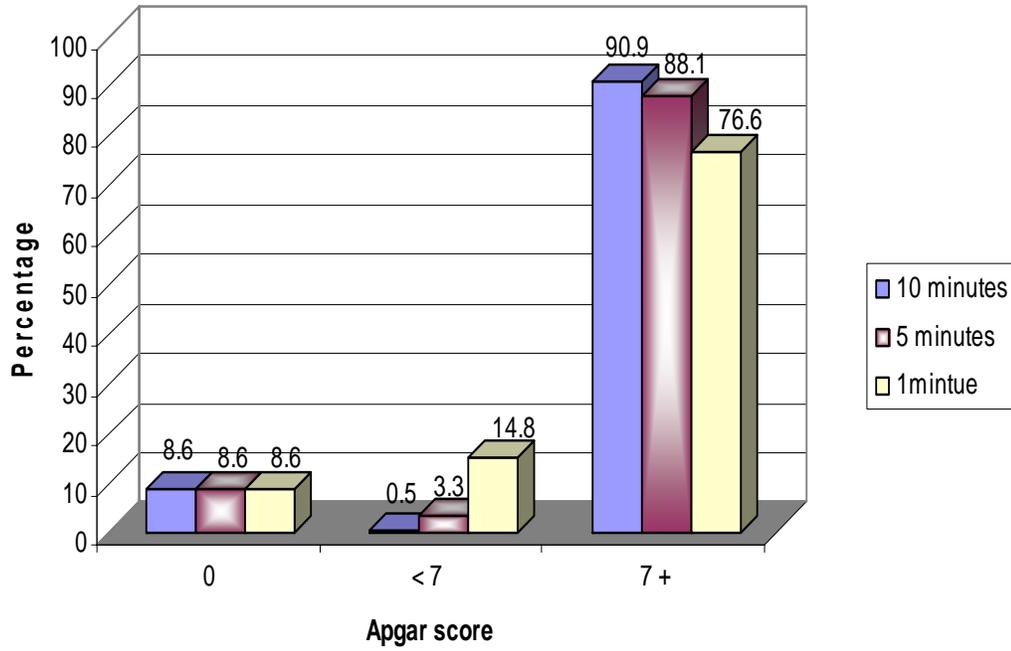
Fig. 18: Distribution of the newborns according to requirement of resuscitations (n= 60)

14.30%

85.70%

■ Need resuscitations
■ Not need resuscitations
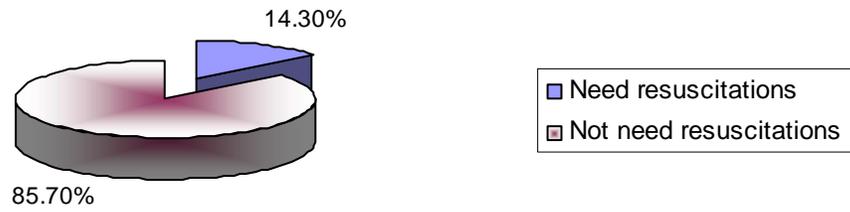
Fig. 19: Distribution of newborns according to duration of resuscitations (in minutes)

5%

11.70%

83.30%

Legend:
- < 5
- 5--10
- >10
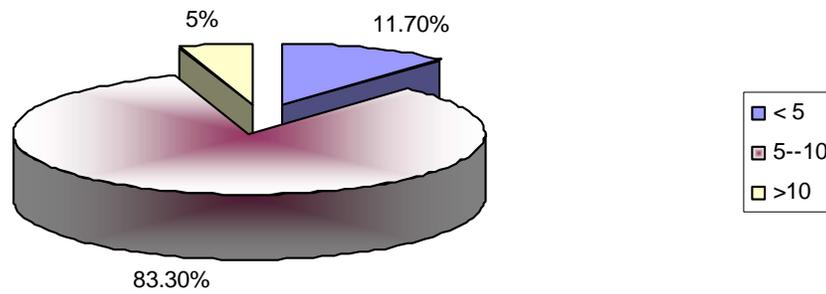
8.2. Examination:

3.8.2.1. Meconium:

Fig. 20 shows that the majority of the newborns were delivered not stained with meconium 359(85.7%), while 33(14.3%) found to be stained with meconium.

3.8.2.2. Physical of examination:

Fig. 21 shows that, the majority of the newborns were physically normal 354(92.4%), while 11(2.9%) had congenital anomalies and 6(1.6%) had cephalohaematoma, 17(4.25%) had trauma (during delivery), while there were others 12(3%) whom had different physical findings such as oedema and skin lesions.

3.8.2.3. Anthropometeric measurements:

Concerning anthropometeric measurements, there were 19 twins among the neonates in the study group. The infant anthropometerical characters are shown in **Table 10** apart from the stillbirths who were 27(6.44%), whom their measurements were not done, the rest of the study group measured as follow:

For the weight, those who weigh less than or equal to 3rd percentile were 14.3%(56) cases, (10th - 50th centile) were 49.5%(194) cases, (75th - 90th centile) were 25.5%(100) cases,

those equal to or more than 97th centile weight for gestational age were 10.7%(42) cases.

For length, those measured less or equal to the 3rd centile were 13%(51) cases, those between (10th - 50th centile) were 54%(221) cases and those between (75th - 90th centile) were 28.6%(112) cases and those equal to or more than 97th percentile were 4.4%(17) cases.

For the head circumference, those measured less or equal to the 3rd centile were 10.5%(41) cases and those measured between (10th - 50th centile) were 46.4%(182) cases and those between (75th - 90th centile) were 28.6%(112) cases and those measured equal to or more than 97th centile were 14.5%(57) cases.

Fig. 20: Distribution of newborns according to meconium stained (n= 392)

14.30%

85.70%

- Meconium stained
- Not meconium stained

Fig. 21: Distribution of the newborns according to the morphological appearance (n= 392)
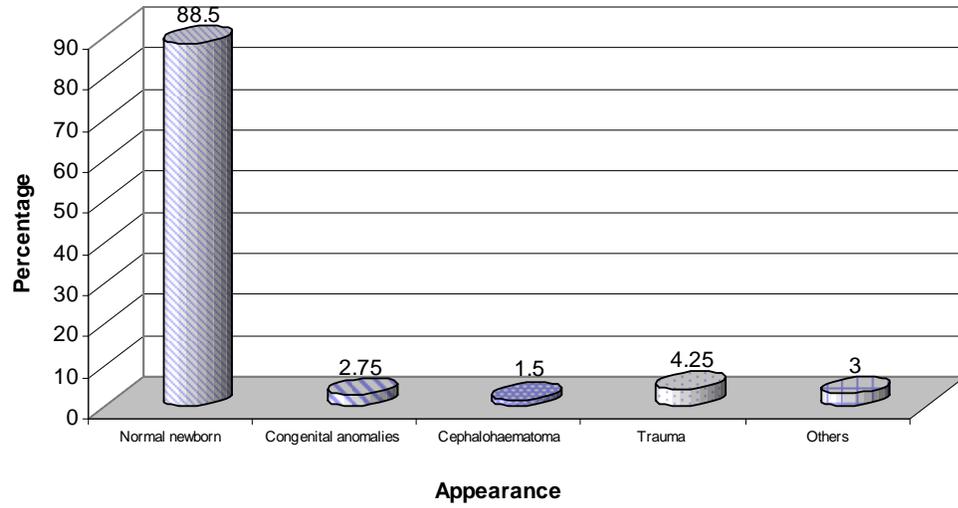
Table 10: Newborns anthropometric measurements

Measure Centile	Weight		Length		Head circumference	
	N	%	N	%	N	%
≤ 3rd	56	14.3	51	13	41	10.5
10th - 50th	194	49.5	221	54	182	46.4
75th - 90th	100	25.5	112	28.6	112	28.6
>97th	42	10.7	17	4.4	57	14.5
Total	**392**	**100**	**392**	**100**	**392**	**100**

3.8.2.4. Relation between the outcome and anthropometrical measurement of the newborn of the current pregnancy:

Table 11 shows the relation between different measurement of the newborn of the last pregnancy and the outcome among the study population. Regarding the weight, (P = 0.000) which indicated statistically significant difference in average weight with respect to the outcome. Of a live births, the highest weight which represented in 382 newborns (mean weight was 2.919 and standard deviation of their weight was 0.753).

