PERINATAL MORBIDITY AND MORTALITY AMONG BABIES DELIVERED BY CAESAREAN SECTION AT PUMWANI MATERNITY HOSPITAL

A thesis submitted in part fulfillment of the requirements for the Degree of master of Medicine (Paediatrics) University of Nairobi.

By

DR NGUGI.M.J, MBCHB

2009

DECLARATION

I declare that this dissertation in part fulfillment of Mmed (Paediatrics and child health) is my original work and has not been presented to any other university forum

Signed ..... Date 9/11/09

NGUGI MJ, MBCHB

This dissertation has been submitted for consideration with our approval as university supervisors.

Signed ..... Date 12/11/09

MBORI NGACHA D., MBCHB, M.MED, MPH,
ASSOCIATE PROFESSOR OF PAEDIATRICS
DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH,
UNIVERSITY OF NAIROBI.

Signature ..... Date 10/11/09

F. WERE, MBCHB, M.MED, FELLOW OF NEONATOLOGY MED. (AUSTRALIA),
ASSOCIATE PROFESSOR OF PAEDIATRICS,
DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH,
UNIVERSITY OF NAIROBI.

DEDICATION

This is a special dedication to my wife Josephine and children. Ruth and Immanuel.

ACKNOWLEDGEMENT

I thank God for having preserved my life during the time of this study and for giving my family patience and ability to cope with my schedule. My family's inspirations, encouragement and sacrifice during the period of this study strengthened my will.

Special thanks to my supervisors Prof Mbori Ngacha and Prof Were for their time, guidance and encouragement when I felt lowly.

I do appreciate the support I got from staff members in the department, from my fellow students and from staff at Pumwani Maternity Hospital especially from Mrs. Gathura during the data collection.

May God bless each one of you for the part you played.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

DEFINITIONS AND OUTCOMES

ELECTIVE CAESAREAN SECTION

Caesarean deliveries was classified as elective if the operation was decided by the attending staff before the onset of labour and any woman referred either from an antenatal clinic other clinics or hospital to the labour ward for caesarean delivery before the onset of labour. Those who went into labour before the elective caesarean was performed but were delivered by caesarean before any fetal distress or maternal complications were still classified as elective.

EMERGENCY CAESAREAN SECTION

Emergency caesarean was any operations carried out as a result of some complications arising during labour whether labour was spontaneous or induced. Operation due to premature rupture of membranes, ante partum hemorrhage or cord prolapse even without labour was classified as an emergency.

INTRA OPERATIVE OUTCOME

Intra operative fetal outcome was entered as live birth or stillbirth .Stillbirth was defined as any fetus with no sign of life 28 weeks after conception and was further classified as either fresh or macerated. Maceration was defined by discoloration and peeling of the skin leaving areas of raw tissue. For a live birth baby, it was defined as extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which after such separation, showed evidence of life such as heartbeat, umbilical cord pulsation, or definite movement of voluntary muscles, whether the umbilical cord had been cut or the placenta was attached.

GESTATION AND BIRTH WEIGHT

This was calculated from the mother's dates of the first day of last normal monthly period where available or from the ultrasound results where done. Preterm babies were those below 37 completed weeks, term between 37 and 42 weeks while postdates were those above 42 weeks. Low birth weight referred to babies of less than2.5 kg at birth, very low birth weight were those weighing 1500grammes or less, large gestation babies were those weighing 4000grammes and above .

FAVOURABLE OUTCOME

Any baby who remained stable after the caesarean section till discharge or on the seventh day

UNFAVOURABLE OUTCOME

Any baby who after caesarean section, was a stillbirth, died within the first week or developed complications requiring use of oxygen or with inability to breastfeed or feed orally on the seventh day.

CONGENITAL MALFORMATIONS

Obvious malformations of the body parts at delivery.

MORTALITY

This was death of a baby born with signs of life.

1.0 ABBREVIATIONS

ANC	Ante natal care
APH	Ante partum hemorrhage
CPD	Cephalopelvic disproportion
CS	Caesarean section
ENMR	Early neonatal mortality rate
FSB	Fresh still birth
HIV	Human immunodeficiency virus
ICU	Intensive care unit
KDHS	Kenya demographic household survey
LBW	Low birth weight
LGA	Large gestation age
LMP	Last menstrual period
MAS	Meconium aspiration syndrome
MSB	Macerated stillbirth
NBU	New born unit
NEC	Necrotizing enterocolitis
NNJ	Neonatal jaundice
NNS	Neonatal sepsis
PMH	Pumwani Maternity Hospital
PMTCT	Prevention of mother to child transmission
PNM	Perinatal mortality
PNMR	Perinatal mortality rate
PROM	Premature rupture of membranes
RDS	Respiratory distress syndrome
SB	Stillbirth
SVD	Spontaneous vertex delivery
VLBW	Very low birth weight
W H O	World health organization

2.0 ABSTRACT

Background: The rate of caesarian sections globally has increased significantly in the past 20 years. Significant poor perinatal outcome has been documented in increased rates and World Health Organization has recommended a rate of not more than 15% to minimize morbidity and mortality. Recent studies from private hospitals in Nairobi have shown a higher CS rate attended by better fetal outcome. Pumwani Maternity Hospital in a low cost setting handles about 60% of all deliveries in Nairobi province. Operative deliveries are suspected to be high while the outcome of babies delivered by in CS has not been described in recent years.

Objective: To determine the perinatal morbidity and mortality in caesarean section births at Pumwani Maternity Hospital.

Design: Prospective descriptive study

Study population: A prospective cohort of 286 neonates born by caesarean section.

Main outcome measure: Stillbirths, early neonatal deaths and neonatal illness (neonatal sepsis, NEC, jaundice etc) on the seventh day.

Results: The CS rate was 17% with 251(87.8%) of operations being emergency sections. Obstructed labour and fetal distress were the main indications for emergency CS at 30% and 27% respectively while PMCTC was the main indication for elective CS accounting for 54%. There were 40 (14%) early neonatal deaths of which 28(70%) occurred within the first 24 hours. Twenty one (53%) of the deaths were, babies of first time mothers. Asphyxia related early neonatal deaths were 24(60%) while RDS related deaths accounted for 37.5%. Among the 39(13.6%) stillbirths in this study, 12(31%) were MSB. The ENMR and perinatal mortality rates were 161.9 /1000 live births and 276 per 1000 total births respectively. Indications necessitating emergency operations, intra operative maternal complications, and LBW had a significant risk for morbidity and mortality ($p< 0.05$).

Conclusions: Perinatal and Mortality remains high with the leading cause being asphyxia and respiratory distress syndrome. Indications necessitating emergency CS, LBW and peri operative maternal complications were significantly associated with perinatal mortality ($p<0.05$).

3.0 LITERATURE REVIEW

3.1 PERINATAL MORBIDITY

Perinatal morbidity rate defines the number of cases of disease among neonates up to seven days of life per 1000 live births. Newborn transition from intrauterine to extra uterine life requires many biochemical and physiological changes. These include pulmonary, renal, hepatic, immunological, cardiovascular and endocrine functions. Any mal adjustments perinatally lead to morbidities. Common morbidities include asphyxia, meconium aspiration syndrome, respiratory distress syndrome, hypoglycemia, jaundice, early neonatal infections and hemolytic disease of the newborn.

3.2 PERINATAL MORTALITY

Perinatal mortality is death occurring between the fetal viability (28 weeks gestation) and the end of the 7th day after delivery It can also be divided into death prior to labour, (antenatal death), death during labour and early neonatal mortality. Perinatal mortality rate (PNMR) refers to the number of perinatal deaths per 1,000 total births (live and stillbirths) while stillbirth rate refers to death of fetus weighing 500 grammes or more or 28 weeks completed gestation or more per 1,000 total births and is usually reported on an annual basis [1] Comparisons between different rates worldwide may be hampered by varying definitions, registration bias, and differences in the underlying risks of the populations [2] Perinatal mortality varies widely and may be below 10% for certain developed countries and more than 10 times higher in developing countries. The rate reflects the quality and utilization of prenatal, ante natal, delivery and immediate post-delivery care available to women and their newborn infants. It is the most sensitive indicator of obstetric care [1, 3]

Globally, about 130 million babies are born every year and about 9.9 million die perinatally. About 3.3 million of these deaths are stillbirths. The highest mortality rates occur in sub-Saharan Africa, followed by Asia and Latin America [4]. In some of the countries where the mortality is highest, almost 10 percent of babies do not survive more than one month. Unlike in the developing countries where under 5 has remained high mainly due perinatal deaths, developed countries have recorded low rates over the years. In some West African countries for example, the perinatal mortality is so high that babies are only named after the perinatal period [5] According to KDHS (2003), perinatal deaths constituted 32 % of all under five deaths and 82% of all neonatal deaths. In a Nairobi birth survey of 1983, PNMR was nearly twice that of England and Wales in 1970 [6].

