

Pregnancy outcome of women with twin gestation who delivered in Kenyatta National Hospital in 2015.

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Dissertation submitted in Part Fulfillment for the Award of the Degree in Master of Medicine in Obstetrics & Gynaecology of the University of Nairobi

2017

DECLARATION

This is to certify that the work presented herein is my original work, has not been presented for a degree course in any other university and was supervised by senior members of the Department of Obstetrics and Gynecology, University of Nairobi, School of Health Sciences, Faculty of Medicine, Kenyatta National Hospital, Nairobi, Kenya.

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DEDICATION

This book is dedicated to my family whose love and patience has made my studies enjoyable.

ACKNOWLEDGEMENT

I wish to thank the almighty God for good health as I complete my Masters training in Obstetrics and Gynaecology.

I would also like to thank the Government of Kenya, through the Ministry of Medical services for financial assistance throughout the study period.

My heartfelt thanks and appreciations to my supervisors Professor Zahida Qureshi and Dr. Peter M. Michoma for their kind advice and professional guidance till the completion of this dissertation writing

I sincerely want to thank all the Consultants, Lecturers and Senior registrars of the Department of Obstetrics and Gynaecology for dedicating their time to equip me with knowledge and skills during the training. Lots of gratitude to my fellow residents, whose commitment to work and encouragement kept us going.

To all and many others not mentioned here, I say many thanks and may God bless you all.

LIST OF ABBREVIATION

ACOG.	American College of Obstetricians and gynaecologists
AS	Apgar score
ANC	Antenatal Clinic
APH	Antepartum hemorrhage
ART	Assisted Reproductive Technology
CS	Caesarean Section
ECV	External cephalic version
IPD	Internal Podalic Version
IUGR	.Intrauterine Growth Restriction
KNH	Kenyatta National Hospital
LWB	Low Birth Weight
MMR	.Maternal Mortality Rate
NBU	.New Born Unit
PIH	.Pregnancy Induced Hypertension
PMR	Perinatal Mortality Rate
RCOG	Royal college of Obstetricians and Gynaecologists
FSB	Fresh Stillbirth
MSB	Macerated Stillbirth
SOPs	Standard operating procedures
SVD	Spontaneous Vertex Delivery
TTTS	Twin-Twin Transfusion Syndrome
VBAC	Vaginal Birth after Caesarean section
VD	Vaginal Delivery
VLBW	Very Low Birth Weight
WHO	World Health Organization

DEFINITION OF TERMS

For the purpose of this study,

- 1) Twin pregnancy - A woman with 2 in utero fetuses.
- 2) Premature labour – Delivery before 37 completed weeks of gestation from the 1st day of her last menstrual period or from first trimester u/s.
- 3) Low birth weight – Babies born with birth weight of less than 2500g
- 4) Anemia – Haemoglobin count less than 10g/dl

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ABSTRACT

INTRODUCTION: Twin pregnancies are considered high-risk pregnancies due to inherent biological factors that put the woman as well as the babies at increased risk. Despite only comprising about 2%, they contribute significantly to maternal and perinatal morbidity and mortality. This study will evaluate the outcomes of these high-risk pregnancies at the facility, it will therefore be important in improving care for twin pregnancies.

OBJECTIVE: To determine the maternal and perinatal outcomes of women with twin pregnancies delivering at Kenyatta National Hospital.

STUDY DESIGN: A hospital based Retrospective Descriptive Cross-sectional study.

STUDY SETTING AND SITE: The study was conducted at the Department of Reproductive Health, KNH.

STUDY POPULATION: The study population was women with a diagnosis of twin pregnancy who delivered at KNH from 1st January 2015 to 31st December 2015.

SAMPLE SIZE: A total of 287 of women with twin pregnancies delivered at KNH during the study period. The sample size was calculated as 141, however a total 203 files with the prerequisite information were reviewed

Outcome measures: Maternal: Pregnancy induced hypertension (PIH), Preterm labour and delivery, APH, PPH, C/S rates and maternal mortality. Perinatal outcomes: IUFD/ still births, Low birth weight, Apgar scores <7 at 5 minutes, admission to NBU/NICU.

DATA COLLECTION: Data was collected using a structured abstraction form prepared by the principal investigator.

DATA ANALYSIS: Data analysis was done via SPSS version 20.