For length, there was statistically significant difference of mean and standard deviation of length of live births and ENND with highest mean 47.874 and standard deviation 5.09 for the average length.

For head circumference, there was also statistical significance in mean and standard deviation of the average of the head circumference among the newborn in the study, where the live birth also represented the highest number for both mean (33.470) and standard deviation (2.966).

Table 11: Relationship between outcome and anthropometric measurement of the newborns

Measure	N	Mean	Std. Deviation	F. value	P. value
1- Weight (kg)					
Stillbirth	27	0	0	203.7	
Alive birth	383	2.919	0.753		0.000*
ENND	9	1.712	1.143	67	
Total	**419**	**2.693**	**1.038**		
2. Length (cm)					
Stillbirth	27	0	0	940.2	
Alive birth	383	47.874	5.090		0.000*
ENND	9	34.5	18.674	51	
Total	**419**	**44.469**	**13.108**		
3- Head circumference (cm)					
Stillbirth	27	0	0	1144.	
Alive birth	383	33.47	2.966		0.000*
ENND	9	26.4	14.229	68	
Total	**419**	**31.144**	**8.973**		

* Indicate significant relationship at 5% level of significance

3.9. Admission to neonatal intensive care unit (NICU):

Among newborn under the study, there were 83(19.8%) who needed an admission to the NICU, the rest of 336 (80.2%) did not need it (**Fig. 22**).

3.9.1. Causes of admission:

Fig. 23 shows the commonest cause for admission to NICU. Prematurity represented the predominant cause of admission (37.3%) of cases, while neonatal jaundice represented the least percent of the causes (3.6%). Neonatal infections were found in (19.3%) among admitted cases. Birth asphyxia in 14.5% and admission due to congenital anomalies were found in 6% of the cases. Infant of diabetic mothers were 9.7%, and those admitted because of hypothermia and traumatic delivery were 2.4%, 4.8% respectively, and there were two neonates (2.4%) admitted for feeding.

3.9.2. Relation between admission to the NICU and the outcome of The current pregnancy:

Shown in **Table 12** where, the majority of those admitted to the nursery were alive births 74(88%) cases throughout were 9 (12%) cases were died during the first week of life. There was statistical significance between the admission to the NICU and the outcome of the study group (P = 0.000).

Fig. 22: Distribution of the newborns according to admission to NICU (n= 419)

19.80%

80.20%

Yes
No
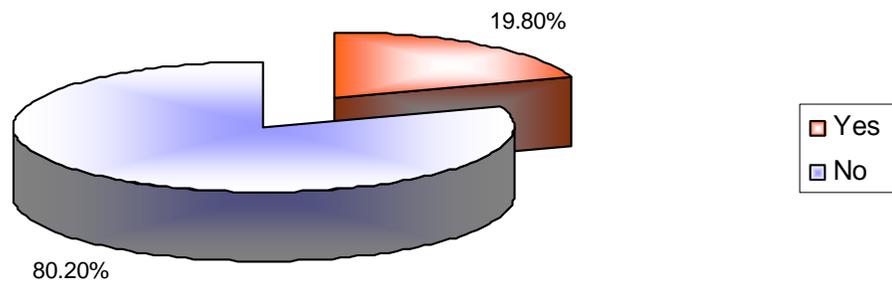
Fig. 23: Causes of admission of the newborns to the NICU
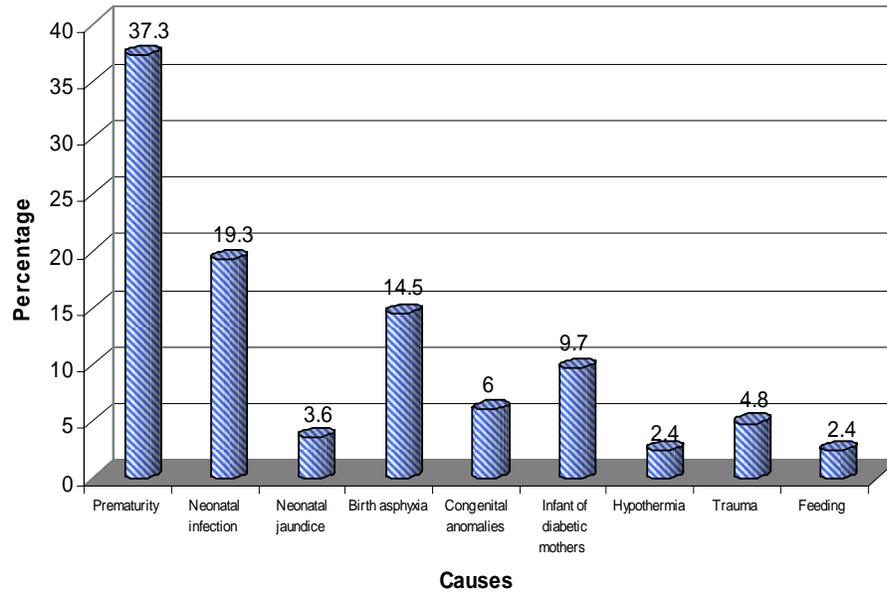
Table 12: Relationship between pregnancy outcome and admission of the newborns to NICU (N=419)

Admission to the NICU	Yes		No	
Pregnancy outcome	N	%	N	%
Stillbirth	0	0.0	27	08
Live birth	74	88	309	92
ENND	09	12	0	0.0
Total	**83**	**100**	**336**	**100**

$X^2 = 47.269$ $P < 0.000*$

* Indicate significant relationship at 5% level of significance

3.9.3. Breast feeding:

When the stillbirths excluded from the study (27), the rest of the newborn were evaluated for the starting of breast feeding and the result shown in (**Fig.24**).

Mothers who started breast feeding within the first 24 hours after delivery were 312(79.6%), while those started at or after that, were 62(15.8%), while those who did not fed their babies at all (till the end of day 6) were 18 (4.6%).

3.9.4.Postnatal outcome:

Fig. 25 shows that the distribution of the newborn according to their discharge 297(70.9%) discharged without follow up, 86(20.5%) discharged with follow up.