Most women in the developing world begin childbearing in adolescence, before reaching biologic and social maturity. These women and their infants risk not only pregnancy-related complications but also sexually transmitted diseases, including HIV infection [7]. Perinatal deaths generally result from complications of preterm birth, asphyxia or trauma during birth, infections, severe malformations, or other specifically perinatal causes. Mortality has also been found to be high in illegitimate or unwanted pregnancies and among mothers with maternal morbidity [8]. In a cross-sectional study at Harare maternity hospital Zimbabwe, women delivering stillbirths and having babies who had early neonatal deaths were less likely to have received prenatal care, were rural residents and were young. Deaths among neonates weighing 1000gm accounted for 50% of the mortality with prematurity being responsible for these deaths. Among neonates weighing 2500gm, deaths were mainly due to birth asphyxia especially among teenage mothers [9]. Rising prevalence of HIV infection, inadequate number of midwives and anesthetists, lack of electronic fetal heart monitors and poor morale among nurses and junior medical staffs also contributed to high perinatal mortality [10]

In Sudan, the risk of an unfavorable outcome in multiple pregnancies was more than nine fold that of singletons. Grand multiparity (greater than eight previous pregnancies) carried almost a similar risk [11] While the true perinatal mortality in Kenya is not known [12]. Renay et al (in a

Kenyan rural study) found a perinatal mortality rate of 118 per 1000 births [13] It is estimated that perinatal deaths in Kenya contributes more than 40% of the under five mortality [2, 14] In a Kilifi study, 10 out of a hundred babies were stillborn or died in the first week of life, 53% of the deaths being due to complications during labour. The risk was higher amongst women without any schooling, with a history of stillbirth and amongst those who had attended fewer than three antenatal appointments. It was also linked with poor nutrition in the mother [13].Many useful interventions have been proposed and implemented for reduction of infant mortality (through immunization and malaria control) but for the newborns, many proposals remain unimplemented [7].

3.3 DELIVERY BY CAESAREAN SECTION

CS is a form of childbirth in which a surgical incision is made through a mother's abdomen and uterus to deliver one or more babies. It is usually performed when a vaginal delivery would put the baby's or mother's life or health at risk although in recent times it has been also performed upon request for births that would otherwise have been normal. Profound changes have occurred during the past three decades regarding the mode of delivery and perinatal outcomes. Changes include recent efforts to reduce high rates of CS while at the same time attempting to incorporate women's obstetric preferences [5] It is one of the most frequently performed operations in women. In the last 20 years, the rate of CS has increased significantly. Though WHO estimates that about 5% of pregnancies require CS to deal with obstetric complications and recommends a CS rate of less than 15%, this figure is considerably exceeded in the West, Latin American and Asian countries [15]. In the United States for example, rates have risen to above 40% in some hospitals, whereas in Latin America, rates of up to 70% have been reported. Sub Saharan countries on the other hand are different with rates of less than 5% being quoted [1]

There is a great disparity in CS rates between countries. With the exception of Kenya and possibly Ghana, the rate of CS is well below 5% and has either remained low or actually fallen between the early and late 1990s [5] Extremely low CS rates, such as less than 1%, may indicate

substandard maternity care. Poor safe motherhood programmes, lack of access to health facilities, improper referral systems, reluctance to accept referrals by patients and relatives or lack of transport to health facilities have been associated with the low CS rates in some of these countries [16]. The estimated rates of CS in cities are higher than in rural areas, reflecting the differential use of maternity services, whereby 80% of deliveries occur in the city hospitals compared to only 20% in the rural areas [14] In Kenyatta National Hospital for example, the rates have been rising from 18% in 1977-80 to 29.1% in 1998, Nairobi Hospital had CS rates of 30 % in 1996 and 46.9% in 2004 while in Aga Khan Hospital Nairobi, the rates have been rising to current rate of 37% [17, 18, 19] According to data collected through the routine health information system of the ministry of health, the rate of hospital-based caesarean section from rural Kenya averages 6.3% of all births whereas the rate of population-based caesarean section is 0.95% (range 0.1%-4%) [3].This rate of population-based caesarean section indicates a significant unmet need for obstetric care in the rural areas.

The determinants of rising CS rates are obstetric, medical, professional and individual-related. They also vary between teaching and non-teaching hospitals, private and public hospitals, solo and group practice, different socio-economic status of the patients and round-the-clock availability of ancillary support like anaesthetic, paediatric and blood bank services. Increasing avoidance of instrumental assisted delivery, the current delivery of all breeches by caesarian section, early detection of fetal jeopardy by cardiotocography and ultrasonography, prevention of mother to child transmission of HIV and avoidance of trial of scar have also led to the rise in the rate. In developed countries the main reason for increasing rates is repeat CS. One study among the developed countries showed that this was responsible for 40% of all CS, a 68% increase between 1979 and 1982 [20] In 1989 the CS rate in the United States of America was 23.8% and 81.5% were repeat cases. The high repeat cases in these countries are possibly as a result of litigation or financial gain. Other reasons for increased rates includes increasing avoidance of instrumental assisted delivery, the current delivery of all breeches by caesarian section, early detection of fetal jeopardy by cardiotocography and ultrasonography, prevention of mother to child transmission of HIV and increasing demand for abdominal delivery by the mothers.

Patient demand for CS has complicated this already complex issue. In the United Kingdom, it was the third commonest indication for elective caesarean section in 1992 [21] while in Nairobi hospital, it was fourth after fetal distress, obstructed labour and repeat scar [18]. Fear of the pain of labour and avoiding injury to the perineum, which may lead to sexual dysfunction, are some of the reasons quoted for the demand. Though repeat CS is increasingly becoming a major indication among Kenyan private hospitals probably due to similar reasons as the in developed countries[17], the most common indications for CS in Sub Saharan countries includes obstructed labour, fetal compromise, failure to progress in labour, cord prolapse among others. Breech presentation, short maternal stature and currently PMCTC are among the leading indications for elective operations. In both Kenya and Malawi for example, the indications for emergency operations were related to obstructed labour, fetal distress, ante partum hemorrhage, and pre eclampsia. [10, 18, 19]

Most often, the nature of CS, in terms of whether it is performed as an elective or as an emergency surgical procedure is determined by the indication. When the need for a CS arises, it is often much better for the patient if adequate time is allowed to prepare for the procedure. Thus, when the CS is performed electively, the chances of morbidity and mortality (in both the mother and the baby) complicating the operation would be much less than when it is performed as an emergency. There are documented risks in both cases of elective and emergency CS. This is not only in terms of the pain and trauma of an abdominal operation, but also the complications that may be associated with it, cost of the operation itself as well as the longer postpartum stay in the hospital that is required compared to vaginal delivery. The mean stay in Nairobi Hospital for example was 5.1 days after CS compared to 3.37days for a normal delivery [17] CS can also delay the opportunity for early mother-newborn interaction, breastfeeding and the establishment of family bond.

In Sub Saharan Africa most of the operations are done as emergencies and are associated with major peri operative complications. Since the fetal state is already compromised in most cases, a higher morbidity and mortality is experienced. Kaihura et al (in Chogoria), found emergency

operations resulting in unfavourable outcome almost twice the elective [22] Various factors, maternal and medical may influence baby's outcome following the emergency operations [23, 24] In Kenyatta Hospital for example, unfavourable outcome was associated with condition of the mother before operation, indication for the operation and the environment in which the operation was done [25].

CS independently reduces risk for poor newborn outcome in breech presentations and risk of intra partum fetal death in some cephalic presentations [26] Therefore, the use of crude perinatal mortality rates may mask any benefit from caesarian section as some contributors to crude perinatal mortality rates i.e. lethal anomalies and low birth weight, are not readily amenable to obstetric intervention and are unlikely to be affected by caesarian section. Also, hospitals acting as referral centers may have increased morbidities and mortalities due to the nature of patients attended to. Cesarean delivery might be a marker for serious pre-existing maternal morbidities associated with increased mortality risk rather than a risk factor for death in and of itself.

3.4 PERINATAL MORBIDITY AND MORTALITY IN BABIES BORN BY CAESAREAN SECTION.

Although perinatal mortality in some hospitals has declined over the years, there is little evidence that more frequent caesarean births are the cause [19] Chile and Brazil for example have the highest caesarian section rates in the world yet their perinatal outcomes are worse than in countries like Sweden, Belgium and Ireland with caesarian section rates of between 5-12% [23, 27] Aga khan Hospital and Nairobi Hospital, whose standards may compare with hospitals in developed world, had higher CS rates (37% and 41%) respectively and also had better fetal outcome than some hospitals in Chile and Brazil [18, 19]. The CS rate in a Zimbabwean study for example varied between 2.2 and 16.8 per 100 deliveries in different hospitals and there was a positive correlation between the rate of CS and the perinatal mortality rate with better outcome being observed in hospitals with higher rate [23] It is therefore possible that other than the CS

rate, other peri operative factors within the hospital are responsible for the high rates of perinatal morbidity and mortality.