RESULTS

Frequency of twin deliveries in KNH was 1 in 55 deliveries. Twinning in this study did not increase with age or parity. Majority of the patients were primigravida(31%). 80.8% of the cases the diagnosis was made during the antenatal period, 76% by obstetric ultrasound. 53.7% of the mothers delivered before 37 completed weeks. Most (80.5%) of the deliveries were cesarean sections. There was significant association between the mode of delivery and level of education OR 2.93(95% CI 1.10-7.84) p = 0.032. Chorionicity did not influence the mode of delivery p=0.11. The most common maternal complication was preterm delivery with 139(53.7%) delivering before 37 completed weeks. There were 52 (25.6%) mothers who had

pregnancy induced hypertension, PROM was reported in 33 (16.3%) of mothers, anemia in 26 (12.8%) and PPH occurred in 25 (12.3%). Majority of the twins were live births 97.5% for the first twins and 91% for the second twins. Second twins were 5 times more likely to suffer mortality compared to first twins OR 5.33(95% CI 1.53-25.6) $p= 0.003$. The odds of mortality were approximately three times higher among second twins delivered through cesarean section (AOR = 3.67, 1.08-20.5) $p=0.033$. The remaining perinatal outcomes were not significantly associated with birth order: low APGAR ($p = 0.179$), NBU admission ($p = 0.074$).

CONCLUSION

Maternal outcomes and neonatal outcomes in this study were found to be comparable to similar studies elsewhere. The cesarean section rate for twins was found to be 80.5%, this was high compare to similar studies done elsewhere. Standardization of care for twin gestations at the facility may reduce the cesarean section rate.

INTRODUCTION

Twins remain a fascinating topic for many a scientist. Twin fetuses commonly result from fertilization of two separate ova and are termed as double ovum, dizygotic or fraternal twins. About a third as often, twins arise from a single fertilized ovum that subsequently divides into two similar structures, each with the potential for developing into a separate individual. These twins are termed as single-ovum, monozygotic, or identical twins. All dizygotic twins and one-third of monozygotic twins have separate inner and outer sacs and are thus dichorionic-diamniotic. Two thirds of monozygotic twins have a single outer sac and two inner sacs (monochorionic-diamniotic) and about one third of twins will share their inner sac resulting in monochorionic-monoamniotic twins.(1,2)

In monozygotic twins, various types of chorionicity and amniocity occur as result of when the fertilized oocyte divides. Division occurring between the first day and third day results into dichorionic-diamniotic twins accounting for about a third of cases. Division between the fourth day and the eighth day results into monochorionic-diamniotic twins (about two thirds of the cases). Division occurring late between ninth and thirteenth day after fertilization results into monochorionic-monoamniotic (about one percent). Division taking place beyond the thirteenth day results into conjoined twins. (1,2)

Worldwide, the incidence of multiple pregnancies varies considerably. Twinning is a phenomenon that is highest among women of African descent and lowest among women of Asian descent. The highest rates of twinning being reported in Benin and Nigeria at 33 per 1000 live births. (3)Kenya's twinning rate is estimated at 15-20 per 1000 live births.(4-6)

The incidence of twins has increased remarkably since the late seventies due to improved reproductive services and use of technologies such as ovulation inducing drugs and assisted reproductive technology as well a shift toward bearing children at older ages where twins are more likely to occur naturally.

With increased use of ART in Kenya, there is bound to be an increase in the number of twin pregnancies, as has been evidenced in the developed world.(7)

Twins pregnancies are considered high-risk pregnancies, in that there are inherent biological factors that put the mother as well as the babies at higher risk than singleton pregnancies. Women with multiple gestations are nearly six times more likely to be hospitalized due to complications during pregnancy (8); perinatal mortality rates are four times higher in twin babies than in singletons.(9)(10)(11). The risk mortality remains higher for the second twin.(12)(13). The mode of delivery of twins has been a point of controversy and thought to significantly contribute to perinatal mortality of both the first and second twin.(14,15)

This study purposed to establish the outcomes of these high-risk pregnancies at KNH and thus contribute to improving patient care and resident training at the institution.

LITERATURE REVIEW

The prevalence of monozygotic twins remains constant at approximately 4 per 1000 live births whereas the prevalence of dizygotic twins varies by race and genetic predisposition. The prevalence of spontaneous twin pregnancies ranges from approximately 0.6% of pregnancies in Asia and 1 to 2% in Australia, Europe and the USA to about 4% in Africa.

The highest rates of twinning are reported among the Igbos of Nigeria at 45 per 1000 live births, 90% of which are dizygotic. (16)

Analysis of data from the WHO Multi Country Survey on Maternal and Perinatal Health, which involved collection of data from 23 low and middle income countries revealed Nigeria, DRC and Niger as having the highest twinning rates of the countries sampled at 4.2%, 3.8% and 3.6 % respectively.(17)

A study done in Southwest Nigeria to determine the frequency of twinning in four urban settings of Ilesha, Ile-Ife, Ogbomoso and Ado-Ekiti showed the overall average frequency of 40.2 per 1000 deliveries. The four hospitals ranked among the highest recorded rates of twin births in the world.(18) A study done in rural Burkina Faso to assess the prevalence, mortality and provision of obstetric care in twins, showed the overall population based prevalence of twin delivery of 1.6% and a hospital based prevalence rate of 2.8% out of the total 9457 deliveries recorded in the study period. (19)In Tanzania, Walraven et al did a study to compare the perinatal outcome and twinning rate in Kwimba district Tanzania as obtained from a prospective community-based survey and hospital data. The twinning rate was found to be 14 per 1000 births and 39 per 1000 births in the community study and hospital data respectively. (20). Most studies in Africa are hospital based and possibly may explain the high prevalence of twin(20,21).