Fig. 24: Distribution of the newborns according to the starting of breast feeding (n= 392)

15.80%

4.60%

79.60%

None
< 24 hours
> 24 hours
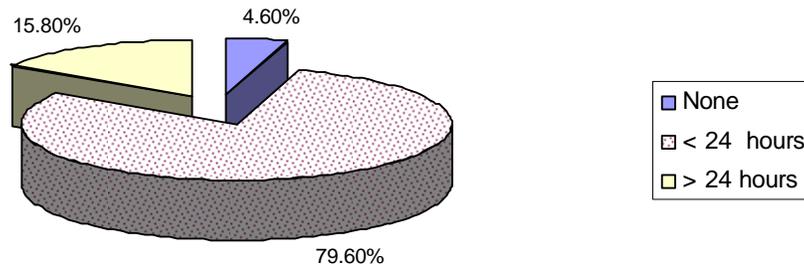
Fig. 25: Distributrion of the newborns according to postnatal outcome (n= 383)

20.50%

79.50%

☐ Discharged with follow up

☐ Discharged without follow up
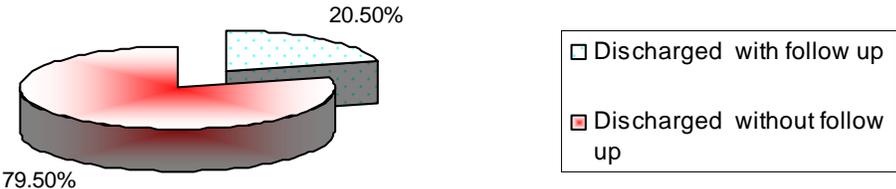
3.10. Risk analysis:

Distribution of the study group   g to risk factors shown
in **Table 13** Pregnancy induced hypertension represented the
most common risk factor among the study group (18.9%),
followed by breech presentation, which were represented in
9.5% of the mothers, followed by mothers who had medical
illness not related to their pregnancy such as chronic renal
failure, cardiac problems and epilepsy they were 6.9% of the
study group. Mothers presented with antepartum haemorrhage
constituted 5.5% of risk presentation, those presented with
multiple pregnancy were 5%, while mothers presented with
gestational diabetes were 3.3% of the risk mothers, and
mothers who had history of Rhesus isoimmunization were 3%.
Abnormal lie at the time of labour occurred in 3% of the mother,
prolonged ruptured of membrane and anaemia during
pregnancy was the presentation in 4.5%, 4.3% respectively.

Regarding the age of the mothers, teenager were 1.2% also
elderly primigravida were 1.2% mothers who had recurrent
foetal loss were 2.6%, while the grandmultiprae were 1.9%.

According to the gestational age, mothers who presented with
preterm labour were 2.9%, while those whom were post-term
were 3.8%, mother whom had history of infertility were 1%,

while the least percent (0.2%) for mothers who presented with polyhydramnios without associated factors.

There were 23.9% presented by more than one risk, the majority presented with PIH associated with other risk such as multiple pregnancy (2.4%), preterm labour (0.5%), APH in 1.4%, elderly primigravida and infertility (1%). Followed by the association between grandmultipare and multiple pregnancy (1%), breech presentation in 1%, APH in 0.2%.

Those who had chronic illness presented by anaemia 1.4%, PIH in 1%, preterm deliveries also associated with APH (1.2%), polyhydramnios in 1% and prolonged ruptured of membranes in 1%. Teenage pregnancies were associated with anaemia in 0.5%, preterm and post-term delivery 1% for each. Abnormal lie and presentation during labour 0.5%, 1% respectively.

3.10.1. Relation between the risk factors and the type of delivery:

Table 14 shows the relation between different type of delivery and risk factors, 40% of the elderly primigravida had delivered by NVD and C/S for each, while 2.4% were used induced for their delivery, grandmultiparae delivered by either NVD or C/S (62.5%), (37.5%) and (20%) for each type. PIH had the highest C/S rate among other risk factors (62%), while 22.8% were

125

delivered normally and 5.1% were delivered by induction. For mothers who had recurrent foetal losses, the C/S was reported in 54.5%, while the rest delivered by induction (9.1%), forceps (18.2%) and normally (18.2%).

The majority of the mothers with gestational diabetes were delivered by C/S (78.6%), while the rest delivered normally (21.4%), multiple pregnancy, used (33.3%) NVD, (9.5%) ventose, (9.5%) induction and (47.6%) were delivered by C/S.

For abnormal lie and breech presentation 76.9%, 75% were delivered by C/S respectively, 23.1% of abnormal lie delivered by forceps and only 2.51% for those presented breech were delivered by induction.

The only case, which the mother's pregnancy complicated by polyhydramnios was delivered by C/S.

For those who had anaemia or chronic illness during pregnancy, 66.7% and 31% were delivered normally, 5.6% and 3.4% were delivered by using ventose, 15.6% and 6.9% by induction and 22.2% and 58.6% by C/S respectively.

Those who had history of infertility, all delivered by C/S (100%), compared to those who had history of rhesus isoimmunization, 38.5% delivered normally, 23.1% by induction and 38.5% by C/S.

For preterm and post-term deliveries, 58.3% and 13.5% were delivered normally, while forceps had been used only in 6.3% in postterm induced labour had been used to deliver 25% and 37.5% respectively and C/S in 16.7%, and 43.3% respectively.

Mothers who had multiple risk factors, they were delivered by NVD (31.8%), induced labour in 10.6% or C/S in 57.6%.

The relation between the types of delivery used according to the risk factors was statistically significant (P= 0.000).

3.10.2. Relative Risk of perinatal deaths by maternal risk factor in the current pregnancy :

As shown in **Table 15** the outcome of elderly primigravida were 80% alive births, 20% stillbirth and there were no ENND with relative risk of perinatal death was 2.26 (CI: 0.38 to 13.4), while teenager outcome all were alive birth (100%) as well as the grandmultipara and those with anaemia with pregnancy, those who had prolonged ruptured of membranes, those who had history of infertility, medical illness, those who had polyhydramnios alone during pregnancy and those delivered post-term have the same previous out come of the 100% live birth.

Mothers who had PIH had an outcome, 7.6% stillbirth, 89.9% were live birth and 2.5% were ENND and the perinatal deaths among these group was 1.11 (CI: 0.15 to 6.72). Those who had

history of rhesus isoimmunization had an outcome of 7.7% stillbirths, 84.6% live births and 7.7% were ENND. Mothers who had multiple pregnancy had no stillbirths in their outcome, majority were live births (90.5%) while ENND were 9.5%. For mothers who had gestational diabetes, their products were 7.6% stillbirths, 92.9% live births. Mothers whom their labour complicated by abnormal lie or presentation (breech) gave an outcome of stillbirths (15.4%), (2.5%) respectively and live births of 84.6%, 97.5% respectively and they showed a relative risk of perinatal deaths of 1.75 and 0.26 respectively. Mothers with antepartum haemorrhage had an outcome of 34.8% still births and 65.2% alive births with relative risk of deaths of 4.68 (CI: 2.41 to 9.09), while preterm labour, 91.7% of them were alive and 8.3% were ENND. For mothers whom had multiple risks, stillbirths were 6.8%, live births were 9.8% and ENND were 3.4%.

Statistically, there was a significant difference between the risk factors and the outcome of the current pregnancy (P = 0.009).

Table **16** showed the perinatal mortality rate according to the risk factors among the study group. Only one perinatal death occurred in the elderly primigravida with PMR of 20/100 births and in mothers presented with gestational diabetes and in those had history of

recurrent foetal loss with PMR of 7/100 births, 9/100 births respectively, while those presented with PIH, the perinatal deaths were 6 cases with PMR of 10/100 births. Tow perinatal deaths occurred in those with risks of Rh-isoimmunization, multiple pregnancies and abnormal lie with PMR of 14/100 births, 10/100 births and 15/100 births respectively. Eight perinatal deaths occurred in pregnancies complicated by APH with PMR of 35/100 births, while there were 6 perinatal deaths occurred in whom presented by more than one risk and their PMR was 14/100 births.