In general, CS has a maternal mortality rate of less than 1%. However, in many developing countries mortality is 10–20 times greater with CS than with normal births [28] The increased risk of CS mortality exists even with elective CS, with no pathology. Some of the causes of maternal mortality include infections, hemorrhage, transfusions and anesthesia complications. [29, 30, 31] Maternal death significantly affects the health of the baby [26]

The relative safety of elective CS in developed countries, has led to increase demand for it. However, in some studies of elective operations, increased risk to the infant have been reported. These include premature birth and respiratory distress syndrome both of which are associated with multiple complications, intensive care and burdensome financial costs [32, 33, 34]. Even in mature babies, the absence of labor increases the risk of breathing problems [29]. Babies born by cesarean are more likely to develop breathing problems such as transient tachypnea as they don't experience the usual squeezing that occurs with a more routine vaginal birth. They tend to have more fluid than normal in their lungs when they take their first breaths. Though this is not associated with mortality or morbidity, it prolongs the neonate's hospital stay and is associated with an increased risk of asthma development during childhood [1, 33] Although this can occur in premature babies, most babies with this problem are full-term. Recovery usually occurs within 2 to 3 days. CS babies sometimes have low Apgar scores. The low score can be an effect of distress to begin with or lack of stimulation as he or she would have been by vaginal birth.

LBW and prematurity has been associated with higher neonatal morbidity with some studies reporting a fourfold increase in mortality mainly due RDS [35]. Verma et al (In India), found Perinatal mortality in CS highest in babies below 1500gm birth weight while a similar study in Jeddah, Saudi Arabia in 1988 showed perinatal mortality rate of 14.2% among the group of babies[36]. It is generally recommended in the literature that small premature babies with an

expected weight of less than 1500 g be delivered by cesarean section. There is however little evidence to suggest that uncomplicated VLBW deliveries benefit from caesarean section. There is some debate in the literature regarding the efficacy of caesarean section for the routine delivery of breech-presenting VLBW infants with some studies revealing beneficial effects whereas others have shown no effects [37]

Fetal injuries complicate 1.1% of cesarean deliveries and the frequency varies with the indication for surgery as well as with the duration of the skin incision to delivery interval and the type of uterine incision [38] The most common injury is skin laceration (0.7%). Other injuries included clavicle fracture and brachial plexus injury especially in a case where the fetus has advanced in descent.

Despite its growing acceptance as an alternative to vaginal birth, reflection of change in obstetric practice and patient views and empowerment in the recent years, CS should be justified only when benefits outweigh harms at an institutional level. There is therefore an urgent need to provide women and care providers at institution level with information on the potential individual risk and benefits associated with caesarean delivery. As over 60% of CS can be attributed to obstructed labour, repeat CS scar and fetal distress, practices that reduce the number of CS performed for these indications could contribute to the stabilization of CS rate and therefore reduce the associated complications. Any attempt to reduce morbidity and mortality, even with relatively modest differences for a particular outcome, is likely to have significant benefits in terms of costs and health benefits especially in an under-resourced country like Kenya.

3.5 STUDY JUSTIFICATION

Caesarean section is the most common major surgical procedure in sub-Saharan Africa and the CS rates are on the increase. Operations are mainly performed as emergencies and are associated with increased perinatal morbidity and mortality.

The Pumwani Maternity Hospital serves as the major referral centre for obstetric cases from Nairobi city and its surroundings. The hospital is in a low cost setting and handles about 60% of all deliveries in Nairobi province. With such large numbers, operative deliveries are suspected to be high. The outcome of babies delivered by in CS has not been described or reported in recent years.

Reports from private hospitals in Nairobi have shown a higher CS rate attended by better fetal outcome. It is possible that babies delivered in Pumwani through CS could have additional risks which we don't know.

It is necessary for Kenya to meet the targets set for the Millennium Development Goal Number 4 by attaining a substantial reduction in perinatal deaths. This study sought to describe some associated risk markers among mothers undergoing CS and medical practices associated with unvafourable fetal outcome with a view to recommending ways of reducing perinatal morbidity and mortality.

3.6 RESEARCH QUESTION

What is the perinatal outcome of babies delivered by caesarean section at Pumwani Maternity Hospital?

3.7 MAIN OBJECTIVE

The overall goal of the study was to determine perinatal morbidity and mortality in caesarean section births at Pumwani Maternity Hospital.

3.8 SECONDARY OBJECTIVE

Describe the demographic and biological factors associated with poor perinatal outcome.

4.0 STUDY METHODS AND MATERIALS

4.1 STUDY DESIGN

Prospective descriptive study.

4.2 STUDY POPULATION

A prospective cohort of 286 neonates born by caesarean section.

4.3 STUDY AREA

This study was carried out at Pumwani Maternity Hospital between July and September 2008. Pumwani is the busiest maternity unit in Kenya. It caters for 60% of all deliveries in Nairobi city and serves mainly low-income groups in Nairobi and neighboring districts. It is a referral centre for Nairobi City Council clinics and other units. It is situated in Eastland, 4kms from Nairobi

business centre. In 2007 there were 24,000 deliveries in this hospital. It has a bed capacity of 350, 140 neonatal cots, and 60 beds in labor ward.

There are three categories of patients attended to at the hospital. Those attending the ante natal clinic and planned to deliver at the hospital, those who attend clinics elsewhere but choose to deliver at the hospital and those who are referred for caesarean section from other clinics due to complications. The antenatal clinics are conducted by hospital consultants and midwives on daily basis .Those scheduled for elective operations are either admitted through labour ward or antenatal ward from where the patients are prepared for theatre. In the labour ward initial assessment is done by the doctor on duty usually a medical officer and a plan for the management is made. Those scheduled for CS are prepared and continue to be observed in labor ward awaiting theatre.

All CS babies whose Apgar score is less than seven at five minutes, those with congenital anomalies and those whose mothers have postoperative complications are admitted in the new born unit for observation and treatment. Upon admission, they are examined by the doctor on duty and by the unit pediatrician. Babies accompanying the mothers to the postnatal ward are reviewed regularly and those requiring treatment are admitted to the new born unit. The average stay for post-operative patients is eight days and about one percent is discharged before day seven. Upon discharge, many of them are followed up in the various health centers within the province and only a small percent come back for well baby clinic.

4.4 INCLUSION AND EXCLUSION CRITERIA

All babies delivered by CS in the hospital during the study period were eligible for the study after obtaining a written consent from the mother.

4.5 SAMPLING

Selection was sequential with no randomization. Babies born by CS were enrolled in the study until the desired number for babies with unfavourable outcome was achieved.

4.6 SAMPLE SIZE CALCULATION

$$\frac{p0q0+p1q1)\,(Z_{1-\alpha}+Z_{1-\beta})^2}{(p1-p0)^2}$$

Where

p1= proportion among the mothers with maternal morbidity (27.5%) [39].

P0= proportion among the mothers without morbidity (12.5%) [39].

q1=1-p1

q0 =1-p0

$Z_{1-\alpha}$= 1.96 (Standard Normal Distribution for 95% Confidence interval)

$Z_{1-\beta}$= 0.84 (for 80%) power.

n =108 for each (favorable and unfavorable outcome) 11 patients were added since 1% are discharged before the seventh day (n=119).

5.0 DATA MANAGEMENT

5.1 DATA COLLECTION

Theatre records were reviewed every morning and CS mothers traced to their post surgical wards within twenty four hours of delivery. The principal investigator or the trained assistant sought consent from the mother when fully recovered from the anesthesia. The investigator proceeded to extract the demographic and obstetrical data from the antenatal card where

available or from the mother's file. Any further information not available from the card or the mother's file was obtained from the mother through a structured questionnaire.

Part one of the questionnaire sought maternal social-demographic data. Demographic data of interest included maternal age, parity, marital status, residence (rural v. urban), education, smoking and alcohol consumption during the pregnancy. Part two contained information on relevant obstetric history .This included prenatal care, visits, previous cesarean delivery and previous perinatal death among multi-parous women.

Medical data of importance included maternal morbidity before and during pregnancy, indication for the CS, type of CS (emergency or elective), duration between decision to operate and operation, time of the operation, presentation at operation and any intra operative complications. Part four of the questionnaire contained fetal information. For intrapartum fetal death, the records were reviewed to classify them into either fresh or macerated stillbirths. For live births, data of interest included, Apgar score, birth weight, gestation, whether active resuscitation was done or not. Babies were examined within first twenty four hours, on the third day and seventh day or up to the time of discharge from the hospital if earlier than seven days and the findings recorded on the questionnaire.

The mother's LMP dates where available or ultrasound reports were used to calculate the gestation. Babies on oxygen and those unable to feed orally at twenty four and third day were considered to have morbidity and the specific sickness where possible was recorded. Presence of any congenital abnormality was noted and the specific anomaly recorded. Any discharge before the seventh day was noted and recorded. For mortality, time of death and the age at death were recorded. At the seventh day, any baby not on oxygen and able to breastfeed or feed orally was classified as a favorable outcome and recorded as such while any stillbirth, death at or before seventh day and any baby on oxygen or not able to breastfeed or feed orally on the seventh day was recorded as unfavourable outcome.