In Kenya prevalence the from a retrospective study conducted at Pumwani maternity hospital put the prevalence rate at 1 in 48 live births, in keeping with previous studies done at Kenyatta National Hospital, which were 1 in 58 and 1 in 46(4–6).

Maternal Morbidity and Mortality

Multiple pregnancies are associated with increased complications when compared to singleton pregnancies. The physiological changes of pregnancy such as increase in cardiac output, volume expansion, haemodilution, diaphragmatic splinting tends to be exaggerated in pregnancy. This subsequently results in greater stresses being place on maternal reserves, more so for women with pre-existing health problems or nutritional deficiencies.(22) These complications include hyperemesis gravidarum, pregnancy wastage, gestational diabetes, ante-partum hemorrhage; pregnancy induced hypertension, preterm labour, anemia and increased need for elective and emergency caesarean section and postpartum hemorrhage (9,11,17,23)

The WHO Multi-Country survey on maternal and perinatal Health report published in 2013 found the prevalence of maternal death in twin pregnancies as 0.3 percent compared to 0.1 percent in singleton pregnancies. The prevalence of severe adverse maternal outcome in the same survey was 9.6 percent and 3.5 percent in twin and singleton pregnancies respectively. The severe adverse maternal outcomes were described as blood transfusion, ICU admissions, hysterectomy and need for at least one organ support such as dialysis. The most common complication was found to be preterm labour 35.2 percent in twin gestations versus 9.6 percent in singletons. (17) Other complications found to occur more frequently in twin gestations was PIH (7.6 percent versus 3 percent in singleton pregnancies), premature rupture of membranes, antepartum hemorrhage, severe anaemia and postpartum hemorrhage.

Mazhar in a 2-year prospective study in Pakistan also had similar findings with the risk of preterm labour at 51.6 percent in twin gestations. In the same study the risk of PIH, PROM anaemia was also found to occur significantly high in twin gestations.(9)This is in keeping with other studies findings with varying rates identified.(9,19,24,25,26,27).

Increased fetal surveillance and monitoring during the ante-natal period reduces the risks associated with twin pregnancy and leads to better pregnancy outcomes.(28)

The mode of delivery of twin pregnancy is an important predictor of perinatal outcome. Twin pregnancies are associated with higher rates of caesarean sections and operative vaginal deliveries such as complete and assisted breech deliveries due to the increased frequency of malpresentation, cord prolapse and ante-partum hemorrhage which require expedited delivery.(4,6,17) . The increased rates of caesarean deliveries in the last decade have also been informed by large retrospective studies by Smith et al whose results indicated better perinatal outcomes with cesarean versus vaginal delivery of twin pregnancies.(29,30)

Perinatal outcomes

Fetal outcomes are also of major concern as demonstrated in various studies. Twins have a 4 times increased chance of mortality, increased risk of low birth weight, prematurity, birth trauma, increased risk of asphyxia.(9,11,28,30–32)

A study done in Pakistan reported a Perinatal mortality rate of 108 per 1000 birth in twins as compared to 82 in singleton (9).

The risk of morbidity and mortality is higher for the second twin. Musili and Karanja conducted a clinical audit at Pumwani found that the 2nd twin was 6 times as likely to suffer mortality and 8 times as likely to suffer increased morbidity(6).

Chorionicity, presentation, birth order, weight discordance between the twins and the delivery interval have been shown to influence the perinatal outcomes.

Monochorionic-diamniotic twins have more than double the risk of intra-uterine foetal death than dichorionic twins due to specific risks such as feto-fetal transfusion syndrome, with morbidity and the risk of central nervous system damage being significantly increased.(33) Glinianaia in a large retrospective study conducted in Northern England found that stillbirth and neonatal mortality rates were significantly higher in monochorionic than dichorionic twins: 44.4 versus 12.2 per 1000 births [relative risk (RR): 3.6; 95% CI: 2.6-5.1], and 32.4 versus 21.4 per 1000 live births (RR: 1.5; 95% CI: 1.04-2.2), respectively.(34)