Table 13: Distribution of the study group by risk factors

Risk factor	Frequency	Percentage
Elderly primigravida	5	1.2
Grand multiparae	8	2.0
Teenage pregnancy	5	1.2
Recurrent foetal losses	11	2.8
Pregnancy induced hypertension	82	20.5
Gestational diabetes	14	3.5
Multiple pregnancy	21	5.3
Abnormal lie	13	3.2
Breech presentation	40	10
Polyhydramnios	1	0.3
Prolonged rupture of membrane	19	4.8
Anaemia	18	4.5
Medical problem with pregnancy	29	7.3
Infertility	4	01
Antepartum haemorrhage	23	5.8
Rh. isoimmunization	13	3.2
Pre-term delivery	12	03
Post-term delivery	16	04
More than one risk	66	16.5
Total	**400**	**100**

Table 14: Distribution of at risk mothers according to the type of delivery

Risk factor	NVD		Ventose		Forceps		Induction		C/S	
	N	%	N	%	N	%	N	%	N	%
Elderly primigravida	2	40	0	0	0	0	1	20	2	40
Grand multiparae	5	62.5	0	0	0	0	0	0	3	37.5
Teenage pregnancy	1	20	1	20	1	20	1	20	1	20
Recurrent foetal loss	2	18.2	0	0	1	9.1	2	18.2	6	54.5
Pregnancy induced hypertension	20	24.4	0	0	4	4.8	8	9.8	50	61
Gestational diabetes	3	21.4	0	0	0	0	0	0	11	78.6
Multiple pregnancy	7	33.3	2	9.5	0	0	2	9.5	10	47.6
Abnormal lie	0	0	0	0	3	23.1	0	0	10	76.9
Breech presentation	6	15	0	0	3	7.5	1	2.5	30	75
Polyhydramnios	0	0	0	0	0	0	0	0	1	100
PROM	8	42.1	0	0	1	5.3	3	5.8	7	36.8
Anaemia	12	66.7	1	5.6	0	0	1	5.6	4	22.2
Chronic illnesses	9	31	1	3.4	0	0	2	6.9	17	58.6
Infertility	0	0	0	0	0	0	0	0	4	100
APH	4	17.4	1	4.3	0	0	3	13	15	65.2
Rh. isoimmunization	5	38.5	0	0	0	0	3	23.1	5	38.5
Pre-term delivery	7	58.3	0	0	0	0	3	25	2	16.7
Post-term delivery	2	12.5	0	0	1	6.3	6	37.5	7	43.8
More than one risk	21	31.8	0	0	0	0	7	10.6	38	57.6

X2 = 146.182   P= 0.000*

Indicate significant relationship at 5% level of significance

Table 15: Relation between the risk factors and the pregnancy Outcome among the study group

Risk factor	Stillbirth		Alive birth		ENND		RR	ODD	95% CI
	N	%	N	%	N	%			
Elderly primigravida	1	20	4	80	0	0	2.26	2.57	0.38 - 13.4
Grand multiparae	0	0	8	100	0	0	0	0	0 - 0
Teenage pregnancy	0	0	5	100	0	0	0	0	0 - 0
Recurrent foetal losses	1	9.1	10	90.9	0	0	1.01	1.01	0.15 - 6.72
Pregnancy induced hypertension	6	7.3	74	90.3	2	2.4	1.11	1.12	0.53 - 2.34
Gestational diabetes	1	7.1	13	92.9	0	0	0.79	0.77	0.12- 5.35
Multiple pregnancy	0	0	19	0.5	2	9.5	0.78	0.76	0.20 -3.03
Abnormal lie	2	15.4	11	4.6	0	0	1.75	1.89	0.47 - 6.52
Breech presentation	1	2.5	39	97.5	0	0	0.26	0.24	0.04 - 1.83
Polyhydramnios	0	0	1	100	0	0	0	0	0 - 0
PROM	0	0	19	100	0	0	0	0	0 - 0
Anaemia	0	0	18	100	0	0	0	0	0 - 0
Chronic illnesses	0	0	29	100	0	0	0	0	0 - 0
Infertility	0	0	04	100	0	0	0	0	0 - 0
Antepartum haemorrhage	8	34.8	15	65.2	0	0	4.68	6.65	2.41 - 9.09
Rh. isoimmunization	1	7.7	11	84.6	1	7.7	1.75	1.89	0.47 - 6.52
Pre-term delivery	0	0	11	91.7	1	8.3	0.92	0.92	0.14 - 6.20
Post-term delivery	0	0	16	100	0	0	0	0	0 - 0
More than one risk	6	9.1	57	86.4	3	4.5	1.69	1.79	0.83 - 3.42

RR: Relative Risk

ODD: Odd Ratio

CI: Confidence interval

Table 16: Perinatal mortality rate of risk factors in the study groups

Outcome Risk Factor	Still birth N	%	Alive birth N	%	ENND N	%	PMR/1000
Elderly primigravida	1	20	4	80	0	0	200
Grand multiparae	0	0	8	100	0	0	0
Teenage pregnancy	0	0	5	100	0	0	0
Recurrent foetal losses	1	9.1	10	90.9	0	0	90
Pregnancy induced hypertension	6	7.3	74	90.3	2	2.4	97.6
Gestational diabetes	1	7.1	13	92.9	0	0	71.4
Multiple pregnancy	0	0	19	90.5	2	9.5	95.2
Abnormal lie	2	15.4	11	84.6	0	0	153.8
Breech presentation	1	2.5	39	97.5	0	0	25
Polyhydramnios	0	0	1	100	0	0	0
PROM	0	0	19	100	0	0	0
Anaemia	0	0	18	100	0	0	0
Chronic illnesses	0	0	29	100	0	0	0
Infertility	0	0	4	100	0	0	0
Antepartum haemorrhage	8	34.8	15	65.2	0	0	347.8
Rhisoimmunization	1	7.7	11	84.6	1	7.7	153.8
Pre-term delivery	0	0	11	91.7	1	8.3	83.3
Post-term delivery	0	0	16	100	0	0	0
More than one risk	6	9.1	57	86.4	3	4.3	136.4

3.11. Causes of perinatal mortality:

Table 17 shows the most common maternal and foetal perinatal mortality causes.

The majority of stillbirths had mothers which their pregnancies were complicated by APH (33.3%), followed those had mothers with severe PIH (25.9%), then mothers who had gestational diabetes 7.5%, mothers whom their pregnancy were complicated by both PIH and APH, the least percentage of stillbirths for mothers who had history of Rhesus-isoimmunization or those who had antiphospholipid syndrome (3.7%) for each.

Regarding the ENND, the most common among those with mothers who had severe PIH (44.4%), followed by gestational diabetes (22.2%) and the least were for combination of PIH and APH in the same pregnancy.

The foetal causes (**Table 17**) showed that, birth asphyxia represented the major cause of stillbirth (66.7%), prematurity represented in 33.3%.

Regarding the ENND, the major causes were prematurity (44.4%), followed by those presented with multiple congenital anomalies (33.4%), then neonatal sepsis was the cause of death in 22.2% of the neonates among their first week of life.