5.2 DATA STORAGE AND ANALYSIS

The collected data was edited and entered into the database. Range checks were enforced to enhance accuracy. Data was analyzed using EPI INFO 3.3. Frequency tables of the distribution of respondents according to socio demographic data, medical data and fetal outcomes were drawn. Cross tabulations were employed to study the relationship between the socio demographic, medical factors and fetal outcomes. Chi square and p-value were calculated to assess the statistical significance of these relationships. Uni-level and multi-level analysis was done to identify factors associated with unfavourable fetal outcome

6.0 ETHICAL CONSIDERATION AND ISSUES

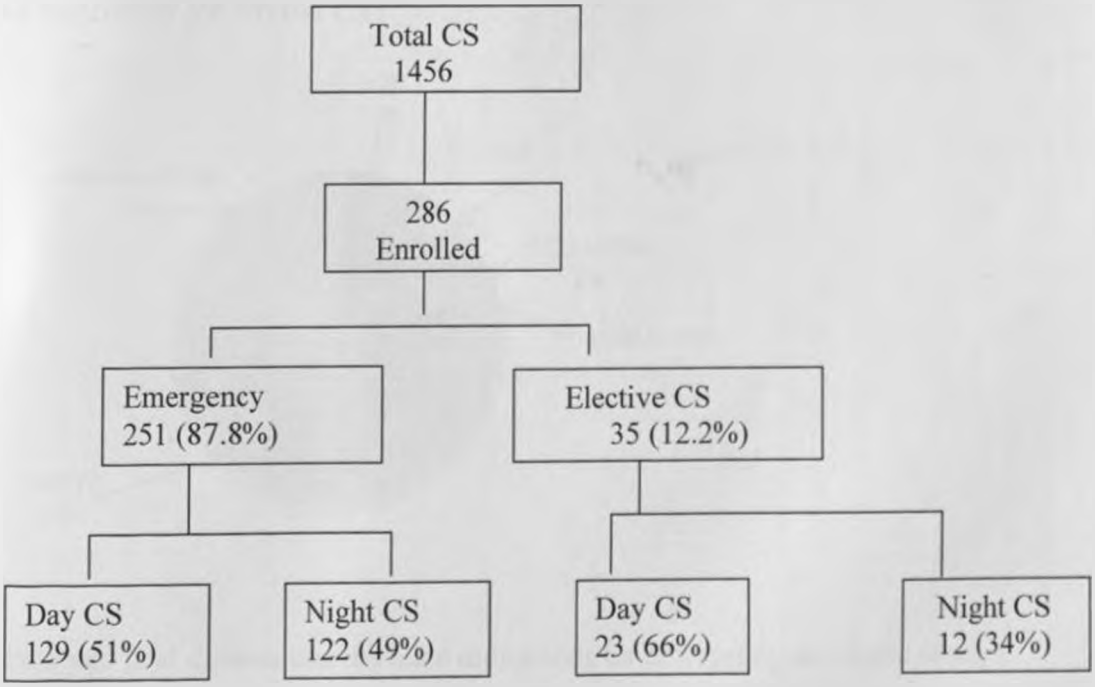
Consent was sought from Kenyatta Hospital and Pumwani research and ethical committees. Consent from the mothers was obtained before collecting data. Confidentiality of patient data was maintained and their names did not appear in our data. No mention was made of any particular doctor or care giver involved in the decisions making to the patients. In no way was the judgment of the investigator influenced by any party. No patient was offered incentive to motivate for participation and any abnormality noted during the examination of the baby was communicated to the primary doctor for management. A report of the study will be submitted to the hospital.

7.0 RESULTS

7.1 CAESAREAN SECTIONS

There were 8,237 deliveries during the period of this study. Of these, 1456 were caesarean section births translating to a CS rate of 17.7%. Of the women enrolled in this study, 251(87.8%) underwent emergency operations and 35(12.2%) had elective operations. Of the total operations, 152 (53.1%) were done during the day while 134 (46.9%) were done at night. Emergency operations performed during the day and night accounted for 51% and 49% respectively whereas most elective operations were conducted during the day 23 (66%) figure 1.

Figure 1: *Caesarean sections by type and time of operation*



7.2 INDICATIONS FOR CAESEREAN SECTIONS

Figure 2: *Main indications for emergency CS at Pumwani Maternity Hospital*

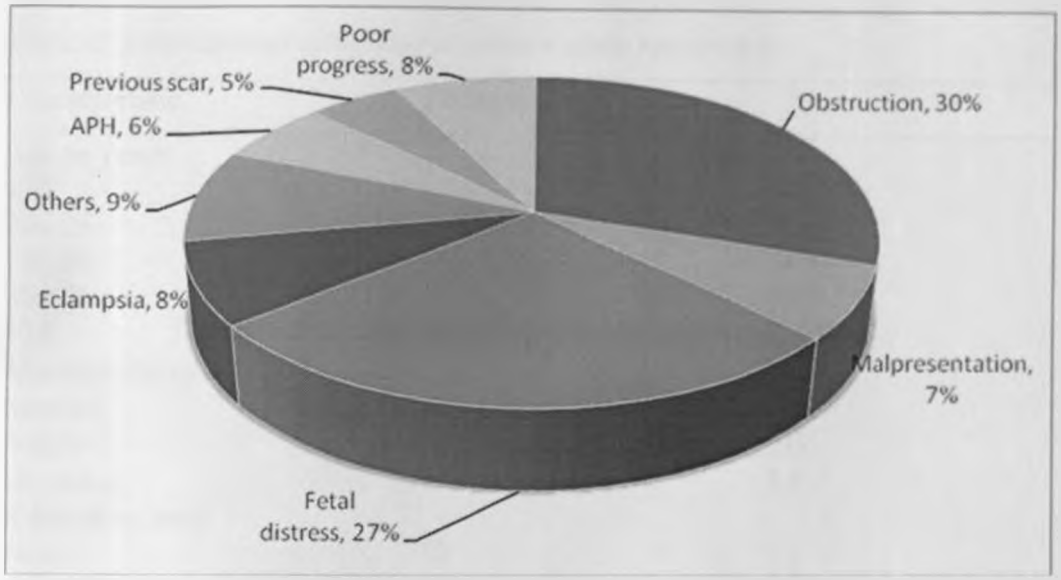
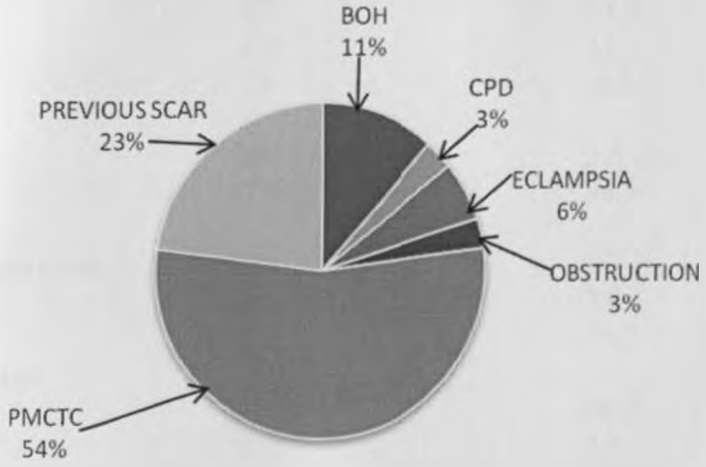


Figure 3: *Main indications for elective CS*



Obstructed labour and fetal distress was the main indications for emergency caesarean sections. Other indications included BOH (1), APH (15), cord prolapsed (2), ruptured uterus (4) and failed induction (1). PMTCT and previous scar were the main indications for elective CS (figure 2 and 3). Elective operations due to CPD accounted for only 3%.

8.0 MATERNAL CHARACTERISTICS

There were 286 respondents and their socio -demographic characteristics are as shown in table 1.

Table 1: *Socio-demographic characteristics of the respondents*

Characteristic	Observation	%
Age in years		
<20	61	21.3
20 - 25	109	38.1
25 - 30	69	24.1
30 - 35	33	11.5
>35	14	4.9
Marital status		
Married	238	83.2
Single	39	13.6
Divorced	9	3.1
Education level		
None	10	3.5
Primary	119	41.6
Secondary	106	37.1
College	51	17.8
Parity		
Primi	137	47.9
1-3	130	45.5
4 and above	19	6.6
Residence		
Rural	10	3.5
Urban	276	96.5
Alcohol consumption		
yes	11	3.8
No	275	96.2
ANC attendance		
Yes	277	96.9
No	9	3.1
Gestation at First ANC visit		
First trimester	45	15.7
After first trimester	241	84.3
No of ANC visits		
Less than 4 visits	153	53.5
Four or more visits	133	46.5

The median age of the respondents was 24years (range; 15 to 41 years). There were 238 (83.2%) married women while 129 (45.1%) were semi literate with 10 (3.5%) having reported no formal education. There were 137(47.9%) first time mothers and 19(6.6%) parity four and above. About 97% of the mothers were urban residents. Only 0.3% and 3.8% of the respondent's smoked and drunk alcohol respectively.