Table 17: Causes of perinatal mortality in the study group

Causes	Stillbirth		ENND	
	N	%	N	%
1- Maternal:				
Severe PIH	7	25.9	4	44.4
APH	9	33.3	0	0.0
PIH + APH	3	11.1	1	11.2
Abnormal presentation	4	14.8	0	0.0
Gestational diabetes	2	7.5	2	22.2
Rh. isiommunization	1	3.7	0	0.0
Anti-phospholipid syndrome	1	3.7	2	22.2
Total	**27**	**100**	**9**	**100**
2- Foetal:				
Prematurity	9	33.3	4	44.4
Foetal distress	18	66.7	0	0.0
Multiple congenital anomalies	0	0.0	3	33.4
Neonatal sepsis	0	0.0	2	22.2
Total	**27**	**100**	**9**	**100**

3.12. Early neonatal events:

Table 18 shows the events among the newborns during the follow up, in the first week of life.

The majority of the newborns completed the first weeks of their life normally, were 297(75.8%). Those who developed jaundice were 27(6.9%), those who developed umbilical infections were 16(4.1%) and those who developed neonatal sepsis were 33(8.4%) and the deaths during the first week were 9(2.3%). Others who had hypoglycemia, hypothermia and difficult in feeding were 10(2.5%).

Table 18: Follow up results in results in the first week of life

Follow up	Frequency	Percentage
Normal	297	75.8
Death	9	2.3
Jaundice	27	6.9
Umbilical infection	16	4.1
Neonatal sepsis	33	8.4
Others	<u>10</u>	<u>2.5</u>
Total	**<u>392</u>**	**<u>100</u>**

DISCUSSION

In a three months period, 66 mothers in SUH and 334 mothers in OMH had been selected and studied for their high-risk pregnancies; their outcome had been evaluated. It was found that there was no statistical difference in maternal characteristics between the two hospitals.

4.1. Maternal characteristics:

Maternal age, which was dominantly found in this study was the age group of 25 - 29 years in both hospitals, while mothers in the extreme of age (less than 20 and more than 40 years) were represented by percentage in both hospitals, 3%, 1.5% in SUH and 6.9%; 3% in OMH respectively. The Predominance of this age group 20 -29 years is consistent with the fact that, this is the age of higher reproductivity. The difference in maternal age between both hospitals was statistically insignificant.

Maternal education when studied showed that, those spend 7-12 years of education were highest in both hospitals, 56.1% in SUH, 52.7% in OMH, and this reflect an average duration for education among Sudanese female (higher schools), illiterate represent the least percentage among the study group, this in contrast to Babiker M, [15]study who found that, the illiterate were the predominated (one third in Ibrahim Malik Hospital and half in Abayazeed Hospital), also

it appears to be different from the findings in the Sudan Demographic Survey[15], where it was found that 60.4% of the women in the Northern State were illiterate, similar finding in Ibrahim M[14] who did a community based study were the predominate were illiterate mothers followed by those educated 12 years or more. These findings can be explained by the more awareness of the female towards education. Education distribution was statistically insignificant in the two hospitals.

Inspite of high percentage of educated mothers among the study group, majority of the mothers were housewives, compared to Ibrahim M[14] study were the majority of mothers were working,1373 vs. 76 were housewives. The same as the studies done outside Sudan, where paternal work gets an essential predominater in the outcome, in producing healthy babies with good housing condition, this can be explained by that, in Sudan, husbands were the main supporter to the family. It was found that the occupation distribution statistically insignificant among the study group in both hospitals.

Regarding the parity, the major groups of mothers were those who had no living babies (PG or had recurrent foetal losses) in the two hospitals, while those who had 4-6 previous births were 6.1% in SUH and 17.1% in OMH. Grand multiprae represented lesser percent (6.1%) in SUH and 30% in OMH, compared to Abdel Aziz

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study,[13] where primigravida were 23.1% and multigravida were 41.5%. About 40% of women in developing countries, compared to 6% in developed countries, have four or more children,[24] This findings can be explained either by the change in behaviour about extended families in Sudan or due to marriage of females at older age. The difference between the two hospitals in maternal parity is statistically not significant.

4.2. Infant and social characteristics:

Among the study group, the outcome represented twin deliveries in 4.7%, while singleton were 95.3%, the percent were comparable between the two hospitals as well as the sex distribution were the male predominated in the two hospitals.

Among the outcome in the study, terms were the majority (75%) followed by preterm (20.3%) and post-terms (4.8%), compared to Elamin B[60] study, which represented that, the post-term deliveries were 3.6% in OMH and Ibrahim M[14] study, 20.6% were pre term while 79.4% were term. This result may be attributed to that, both SUH and OMH are tertiary hospitals and the majority of high-risk mothers are referred there for their good monitoring and obstetrical care.

The distribution of the monthly income among the study group showed the predominance of those with monthly income of less than

40,000 SD in both hospitals, where the least percent for those with monthly income of 100,000 SD or more in both hospitals. It was found that, the predominant group in this study of low monthly income. The difference between the two hospitals regarding the monthly income of the mothers, found to be statistically insignificant. Regarding the parents consanguinity, the majority of the married is from the first degree relatives (39.4%) in SUH and 31.1% in OMH, while married from unrelated parents (22.7%), (35.3%) in both hospitals respectively and this reflected that, still in Sudan, they call for marriage within the same family. The distribution of the study group according to parent consanguinity is statistically insignificant between the both hospitals.

4.3. Adverse outcome of the previous pregnancies:

Among the study group, mothers who had no history of bad events throughout their last pregnancies and deliveries were predominant in this study. But those who had history of stillbirths were 9%, ENND were 7% and abortions were 23%. This can't be explained.

The majority of the study group, who had previous history of losses, did not know the exact cause of their stillbirths (33.3%), while others gave history of PIH, APH and premature deliveries. While febrile illness represented the major cause of deaths among the ENND

(28.6%), followed by prematurity and congenital malformations. This was explainable even theoretically.[2,39].

4.4. Outcome of the current pregnancy:

In this study, the predominate were live births in SUH and OMH (88.2%, 92%) respectively, while perinatal deaths were 8(11.8%) in SUH compared to 28(8%) in OMH with PMR of 11.8/100 births in SUH and 8/100 births in OMH, these finding compared to Ibrahim S[12] study where the live births were 95.6%, stillbirths were 2%, ENND were 1.8% and LNND were 0.6%. A/Aziz[13] study represented 94.9% of the infants were a life, while 5.1% were stillbirths, so the results from this study is comparable with the previous studies.[12,13]

4.5. Relation between outcome of the current pregnancy and the maternal character:

The predominate stillbirths and ENND (9.9%) and (3.7%) were found among the age group 25-29 years, while the least percent of both stillbirths and ENND were found among the age group less than twenty and more than fourty. In contradistinction with other studies, Ibrahim S[12] proved that, an unfavourable outcome occurred among teenage mothers and mothers over 34 years compared to mothers age 20-29 years. A/Aziz (13) also studied the maternal age versus the outcome, he proved that the perinatal

mortality increase with increasing age in Khartoum Teaching Hospital where the perinatal mortality was 100/1000 births for the mothers age under 20 years, 81/1000 births for those aged 20 - 29 years and 26.3/1000 births for the mothers above 30 years. So increasing in the perinatal mortality by age, except for these below 18 years old.[13] So it has been proved that, pregnancy at extremes age, increase risk of maternal and foetal morbidity and mortality,[2] there were many studies[15,21,23] proved that, pregnancy in advanced age carry risk of complicated pregnancy with PIH, APH, malpresentation, preterm delivery and more risk to the baby with IUGR and congenital malformation. Also it increased the incidence of C/S with a significant high stillbirth rate and the incidence of perinatal morbidity and mortality is three times more than the outcome of pregnancy in younger groups.[22] On the other hand, teenager pregnancy carried the same complication for both mothers and fetuses.

The results in this study may be explained to the fact that mothers' age 20-29 years were the predominater. Inspite of these the relation between maternal age and the outcome of the last pregnancy was statistically in significant.

The education of the mothers, reduced the adverse effect of the pregnancy, mothers educated for more than 13 years had the least

number of both stillbirths and ENND 2.9% and 0.0% respectively, while illiterate mothers had the higher stillbirths and ENND 16% and 2% respectively, and these goes with other studies which proved that, any additional year in education is associated with a reduction of PNM by 0.036, so five year education will be expected to reduce child mortality by 18%.[13] The difference in the outcome by maternal education was statistically insignificant.

Mothers without previous live births, had stillbirths were 7.8% and their ENND outcome were 1.1% compared to mothers who had seven or more previous births, their outcome were all alive (100%), while mothers with previous births (4-6) gave 91.8% alive, 8.2% stillbirths and no ENND. That, mothers who had no previous live birth including the primigravida and those who had frequent foetal losses, so the chance to lose the last pregnancy is more due to existence of the cause, can explain this. The relation between the parity and the outcome was statistically not significant.

4.6.Relation between the adverse outcome of the previous pregnancy and the outcome of the current pregnancy:

Mothers who had previous stillbirths of four or more had 100% chance of the outcome to be stillbirths with no live births and no ENND, compared to the others who had no past history of stillbirths, their outcome were 5.2% stillbirths, 4.2% ENND and the rest

(92.6%) were alive births. The same as in the mothers who had history of ENND, her outcome were 92.9% live births, no stillbirths and 7.1% ENND, while those with no previous history of ENND, 90.9% of their outcome were alive, 7.3% stillbirths and 1.9% were alive births. The same as in mothers with history of abortion, stillbirths were 12.8%, live births were 84% and ENND were 3.2%, that is the most serious risk factors, the adverse outcome of the previous pregnancy, mother with a previous stillbirth had seven times the risk of stillbirths and more than twice the risk of NND in the current pregnancy.[12] Awan conducted in a local urban community identified the previous pregnancy loss as a predictor in determining the risk category of the expectant mothers, among this respondent, 76%gave history of no fetal loss, while 21% gave history of 1-2 fetal losses and 3% reported of 3-6 foetal losses, also he found that among mothers who had one or two previous foetal deaths, the pregnancy wastage rates 1.4 times as high, and amongst respondents with a history of 3-6 foetal deaths, the rate of wastage of the current pregnancy were almost four times as high.[16] There was statistical significant between previous fetal losses and the outcome of the current pregnancy for previous stillbirths and abortions.

4.7. Events of the current pregnancy:

The majority of the study group, attended the ANC (5-8) visits throughout their pregnancy (53.4%), while (22.3%) were attended more than eight visits, 18.5% were attended (1-4) visits and 5.8% of the study group didn't attended the antenatal clinic, in contrast to Ibrahim M[14] study 37% of the mothers did not received ANC during their pregnancy.

Corresponding to this, the majority of the mothers started the ANC since the first trimester, while lesser number delayed it tell the third trimester and mothers who were seen by doctors out numbered the other sectors, 79% compared to 12.2% seen by traditional midwives and 0.5% by traditional birth attendant and health visitors.

The ANC among this study group was higher than other studied done in Sudan, A/Aziz in his study [13] which involved 8858 mothers in three major hospitals in Khartoum State, he found that, 31.8% of them had no ANC, 28.7% with eight or more visits. Ibrahim S [12] in his study, initially, the frequency of antenatal visits had a marginally significant effect on the outcome of pregnancy. Following intervention, this effect becomes highly significant. Both PNMR and NNMR improved significantly (from 38.4 to 28.2/1000 births, 21.8 to 17.5/1000 birth respectively) with overall reduction in death rate. Elkatim[19] by using prospective cohort-study of ANC user and non-user and assessed their outcome, he found that 84% of the women

attended the ANC, while 16% did not of which the majority were primigravida and grand multiparous.

Among the study group, the highest percent of stillbirths (26.1%) found among those who didn't attended the ANC, their live births were 69.6% and ENND were 4.3%, compared to the mothers who attended eight and more times, the stillbirths were 3.4%, live births were 95.5% and ENND were 1.1%. These findings were corresponding to the other studies done in Northern England and Wales, where Vause[24]and others used records of 20771 women to explore the relationship between number of ANC visits and adverse perinatal outcome, they found that, the lesser the number of visits, the more the risk of perinatal morbidity and mortality beside the higher risk of C/S.

There was statistically significant difference when the variation in the number of ANC visits is considered, and the outcome of the current pregnancy.

Similarly, the starting of the visit in the first trimester, represented the least percent of stillbirths (3.9%), live births were 69.6% and ENND were 2.2%, compared to those who attended in the 3rd trimester of in those who never attended, the stillbirths were (26.1%), (8.8%) respectively, so the relation was statistically significant (P = 0.007).

The conductor of ANC also played major role in the outcome among the study group. Stillbirths among those conducted doctor for their antenatal care were 4.7% compared to 10.5% in whom conducted midwives and 0% in both birth attendant and health visitors and this variation may be attributed to the large number of mothers conducted doctors 97(79%) compared to 0.5% in both birth attendants and health visitors. The relation between the conductor of ANC and the outcome was found to be statistically significant.

Tetanus toxoid vaccination had received adequately by the study group, where whom received one dose were 19%, two closes were 42%, booster dose were 13.5% compared to 25.5% mothers who did not received the vaccine. This findings were similar to that obtained by Babkier M[15]study, where the majority of mothers under that study were received tetanus toxoid (68.4% in Ibrahim Malik and 84.1% in Abayazeed hospital) and this reflect the good awareness of the mothers about the importance of tetanus vaccination, beside the availability of the vaccine in any health sectors. This elevation in the percent of vaccinated mothers, correspond to the WHO recommendation in Lahore (1982) aiming for neonatal tetanus less than 1/1000 live births by 1990 and zero by 2000.[98]

Also the correlation between receiving tetanus toxoid vaccine in the pregnancy and the outcome of that pregnancy, also was studied and

it was found that, it was statistically insignificant (P = 0.053), where mothers who received the vaccine had one or two doses, had (92.1%, 93.5%) live births, (5.3%, 4.2%) stillbirths and (2.6%, 2.4%) ENND respectively compared to those did not received the vaccine, had 83.3% live births, 13.7% stillbirths and 2.9% ENND and it also statistically insignificant.

Malaria, anaemia and febrile illness represented the major illness during pregnancy, 21.99%, 9.64% and 7.53%, while other chronic illness such as renal, liver cardiac represented 1.2% among the study group. Similar finding in Ibrahim M [14] study where malaria was the major illness, represented in 61% followed by anaemia in13% of the study group. This in fact not related to the pregnancy, but it adds more seriousness to its outcome for both mother and foetus.

Major medicine used during pregnancy, fefol, which used by 58.2% mothers followed by others medication (16.97%), the predominant of them were antibiotics, aspirin, while other types of medicine such as antihypertensive or hypoglycemic drugs were used accordingly, this finding reflect the awareness of the mother in using medication during pregnancy, especially tonics, this reverse the idea about harmful effect of drugs during pregnancy.