8.1 ANTE NATAL CARE

In total, 277(96.9%) had attended ante natal clinic. The median gestation at initiation of ANC attendance was 20 weeks (range of 12-38). Only 45(15.7%) initiated ANC in the first trimester. The median number of visits to ANC was 3 (range of 1-7) with 133 (46.5%) making four or more visits. Almost all the women 270 (94.4%) did not take haematinics while 240(83.1%) did not have complete antenatal profiles.

8.2 PREVIOUS OBSTETRICAL HISTORY

Table 2: *Past obstetrical history*

Characteristic	No	%
Previous perinatal death		
Yes	29	10.1
No	257	89.9
Previous scar		
Yes	60	21
No	226	79
Maternal morbidity		
Yes	70	25
No	216	75

In this study, 29(10.1%) of mothers had had a previous perinatal death (Table 2). There were 60 (21%) mothers who had previous scars. The median number of scars was one (range: 1-4). Seventy mothers (25%) had a history of either an existing pre-pregnancy illness, gestational morbidity or an intra-partum sickness. Of the morbidities, there were 37 cases of HIV, 30 cases of hypertension and one case each of diabetes, PROM and chorioamnionitis. The distribution of mothers with morbidities by age category is shown in table 3.

Table 3: *Morbidities by age group of the mother*

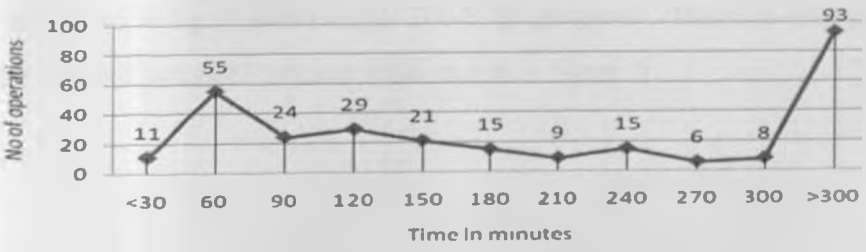
Age group	N	%
<20 n=61	15	21.4
20 – 25 n=109	23	32.9
25 – 30 n=69	19	27.1
30 – 35 n=33	9	12.9
>35 n=14	4	5.7

* Four mothers had more than one morbidities.

8.3 DURATION FROM CAESAREAN SECTION PRESCRIPTION TO OPERATION

The mean duration between prescription of the CS and the time of operation was five hours (range: 0.25 - 30 hours). There were only 11(3.8%) operations that commenced within 30 minutes of decision making while 93(32.5%) had the delivery done after five hours (Figure4).

Figure 4: *Duration from CS prescription to operation*



8.4 FETAL PRESENTATION AT OPERATION

There were 15 (5%) cases of breech presentation at operation of which only eight had been diagnosed prior to operation. Other malpresentations that included arm prolapse, compound presentation and longitudinal lie accounted for 7% while the rest had cephalic presentation.

8.5 PRE OPERATIVE AND INTRA-OPERATIVE COMPLICATIONS

There were 15(5.2%) cases of pre operative and intra operative complications of which 14(93.3%) had excessive bleeding and one mother had a difficult intubation. Among those with bleeding, 6(40%) developed hypotension. Most of the complications, 8(53.3%) occurred during the day operations. Eight cases of excessive bleeding were as a result of ruptured uterus while 6(40%) occurred in mothers who had APH.

9.0 FETAL OUTCOME

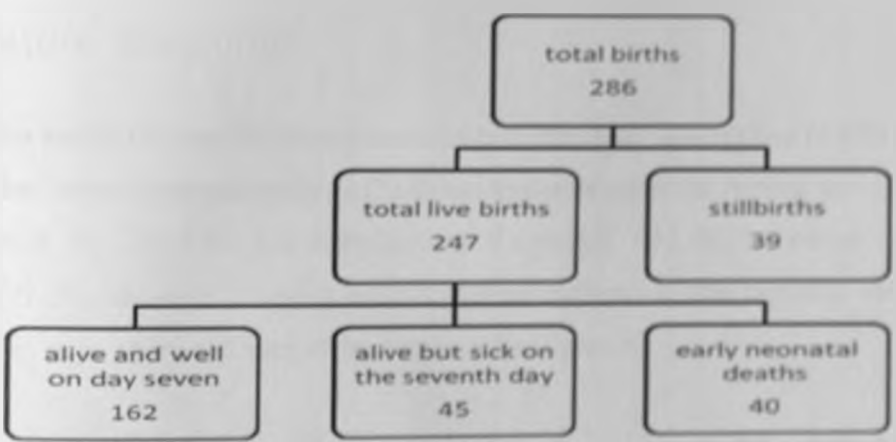
9.1 FETAL CHARACTERISTICS AND PERINATAL OUTCOMES

Out of 286 babies, 177(61.9%) were males while 109 (38.1%) were females. The mean weight at birth was 2914 grammes (range: 700-5300grammes). Baseline fetal characteristics are shown in table 4 and perinatal outcomes are shown in figure 5

ble 4: *Baseline fetal characteristics*

IARACTERISTIC	Observations
station N (%)	
itdates	25 (8.7)
term	48 (16.8)
m	213 (74.5)
th weight (grammes) N (%)	
500	63 (22)
00 -3999	207 (72.4)
00 and above	16 (5.6)

ure 5 *Prenatal outcome of the CS babies*



LIVEBIRTHS

re were 247(86.4%) live births. Among them, 144(58.3%) had a score of 7 and above at 5 utes while 22(8.9%) had severe asphyxia. One hundred and forty six (59.1%) babies were vely resuscitated while 8(2.9%) had congenital malformations. Sixty three (22%) of them : LBW while 17 (6%) were LGA babies. Of the live births, there were 40 early neonatal hs, 45 were sick on the seventh day while 162 remained well.

9.3 STILLBIRTHS

There were 39 stillbirths (SB) among the CS deliveries enrolled in this study. Of these, 27(69.2%) were FSB while the rest were macerated stillbirths. There were no stillbirths among the elective operations. The distribution of SB per birth weight is shown in table 5.

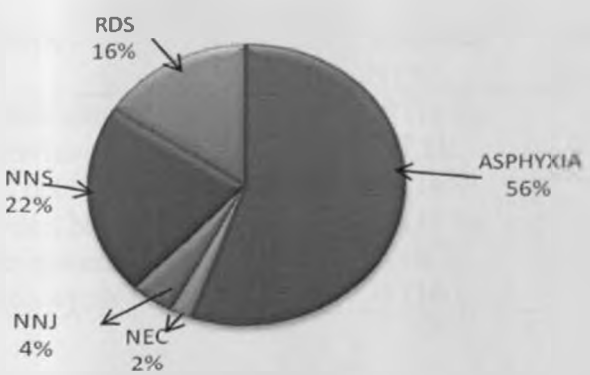
Table 5*: Stillbirth according to birth weight*

BIRTH WEIGHT(kg)	FSB	MSB	TOTAL N (%)
<2500	9	5	14 (35.9)
2500-3999	15	7	22 (56.4)
4000and above	3		3 (7.7)

9.4 COMMON MORBIDITIES

Asphyxia and RDS were the leading morbidities in this study. Twenty two (8.9%) of the live babies had severe asphyxia while 81 (32.8) had moderate asphyxia. Among the sick babies on the seventh day, 25(55.6%) had complications of asphyxia, 7(15.6%) had complications of RDS and 10(22.2%) had signs of severe sepsis. Other morbidities included jaundice, transient tachypnea of newborn and necrotizing enterocolitis (figure 6).

Figure 6: *Common morbidities among babies admitted at Pumwani NBU on the seventh day*



9.3 STILLBIRTHS

There were 39 stillbirths (SB) among the CS deliveries enrolled in this study. Of these, 27(69.2%) were FSB while the rest were macerated stillbirths. There were no stillbirths among the elective operations. The distribution of SB per birth weight is shown in table 5.

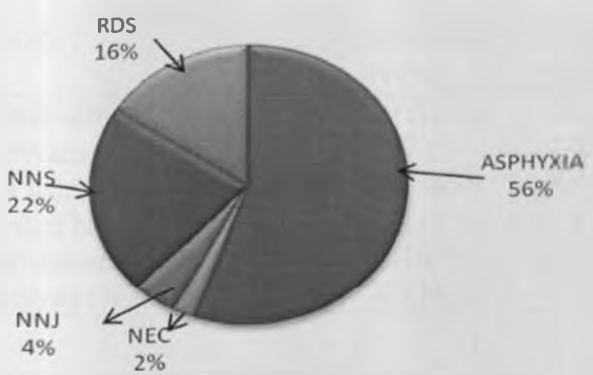
Table 5: *Stillbirth according to birth weight*

BIRTH WEIGHT(kg)	FSB	MSB	TOTAL N (%)
<2500	9	5	14 (35.9)
2500-3999	15	7	22 (56.4)
4000and above	3		3 (7.7)

9.4 COMMON MORBIDITIES

Asphyxia and RDS were the leading morbidities in this study. Twenty two (8.9%) of the live babies had severe asphyxia while 81 (32.8) had moderate asphyxia. Among the sick babies on the seventh day, 25(55.6%) had complications of asphyxia, 7(15.6%) had complications of RDS and 10(22.2%) had signs of severe sepsis. Other morbidities included jaundice, transient tachypnea of newborn and necrotizing enterocolitis (figure 6).