4.8. Labour:

Type of delivery showed that the majority of the mothers in the study group were delivered by C/S (58.7%), followed by NVD (26.3%), induction (10%), instrumental (4.9%) and this higher percent of C/S among the study group, can be explained either by the highly complicated risk pregnancy that included in this study or the outpouring of obstetrician toward C/S as safest method among high risk mothers. When weighing to the other mode of delivery. Compared to A/Aziz[13] study, where he found that, the most of delivery among studied mothers were as follows, 88.6% spontaneous vaginal delivery, 6.9% induced, and elective C/S among 4.2%, here the predominant mode of delivery were spontaneous delivery compared to C/S in this study, this can be explained by that, A/Aziz[13]studied all mothers who delivered in three major hospitals during 1975 - 1979, while in this study selected only the high risk mothers whom their pregnancies and labour were complicated enough and necessitate C/S.

Mothers whom presented by complications during labour were 24.1% and this may explained the half of the causes of C/S.

The most common complications occurred during labour in the study were obstructed labour, which occurred in 7.6%, PPH (6.5%), failure of progression in 2.4%, although C/S rate was high, there were three

cases of ruptured uterus among the study group. Compared to A/Aziz study,[13] where 14% of the studied mothers had complications during delivery, where obstructed labour presented in 6.4%, PPH in 2.2% and preterm labour in 1.9%.

4.9. Postnatal events:

Those with Apgar Score seven and above represented the majority, throughout the duration Apgar assessment, those with Apgar seven or more at 1 min were 76.6% at 5 min were 88.1% and at 10 min were 90.9%, while those below seven score were 14.8% at 1 min and 3.3% at 5 min and 0.5% at 10 min.

In the other hand, with this good percent of newborn with favorable Apgar among the study group, the resuscitation techniques needs only to 14.3% of the newborn in the study and only in 5% of them the duration of resuscitation took more than 10 min. These findings reflect that those at risk fetus handle proper at the level of the labour room, by attending of professional person and availability of resuscitating equipment at the two hospitals. Corresponding to the recommendation of American Academy of Paediatric[99] to establish at every delivery room, two person at least skilled in all aspect of neonatal resuscitation with a complete equipment needed for this purpose.

Majority of the newborn delivered not stained with meconium (85.7%) while 14.3% delivered stained, so as to prevent meconium aspiration pneumonia, which occurs in 5% of those stained with meconium. Among them 30% need mechanical ventilation.[95]The finding of this study is corresponding to Kat[96] study, he found that, the rate of meconium stained was (18.1%), majority of them, their pregnancy were complicated by oligohydramnios (95%) and it associated with low Apgar Score at 1 and 5 min beside high admission rate to NICU.

Mainly the newborns were delivered normally (92.4%), while 2.9% had congenital anomalies, 1.6% had cephalohematoma and 4.2% had trauma.

Those small for date represented 14.3% of the newborn in this study, while large for date were 10.7% and those appropriate for date were 75% of the newborn. This can be explained by that most of the risk factors during pregnancy affect directly into the foetus weight (PIH or gestational diabetes).

Regarding the length, those with equal or below the 3rd centile were 3%, while those more than 97th centile were 4.4% and those 10th - 90th were 82.6%, so the changes in lengths among the newborn in this study were not related directly to the risk factor.

Regarding the head circumference, those with H.C of or less than 3rd centile 10.5% more than 97th (14.5%), when concerning those more than 97th centile for length (4.4%), the rest of 10.1% of HC more than 97th centile represented those with macrocephaly.

Relation between the different measurement of the newborn and their outcome in the study, revealed that, those with the mean weight (for a live births) were 2.919kg and for ENND were 1.712 kg. For length, mean length for a live birth was 47.874 cm and for ENND was 34.5cm, for HC, the mean HC for a live birth was 33.47cm, for ENND was 26.4 cm. This reflects that, newborn that died at the first week of life measured less in their weight, length and head circumference compared to alive births and continue alive.

4.10. Admission to NICU:

In both SUH and OMH, there were well-established nursery and the admission to it by paediatric registrar who is available to attend all of the deliveries of high- risk pregnancies.

In this study, 19.8% of the newborns were admitted to NICU. The main cause of admission was prematurity (37.3%) followed by neonatal infections (19.3%), birth asphyxia (14.5%), then the other causes. So admission to the NICU, seem to be adequate and concerning to the need of the neonates only. These findings compared to study done in U.K where the admission to the NICU

determined by bed availability, rather that the need.[106]On the other hand, unnecessary admission, also harmful for both baby and mother in term of mother-child relationship,[107] also for the capacity and resources in NICU.

Among those admitted to NICU (12%) were ENND i.e. all of early neonatal deaths had been admitted and managed in the nursery and 74(88%) were alive births, this found to be statistically significant.

The majority of the newborn (79.6%) were breast fed within the first 24 hours of their life. While those who did not breast fed till the end of the first week of their life were 4.6%. This high percent of breast fed babies goes with the recommendations of WHO (1993) to promotes breast feeding for all the newborn.[7]

4.11. Postnatal outcome:

When excluded the percent of the stillbirths from the study group, newborn were discharged postnatally without follow up were 90.9% and those needed to be seen in the referral clinics were 20.5% and this finding is comparable.

4.12. Risk analysis:

PIH represented the major risk factors among the study group (19.8%), followed by those their labour complicated by breech presentation (10%), then mother with medical illness (7.3%), followed by APH (5.8%), multiple pregnancy, prolonged ruptured of

membranes then anaemia, Rhesus-isoimmunization, then recurrent foetal losses and grandmultiprae, elderly primigravida and teenager represented in 1.3% for both, the least risk among the study group were infertility, pre-and post-term delivery. This distribution is more or less equivalent to the incidence of each of the risk.[2] Also A/Aziz[13] found that in his study, the most prevalent complications were PIH followed by anaemia, then APH, preterm deliveries, breech presentation.

Association of the risk factor with the type of delivery beside the obstetrical intervention for each type also were studied and the results were obtained, it was found that, the highest rate of C/S occurred among risks infertility (100%), abnormal lie and presentation (76.9%, 75%) respectively, gestational diabetes (78.6%), APH (65.2%) and mothers who had recurrent fetal losses (54.5%), while delivery by induction, used frequently in post-term deliveries (37.5%) and among mothers with history of Rhesus-isoimmunization (23.1%).

Instrumental deliveries (forceps and ventouse) were used frequently among teenager and pregnancy with abnormal lie (20%, 23.1%) respectively. The majority of grandmultiprae (62.5%), mothers with anaemia (66.7%) and those with multiple pregnancy (33.3%) were delivered by NVD.

Those findings were compared to other findings done in different studies, A/Aziz[13] proved that, among grandmultiparous the most common mode of delivery was spontaneous vaginal deliveries (88.5%) compared to primiparous (77%), while instrumental was less in grand (2.1%) versus (8.5%) in primiparous. Also Elias M[36]proved that in his study, the C/S rate found to be high (48.8%) among mothers with PIH. Al-mulhim[37] in Saudi-Arabia found the NVD among PIH mothers was 69.2%, while instrumental deliveries were 15.9%, induction was (22.81%).

Elamin N (1997) proved in her study that C/S is the best way to deliver multiple pregnancy, for better perinatal outcome.[47]

A study done in OMH among post-term deliveries, it was found that, the rate of C/S among them was 7.9% and the macrosomia was the main indication.[60]

Elamin EA[64], studied 79 primigravida for their breech presentation, he found that 29% delivered vaginally, and C/S rate was 71%. It was found that, the mode of delivery according to risk factors in the current pregnancy, statistically highly significant.