Figure 6: *Common morbidities among babies admitted at Pumwani NBU on the seventh day*



9.5 EARLY NEONATAL MORTALITY

There were 40 early neonatal deaths translating to an ENMR of 161.9 and a crude perinatal mortality rate of 276.2 per 1000. Asphyxia accounted for 60% of the early neonatal deaths. Most of the deaths, 28 (70%) occurred within the first 24 hours (figure 7). Deaths among babies born by emergency CS were 36 accounting for 90% of ENM. Of the total deaths, 23(57.5%), 13(32.5%) and 4(10%) occurred among term, preterm and postdate babies respectively. Mortality was highest among babies of first time mothers and decreased with increasing parity. Only 4 (12.5%) mothers with a previous perinatal death lost their babies while 12 (17.5%) of the mothers whose babies died had had a maternal morbidity during this pregnancy. Case fatality was highest among mothers with cord prolapse, ruptured uterus and mal presentation at 50%, 25% and 22.2% respectively. Only 7(18%) babies who died had a congenital malformations.

Figure 7: *Baby's age at death*

10.0 RISK FACTORS FOR PERINATAL MORBIDITY AND MORTALITY

10.1 PERINATAL MORBIDITY

Table 6: *Socio demographic factors and fetal morbidity*

Characteristic	Morbidity N (%)	Relative Risk	95 %CI	P value
Teenage motherhood; N=61	10 (16.4)	1.0	0.6-2.0	0.87#
Elderly gravidae; N=14	1 (7.1)	0.4	0.1-2.9	0.32 *
Education below secondary; N=129	18 (14.0)	0.8	0.5-1.4	0.45#
Primigravida; N= 137	24 (17.5)	1.2	0.7 -2.1	0.42#
Single and divorced; N=48	8 (16.7)	1.0	0.5-2.2	0.84#
Slum residency; N=220	31 (14.1)	0.7	0.4 -1.2	0.16#

*Fisher's exact test, # chi square

Table 7: *Medical factors and morbidity*

Characteristic	Morbidity N (%)	Relative Risk	95 % CI	P value
Emergency CS; N=251	43 (17.1)	3.0	0.7-11.8	0.08#
Prematurity; N=48	9 (18.8)	1.2	0.6-2.4	0.52#
Postdates; N=25	3 (12.0)	0.7	0.2- 2.2	0.42 *
LBW N=63	9 (14.3)	0.8	0.4-1.7	0.72#
LGA N=16	2 (12.5)	0.7	0.2-2.9	0.52 *
Peri operative maternal complication; N=15	2 (13.3)	0.8	0.2-3.1	0.57 *

*Fisher's exact test #chi square

None of the maternal socio-demographic factors was significantly associated with morbidity in this study (Table 6). Regarding the medical factors, neonates born by emergency CS had a 3 fold risk for perinatal morbidity but not statistically significant (Table 7).

Table 8: *Socio demographic characteristic and perinatal deaths*

Characteristic	Perinatal deaths N (%)	Relative Risk	95% CI	P value
Teenage motherhood; N=61	15 (24.6)	0.9	0.5 -1.4	0.55#
Elderly gravidae; N=14	5 (35.7)	1.3	0.6 -2.7	0.33*
Education below secondary; N=129	34 (26.4)	0.9	0.6 -1.3	0.66#
No ANC attendance; N=9	4 (44.4)	1.6	0.8 -3.5	0.21*
Primigravida; N=137	35 (25.5)	0.9	0.6 -1.2	0.45#
Para 4 and above; N=8	3 (37.5)	1.4	0.5 -3.4	0.38*
Single or divorced; N=48	13 (27.1)	1	0.6 -1.6	0.92#
Slum residency; N=220	63 (28.6)	1.2	0.7 -1.9	0.48#
Previous perinatal death N=29	12 (41.4)	1.6	0.9 -2.6	0.08#

The maternal socio-demographic factors were not significantly associated with perinatal mortality ($p>0.05$) Table 8.

10.2 PERINATAL MORTALITY

Table 9: *Medical factors and perinatal death*

Characteristic	Perinatal death N (%)	Relative Risk	95 % CI	P value
Emergency CS; N=251	75 (29.9)	2.6	1.0- 6.7	0.02#
Prematurity; N=48	24 (50.0)	2.2	1.5- 3.1	<0.001#
Postdates; N=25	9 (36.0)	1.3	0.8- 2.3	0.33#
Waiting time >30MIN; N=275	76 (27.6)	1.0	0.4- 2.7	0.63*
LBW; N=63	30 (47.6)	2.2	1.5- 3.1	<0.001#
LGA; N=16	4 (25.0)	0.9	0.38- 2.1	0.53*
Peri operative complications; N=15	11 (73.3)	2.9	2.0- 4.2	<0.001*

* Fisher's exact test, CI= confidence interval, # chi square

Among the medical factors, indications necessitating emergency CS carried an almost 3 fold increased risk of perinatal death (RR 2.6, 95%CI 1-6.7) while intra operative complication had a significant risk of death (RR 2.9, 95% CI 2- 4.2). Prematurity and LBW carried a 2 fold risk for mortality each (RR2.2, 95% CI 1.5-3.1) Table 9. In the multi level analysis low birth weight, emergency CS and intra operative complications were significantly associated with perinatal mortality in this study. Post-datism had a high risk though not statistically significant Table10.

Table10: *Risk factors for perinatal mortality in the logistic regression*

Characteristic	RR	95% CI	Coefficient	P-Value
Emergency	3.0	1.0-9.2	1.1077	0.05
Intra operative complications	6.6	1.9-22.6	1.8913	0.003
LBW	2.5	1.2-5.3	0.9358	0.01
LGA	1.0	0.3-3.5	0.0088	0.9
Postdatism	2.4	0.9-6.0	0.8742	0.06
Prematurity	2.1	0.9-4.6	0.7353	0.07
waiting time >30min	0.9	0.2-3.8	-0.1381	0.85

11.0 Discussion

The CS rate has an increased from 6.8 per cent to 17% between 1991 and 2008 [17]. The rise in CS rate in this study did not translate to better newborn outcome as reported in Aga Khan and Nairobi hospital studies [18, 19] The number of mothers attended to in the same institution in 1991 and 2008 were almost similar. It therefore seems that other factors other than the numbers attended to has led to the rising CS rate and perinatal mortality. The leading indications for emergency CS (obstructed labour and fetal distress) in this study remains as they were in 1991. More strategies needs to be put in place to deal with poor outcome associated with these indications. Unlike what has been observed in other studies in Nairobi, there were no cases of operations due to maternal request while repeat scars contributed only 7.3% of all the operations.

First time mothers undergoing CS accounted for 47.9 per cent. Reducing the number of first caesarean sections is an important issue. This is because rise in primary CS means there might be a proportionate rise in repeat sections as well. A number of mothers may end up with a trial of scar in subsequent pregnancies. Trial of scar is not always a safe option especially in a developing country like ours where the patient profiles are different and there are few medical facilities in many places. Ignorance, lack of education, poor understanding of the operation and its subsequent management, both on the part of the patient and her family may lead to poor acceptance of both first and repeat caesarean sections.

In this study, only two mothers fulfilled the ministry of health criteria of focused antenatal care (FANC) which includes first antenatal visit at or before sixteen weeks gestation, at least four antenatal visits, full antenatal profiles and use of heamatinics and antimalarials as appropriate. It is possible that most of the mothers who may have been high risk for referrals or priority services were missed. Failure to seek antenatal care, attempts of delivery at home or reporting late in advanced labour after unskilled vaginal examination and injudicious use of oxytocin at

home or private facilities leads to high maternal and perinatal morbidity and mortality. The risk of repeat CS in such cases has its own morbidity and mortality.

Emergency operations in this study accounted for 87.8% of all the operations and carried nine fold risks for ENM compared to elective operations. This risk was higher than what has been reported in the region [22] This may be due to the high number of clients attended to and the fact that Pumwani acts as a referral centre. Overall, 242 (96.8%) of the emergency operations were done after the WHO recommended time of 30 minutes and one would have expected a significant risk in these cases which we did not find in both univariate and multivariate analysis. Our findings are consistent with previous studies in India where even shorter decision to delivery intervals were associated with poorer baby outcomes [37]. A recent study in Nairobi hospital recorded a decision to delivery interval of 75 minutes which was associated with good baby outcome [18]

It appears therefore that a 30 minutes interval may not be an absolute threshold for influencing baby's outcome. Given the high mortality in our case, there is a possibility that the decision to operate or the referrals were coming in too late to save the baby. The finding of 30.8% macerated stillbirth at operation in this study raises concern over the diagnosis and monitoring process as maceration starts to occur about six hours of death in utero. Fetal assessment before the commencement of the operation when done may lead to other modes of deliveries other than CS in cases where fetal heart is not heard thus reducing the unexpectedly high rate of stillbirths at operation. Auditing of this process will be useful as it may establish factors associate with delay in performing the operations.

The maternal peri-operative and intra operative complications such as ruptured uterus and haemorrhagic shock among mothers with obstructed labour and CPD, was significantly associated with high SB rate and ENM mortality. Though the complications observed here were similar to what has been found in most sub Saharan countries, failure to access medical facilities

is the major setback in most of the cases [10, 30] unlike our case where mothers had been in the hospital for more than five hours. Among the mothers with ruptured uterus, 3 (37.5%) had a previous scar. This was an unfortunate situation as the women's obstetric future has been jeopardized.

It is unfortunate that a number of expectant mothers with pregnancy related risk factors remain unaware of the situation and ultimately present as an acute emergency sometimes with other complications. In our case this may be due to the fact that the hospital is used mainly by women of low socioeconomic levels and currently fees or payments are required in advance for admission.

In this study, about 49% of HIV positive mothers were not delivered by elective CS as per the current recommendations. There is a possibility that they were not identified during the ANC as majority did not meet the focused ante natal care some underwent operations due to other indications other than PMCTC. Primary health providers and traditional birth attendant must be educated on current trends in management of such clients, dangers associated with complicated pregnancies and early referrals to reduce the incidence of maternal as well fetal morbidity and mortality. An interlinked close relationship should be established between primary health centers.

Generally, caesarean section is considered a relatively safe option for the fetus. Perinatal morbidity and mortality will therefore depend upon the indications for the caesarean section, gestational age of the fetus and nature of the operation. Perinatal mortality following caesarean section in our study was 276 per 1000 total births. This is higher than the one reported in a similar study (118 in 1000 total births) in 1991[17] It is far above what is internationally acceptable.

Asphyxia was noted to be the leading cause of morbidity and mortality in 1991. Globally, it is a major cause of morbidity and mortality with an estimated one million newborns dead and many more suffering from permanent neurological damage each year [9] In this study, asphyxia accounted for 60% of ENM and 55.6% of the morbidities. Since there has been effort to improve on the management of newborns through trainings on resuscitation in the same hospital, one would have expected a better fetal outcome in this study. However, it is worth noting that newborn resuscitation must be coupled with good monitoring during labour for a good outcome.

The frequency at which newborn require resuscitation varies between and within countries, with 1% to 10% of hospital born infants receiving assisted ventilation [33]. In this study 59% of the babies were actively resuscitated. Since babies born severely asphyxiated may have little chances of survival even with the best of the resuscitation practices, efforts to reduce the incidence of asphyxia must focus on the organization of the health system as well as on the quality of resuscitation guidelines and the education of caregivers in the implementation of such guidelines. At the local level, the staff of the delivery unit must at all hours be able and equipped to give the asphyxiated infant immediate and adequate prenatal and postnatal care. From the 1991 and this study, there is little evidence that this has been achieved in the institution.

Sepsis seemed to contribute less to early neonatal mortality in this study despite the long waiting time. Factors that predispose to sepsis include PROM which may be occasioned by delayed delivery. One would have expected a higher sepsis rate than observed here. Clean and safe newborn care should prevent and manage neonatal infections and other illnesses that can otherwise become life threatening. Caregivers must be able to recognize signs of illness, and when they appear, promptly institute appropriate medical treatment. The fact that all babies admitted to NBU were started on antibiotics may account for the observation made.

Low birth-weight is one of the most important determinants of perinatal death. Our findings are consistent with this. These babies are prone to hypoglycemia and infections and even the ones who survive perinatal period are at increased risk for health, growth and developmental problems. A baby may be LBW in case of intra uterine growth restriction or preterm birth. Important causes of preterm delivery include genitourinary infection and pregnancy-induced hypertension (PET) among others. In this study majority of the mothers did not have complete antenatal profiles to exclude infections while 43% of mothers with morbidities had PET. About 13% of the LBW babies in this study were delivered in elective operations and though LBW is not easily prevented especially in emergency operations, proper assessment of mothers due for elective operations may reduce the incidence of LBW. To minimize potential perinatal risks of elective cesarean, patients considering elective cesarean delivery should be made aware of available data on potential risks and benefits to the fetus and importance of assessment prior to operation.

Previous studies in the Sub Saharan region have found maternal socio demographic, medical factors and past obstetrical history (maternal morbidity, previous unfavourable outcome, lack of antenatal care, age at first birth, parity, birth order and birth interval) significantly associated with poor fetal outcome [10]. We did not find any significant association between these factors and perinatal morbidity and mortality in this study. These findings are not consistent with other studies that have looked at factors associated with unfavourable birth outcomes in Kenya (Magadi et al, 2001). It is important to note however, that this could have been due to the fact that most mothers who had morbidities were referred to Kenyatta national hospital if they did not present at Pumwani in established labour.

The findings in this study of labour care related complications, presents an opportunity for effective health service intervention. If detected early and appropriately managed, many problems that arise in labour can be limited and serious morbidity and mortality averted. Clinical audit is seen as an essential component for improving the quality of care, but it is often found to be difficult to implement due to obstacles such as lack of time, resistance to change and

lack of motivation. Improving the quality of obstetric care is an urgent priority worldwide. Audit can assist in this process by critical analysis of current practice and identification of substandard care factors.

The findings add support to strategies that focus on improving the quality of labour care. Mutual gains in perinatal and maternal health can be expected through auditing of the intrapartum monitoring to identify causes of delayed caesarean deliveries and factors that predispose to asphyxia.

11.1 STRENGTHS OF THE STUDY

This study was based on carefully collected data from a hospital that ensured complete coverage of births on a daily basis, including weekends and holidays. It was a prospective study and we were able to control for most of the bias that would have arisen and the data contained information from questionnaire-based interviews done by chief investigator and the assistant. Medical records and antenatal cards were also used to verify information from the questionnaires. We obtained full data for over 97% of babies enrolled in the study.

11.2 LIMITATIONS OF THE STUDY

Limitations that challenge the generalizability of our findings include the design of the study as we did not have a control group and the fact that the mothers attended to at the institution came from almost similar background.

11.3 CONCLUSION

1. Perinatal Mortality Rate at PMH is high at 276/1000

2. Leading causes of perinatal mortality and morbidity being asphyxia and respiratory distress syndrome.

3. Indications necessitating emergency CS, LBW and peri operative maternal complications were significantly associated with perinatal mortality ($p<0.05$).

12.0 RECOMMENDATIONS

1. A framework of internal and external reviews of the clinical service delivery in the Pumwani hospital should be developed to help identify specific areas of improvement in service provision to a mother due for CS delivery.

2. There should be regular training (CME) on triaging and monitoring of women in labour coupled with regular updates and supervision of resuscitation process.

13.0 REFERENCES

1. World Health Statistics Quarterly. *The epidemiology of perinatal mortality*. 1985; 38:289-301.

2. Voorhoeve A.M, Nordbeck H.J, Anderson J and Van Ginneken. Perinatal mortality and the high risk approach in antenatal screening in a rural area in Kenya. East Afr Med J. 1983; 60:626-35.

3. Gichangi P, Apers L and Temmerman M. Rate of caesarean section as a Process Indicator of Safe-motherhood Programmes: The Case of Kenya. *J health popul nutr 2001*; 19:52-58.

4. WHO health reports2006.Perinatal Statistics Report. Health Research and Information Division, the Economic & Social Research Institute.

5. WHO health reports 2005. Perinatal and neonatal mortality. Geneva. World Health Organization 2005.

6. Mati J.K, Aggarwal V.P, Sanghvi H.C, Lucas S and Corkhill R. The Nairobi birth survey II. Antenatal care in Nairobi. *J Obstet Gynaecol East Cent Africa*. 1983; 2:1-11.

7. Joseph KS, Liston RM, Linda D and Danlgren L. Perinatal outcomes in a setting with universal access to essential health care services. CMAJ, 2007; 176: 455-60.

8. Ali G, Alpaslan A, Varujan M, Cemal A, Yavuz C, Bianco A, Stone J, Lynch L, Lapinski R, Berkowitz G, Berko R.L. Perinatal outcome of pregnancy on over age 40. *Perinatal Journal*. 2006; 14: 1-6.

9. Iliff P.J and Kenyon N. Perinatal mortality statistics in Harare 1980-1988. Cent Afr j Med 1991; 37:133-6.

10. Paul M. F, Christopher J. M and Felicity R. Caesarean section in Malawi: prospective study of early maternal and perinatal mortality. BMJ. 2003; 327: 587.