The most serious relation among this study which linked between risk factors and the outcome, where the highest percent of stillbirths found among pregnancies complicated by APH (34.8%), followed by those presented with abnormal lie (15.4%), then among those who

had frequent foetal losses (9.1%) and among these with PIH cause stillbirth (7.6%). These findings can be explained by that, those risk interfere more the delivery of the baby and the intrauterine situation (APH, abnormal lie) so more prone to produced stillbirth. This relation was found to be statistically highly significant. Cause of ENND occurred among multiple pregnancy (9.5%) followed by pre-term labour (8.3%), then Rhesus-isoimmunization (7.7%). PIH causes 2.5% of ENND, while the combined risk factors produce more stillbirths (9.1%) than ENND (4.3%).

The causes of ENND were more interfere with the newborn his/herself either by prematurity or by causing serious neonatal complications such as infection, heart failure and IUGR.

Over all, relative risks of perinatal deaths were 4.68 for those presented with APH, 1.11 for those with PIH and 1.75, 0.26 for those with abnormal lie and breech presentation respectively.

Elias M proved that, the perinatal mortality was (14.3%) among mothers with PIH and prematurity was found to be commonest cause of perinatal mortality.[36]

Mohamed G, found that complications such as respiratory distress and prenatal loss were significantly higher in diabetic mothers, in his study in OMH (1999).[41]

Moreover, deaths in multiple pregnancy, due to RDS and birth asphyxia beside the risk of vascular communication with the risk of embolization.[45]

In study to assess the outcome among preterm delivery,[56] stillbirth rate was 12.8% while ENND rate was 12.2%.

Elamin B in her study in OMH, found that among post-term deliveries, the rate of stillbirths, neonatal death, congenital malformation were all more and the perinatal loss was 5.5%.[60]

Elawad E in his study among breech presentation, there were only two cases fresh stillbirth, due to traumatic delivery and they seem to be avoidable death.[64]

Lowen and others also studied the perinatal morbidity among anaemic mothers, found risk of IUFD were more among the studied group by 3.7 times than the non-anaemic mothers.[67] So the relation between the risk factors and the outcome of the current pregnancy, in this study was statistically highly significant.

In these study, the preinatal mortality rate was variable according to the risk factor, there were no deaths among teenager mothers, while the elderly primigravida there was one death, with PMR of 20/100 births and these finding similar to Abdalazyz study[13], the PMR was 100/1000 births when the mothers aged under 20 years and 81/1000 births when the age 20-29 years and 216.3/1000 births for

those above 30 years, thus the perinatal mortality increase with increasing age. Significant PMR occurred in those presented with APH 35/100 births followed by elderly primigravida (20/100 births) and abnormal lie (15/100 births), in contrast to Babiker.M study[15] where prematurity carried 16 times risk of PMR compared to maturity, more over, the maternal illness such as PIH, APH, malaria and anaemia were associated with perinatal losses.

4.13. Causes of perinatal mortality:

When studied, both maternal and fetal causes still APH was found to be the major cause of stillbirths among the outcome of the study (33.3%), followed by severe PIH (25.9%), then abnormal presentation (14.8%), which included both breech and shoulder presentation. Diabetes was the major maternal illnesses (7.5%), that lead to still birth due fetal macrosomia so traumatic delivery. while severe PIH was the major cause in ENND followed by gestational diabetes and antiphospholipid syndrome. These result also explainable by the fact that, the risk which interfere the labour (APH) lead more to stillbirths, while risks interfere the growth of the baby (severe PIH) (44.4%) lead to death in early neonatal period.

Regarding foetal causes, fetal distress represented the major cause of stillbirth among the outcome (66.7%), followed by prematurity, while it represented the major cause of death among ENND,

followed by those with multiple congenital anomalies (33.4%) and neonatal sepsis (22.2%). The percent of birth asphyxia appear to be higher, the general incidence of death from asphyxia (20-50%),[111] but in the study done, Ibrahim[12] proved that, birth asphyxia was directly responsible of 46% of stillbirths and 50.2% of ENND, which 15.5% and 2.1% of the ENND were due to LBW and congenital malformations, respectively.

4.14. follow up in the first week of life:

Most of the newborns were complete their first week of life without complications (75.8%), while (2.3%) died, and (6.9%) developed jaundice, majority of them were physiological, while only one case due to ABO incompatibility. Those who developed umbilical infections were 4.1% (those discharged home) they had been managed there. The majority of the infants developed sepsis with different focus of infections (mainly chest infections) and they were presented by hypo/hyperthermia, refusal of feeding and jaundice, they had been readmitted to the hospitals and received treatment there. There were 2.5% developed other complications such as hypoglycemia, transient tachypnea, hypothermia and difficulty in feeding due to technical problems (especially in primiparous). This high percent of neonatal infections mainly occurred after discharged, reflect the bad housing conditions and poor sanitation.[39]

CONCLUSIONS

- The majority of the mothers in this study were in high reproductive age (20-29 years).

- Illiterate was less among mothers in this study, most of the mothers were housewives and husbands were the main supporter and majority of the families were of low monthly income, first degree consanguinity, was also reflected in this study.

- Most of the mothers in the study received ANC and appropriate doses of tetanus toxoid.

- The most serious risk is the adverse effect of the previous pregnancy, these results simulates other studies, history of 4-stillbirth give 100% chance of the current pregnancy to be stillbirth.

- The predominant out come in these study were live births in both hospitals, with PMR of 11.8/100 births in SUH and 8/100 births in OMH.

- Maternal illness which affected more to the outcome were PIH, APH, anaemia, on the other hand, common maternal complication during labour were, abnormal lie and presentation (breech) and this to some degree cause the main factor in increasing the C/S rate among study group.

- PMR varies according to the risk factors, it increase with increasing maternal age and illness such as APH, PIH and

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abnormal lie of the foetus during pregnancy, while prematurity carried least perinatal losses.

- The type of delivery was selected according the risk factor also the outcome was affected by the obstetrical intervention as well as the availability of paediatrician or skilled persons of the level of labour room, for assessment of the newborn.

- This study proved that, resuscitation is essential procedures that start at the level of labour room.

- Anthropometrical measurements of the newborns were differ according to the risk factors influence, and the predominant of early neonatal death were of mean weight 1.8 kg, and mean length of 34 cm and mean head circumference of 26 cm.

- Study concluded that, admissions to NICU were efficient and appropriate according to the causes.

- There was strong correlation between risk factors and the outcome, which included, alive birth (91%), stillbirth (6.7%) and ENND (2.3%) and this were comparable to the other studies.

- Maternal causes associated with perinatal deaths were APH, severe PIH, abnormal presentation and APH with PIH.

- Birth asphyxia was the major cause of death in our community, and occurred in almost two third of the stillbirths and ENND in this study.

RECOMMENDATIONS

- Most of the risk factors during pregnancy in this study, are preventable, these include maternal illiteracy, lack of ANC follow up, most of maternal illness during pregnancy are manageable if they are detected earlier, so as more concern to mothers health, through education programmes, more care about ANC clinics.

- More care about mother with bad events in their previous pregnancies and especially those without living babies.

- Special labour room for those with high risk pregnancy, equipped to face their needs with regular monitor for both mother and baby (U/S machines, CTG ..).

- Training of midwives, nurses about resuscitation, beside the availability of paediatrician in any risk pregnancy, and providing all equipment that need in resuscitation at the level of labour room (according to AAP recommendation).

- Admission to NICU should be in a proper way, and the nursery should be full constructed so as to achieve its goal.

- Proper follow up, for infants at risk by encourage mothers to attend the referral clinics.

- More studies should be done and more record and documentation about mothers and child health.

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