11. Ibrahim S. A, Babiker A. G, Amin, I. K, Omer, M. I and Rushwan H. Factors associated with high risk of perinatal and neonatal mortality. *Paediatr perinat epidemiol* 1994; 8:193-204.

12. Musoke R. N. Perinatal mortality in Kenya. *East African Medical Journal*, 2004; 81:553-554.

13. Renay W, Carine R, Ed Dorman, Hilton J, Anne M, and Caroline S. Labour complications remain the most important risk factors for perinatal mortality in rural Kenya. *Bulletin of the W H O, 2003;* 81:561-566.

14. English M, Muhoro A, Aluda M, Were S, Ross A, Peshu N. Outcome of delivery and cause-specific mortality and severe morbidity in early infancy: a Kenyan district hospital birth cohort. Am. J. Trop. Med. Hyg., 2003; 69: 228-232.

15. Wilkinson D. Perinatal mortality - An interventional study. *South Afr Med J* 1991; 79: 552-553.

16. Buekens P, Curtis S and Alayón S. Demographic and Health Surveys: Caesarean section rates in sub-Saharan Africa. *British medical journal*, 2003; 326:136.

17. Karanja S.K. Patterns of Caesarean Sections at Pumwani Maternity Hospital. *M.MED Thesis, University of Nairobi*, 1991.

18 Kinyumu F. M. Caesarean Section at Nairobi Hospital. *M.MED Thesis, University of Nairobi*, 2007.

19 Wanyonyi S, Ssequeira and Obura T. Caesarian section rates and perinatal outcome at the Aga Khan University Hospital, Nairobi. *East African medical journal.* 2006; 83:651-8.

20. Anderson G.M and Lomas J. Determinants of the increasing caesarean birth rate. *New England journal of medicine,* 1984; 311:887–97.

21. Hannah M.El. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomized multicentre trial. Term Breech Trial Collaborative Group. *Lancet.* 2000; 356:1375–83.

22. Kaihura M, *Outcome of caesarean section at Chogoria Hospital*, M.MED Thesis ,University of Nairobi,1997.

23. De Muylder X and Amy J.J. Caesarean section rates in an African country. *Paediatr perinat epidemiol*1993; 7:234-44.

24. Kim D.W, Seung I.S and Lee K .J. Factors Influencing the Immediate Neonatal Outcome Following Cesarean Section, *Korean J Anesthesiol.* 1994; 27: 602-608.

25. Anabwani G. Outcome of Caesarean Section in Kenyatta National Hospital during 1977-1979. *M.MED Thesis, University of Nairobi, 1980.*

26. Villar J, Carroli G, Zavaleta N, Donner A and Wojdyla D. Maternal and neonatal individual risks and benefits associated with caesarean delivery: multicentre prospective study. BMJ. 2007; 335:1025.

27 El-Shafei A. M, Sandhu A. K and Dhaliwal J.K. Perinatal mortality in Bahrain. *Aust N Z J obstet gynaecol* 1988; 28:293-8.

28. Moldin P, Hokegard K.H and Nielsen T.F. Cesarean section and maternal mortality in Sweden. *Acta obstetricia et gynecologica scandinavica.* 1984; 63:7–11.

Niven P, Kaufman K and McDonald H. Planned Cesarean delivery reduces early perinatal
onatal complications for term breech presentation. *Canadian Journal of Anesthesia* 2001;
4-1116.

rt R D, Vaughan T L and Daling J R. evaluating the risks of cesarean section. *Am J Public*
, 1988; 78: 1312–1314.

emar E and Gerdtham G. Estimating the effect of cesarean section rate on health
ne. International journal of technology assessment in health care 1999; 15:123-135.

nold H, Mentzel H and Hirsch A. Effect of cesarean section on outcome in high- and low-
ry preterm infants. *Archives of Gynecology and obstetrics. 1989; 246:91-96.*

in L and Dudell G.G. Respiratory transition in infants delivered by cesarean section. *Semin*
tol 2006; 30: 296-304.

lu A, Mohammed H, Tariq K, Mohammed A. Noori C and Babatunde A. Outcome of
an sections (CS) in relation to the elective or emergency. *Ann Saudi Med* 1996; 16: 645-

age J.S, Kennedy C and Schatz B.K. The Apgar score as an index of neonatal mortality.
t.and gynae. 1964; 24: 222-230

erma A, Sarin R and Gupta K.B. Perinatal morbidity and mortality in caesarean section.
ntiseptic. 2001; 98: 428-30.

hauberger C.W, Rooney B.L and Beguin E.A. Evaluating the thirty minute interval in
ency cesarean sections. *J Am Coll Surg* 1994; 179:151-5.

38. Alexander JM, Leveno KJ, Hauth J, Landon MB, Thom E, Spong CY, Varner MW, Moawad AH, Caritis SN and Harper M. Fetal Injury Associated With Cesarean Delivery. *Am J Obstetric Gynecol* 2006; 108:885-890.

39. Ostlund I, Hanson U, Björklund A, Hjertberg R, Eva N and Nordlander E. Maternal and Fetal Outcomes if Gestational Impaired Glucose Tolerance Is Not Treated. Diabetes Care 2003; 26:2107-2111.

APPENDIX 1: QUESTIONNAIRE

Maternal social –demographic data

Name .....

1 Age .....

2 Parity.....

3 Marital status [1] married [2] single [3] divorced [4] widowed

4 Residence [1] rural [2] urban

5 Education.

Level l	Number of years completed
Primary	
Secondary	
College	
None	

6 Smoking [1] no [2] yes

7 Alcohol consumption [1] no [2] yes

Obstetrical history

8 Prenatal care no ..... Yes....., if yes

Date of first visit	
Number of visits	
Antenatal profiles done (yes/no)	
Sp , heamatinics	

9 Previous scar [1] yes [2] no if yes, how many.....

10 Previous births/deaths (use ANC card or mother's file)

Date of birth	Sex	Weight at birth	Perinea l death. (yes/no)	Age at death (days)

Medical information

12 Maternal morbidity [1] hypertension [2] diabetes

From mother's card/file

[3] asthma [4] cardiac disease

[5] HIV [6] others (specify)..... .....

13 Indications for CS

From mother's file [1] fetal distress [2] CPD [3] poor progress

[4] previous scar [5] breech [6] malpresentation

[7] elective. If yes, diagnosis.....

14 Duration from diagnosis to operation. Hours. ..... minutes.....,

15 Time of operation [1] day [2] night

From mother's file and theatre notes

16 Presentations at operation 1[] cephalic [2] breech [3] others (specify).....

(Theatre notes)

17 Intra operative maternal complications [1] hypotension [2] bleeding

[3] others (specify).....

Fetal information

18 Apgar score at 1 min .....

At 5 min .....

19 BWT ..... (grammes) sex [m] [f]

20 Gestation (mother's LMP or ultrasound) ..... (Weeks)

21 Resuscitation [1] yes [2] no

From baby's notes

22 stillbirth [1] FSB [2] MSB

From theatre records

23 Fetal outcomes

Outcome	24 hrs	72hrs	7th day
Stable baby			
Breastfeeding / feeding orally			
Baby on oxygen	Reason	Reason	Reason .....
Baby unable to breastfeed/ feed orally	Reason	Reason	Reason .....
Congenital abnormality	Specify		

24Mortality

Date of death	Time of death	Age at death	
	[1] day [2] night		

APPENDIX 2: INFORMED CONSENT

INFORMATION ABOUT THE STUDY

Title: To determine factors associated with perinatal morbidity and mortality in caesarean section births at Pumwani Maternity Hospital.

I. DR NGUGI MJ of the department of pediatrics University of Nairobi is investigating the outcome of babies delivered by caesarean section at Pumwani maternity hospital to determine if there is any association between the mother`s condition before delivery .the operation done and the outcome of the baby up to one week of age.

It is important to establish what happens to the baby after operation so that appropriate measures may be taken to improve care of similar patients in the future and to support practitioners who guide and inform individual women's birth decisions.

The study will involve extracting some information from your file, ante-natal card and asking you some specific questions if you agree to participate in study, your baby will be examined and followed up to the seventh day or to the time of discharge if earlier than seven days.

The results of this study will be treated with strict confidence and any problem detected in your baby will be communicated to the attending doctor for appropriate treatment at no extra cost to you there are no risks to your baby and the baby will benefit through the physical assessment three times during the study.

Participation in this study is voluntary and you may withdraw at any stage without any obligation and your baby will continue to be monitored and treated.

INFORMED CONSENT FORM

If you have clearly understood the information about this study and are willing to participate. please sign below:

I .....of

.....

Understand the information given above and willingly give my consent to participate in this study.

Signed .....

Date .....

Witness .....

Date .....

In case of any concern, you can contact:

Principal Investigator:

J M NGUGI. Department of Paediatrics and Child Health.

P.O BOX 3481-00506, Nairobi.

Tel 0723633680

Or

Kenyatta National Hospital-Ethics and Research Committee.

P.O BOX 20723. Nairobi.

Tel: 2726300-9