Considering the high perinatal mortality associated with twin pregnancy, the mode of delivery becomes a pertinent question, in which the crucial variable is the probability of a safe vaginal delivery. Evidence-based decision on the mode of delivery considers the presentation and size of the babies. Combinations of presentation, comprising Vertex, Breech and Transverse, are usually grouped into four categories: Vertex-Vertex (40 percent), Vertex-Non-Vertex (30 percent), Non-Vertex-Vertex (20 percent), and Non-Vertex-Non-Vertex (10percent). Vertex-Vertex pairs; in most cases, obstetricians recommend vaginal birth and the available literature supports this option with few exceptions related to size and/or gestational age. Vertex-Non-Vertex; are also considered conceivable candidates for vaginal delivery with many exceptions related to size and/or gestational age. Non Vertex-Vertex and Non Vertex-Non Vertex; are generally considered as an indication for caesarean section, mainly due to lack of evidence about the safety of vaginal delivery in breech-first pairs. (8)

In a retrospective study of twin pregnancies over a fifteen year period in Scotland Smith et al found the risk of significant morbidity and mortality to be five times higher for second twins compared to first twins. The risk was increased in vaginal delivery compared to caesarean delivery in that study(29). However the most recent meta-analysis of the neonatal outcome of twins depending on the birth order, the presentation and method of delivery comprised of eighteen studies with a total of 39571 pairs of twins confirmed lower neonatal morbidity and mortality for the first compared to the second twin (3.0 vs. 4.6%; $p < 0.001$; OR 0.53; 95% CI 0.39–0.70 or 0.3 vs. 0.6%; $p = 0.02$; OR 0.55; 95% CI 0.38–0.81). The risk for the second twin was however not reduced by caesarean delivery(35).

Barret et al in a large multi-center study, compared the twins delivered via C/S and vaginal delivery, found no difference in neonatal outcomes between the 2 groups. (15) However based on an analysis of the WHO Multi-Country Survey on Maternal and Perinatal Health, which included 3238 twin pregnancies in randomized institutions from 23 low to middle-income countries in Africa, Latin America and Asia, the requirements for safe vaginal twin births are not met in many third world countries. The authors of this study therefore found timely access to a safe caesarean birth to be necessary in order to reduce the risks for both mother and child.(17)

Time interval between delivery of twin pairs is another variable that many investigators have considered important in the outcome of the twin pregnancies. The safe time limit of the delivery interval between the twins has not been clearly defined. After delivery of the first twin, uterine inertia may develop, the second twin's cord can prolapse and partial separation of its placenta may render the second twin hypoxic. In addition, the cervix can clamp down making rapid delivery of the second twin extremely difficult if fetal distress develops.

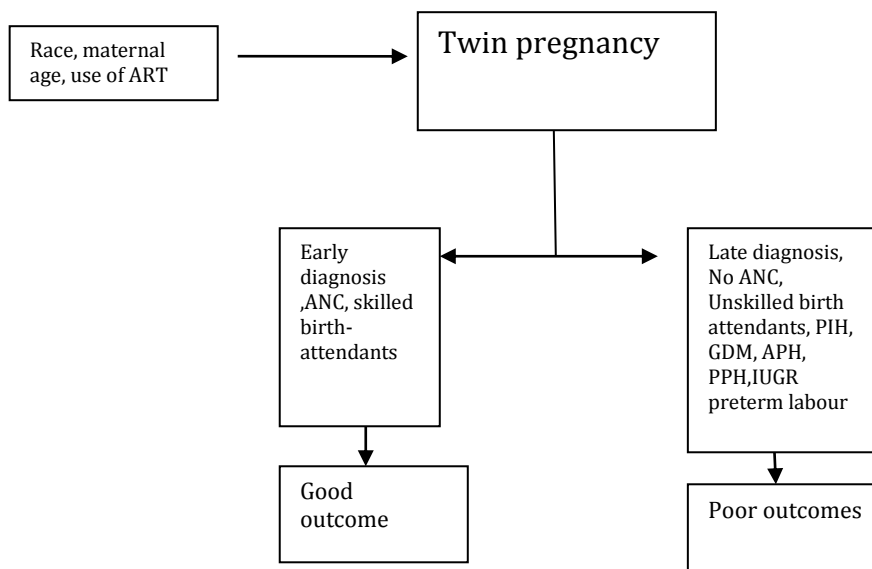
Breech, transverse lie, birth weight discordance with the second twin more than 20% larger, vaginal operative delivery, and caesarean section for the second twin are among the risk factors associated with an increased time interval.(36) Increasing time interval is related to a decline in the mean umbilical arterial pH and base excess leading to fetal acidosis and Apgar score of less than 7 at 1 and 5 minutes.(36) As twin-to-twin delivery interval seems to be an independent risk factor for adverse short-term outcome of the second twin, it is necessary to make an effort to reduce the delivery interval time.(37) Therefore active rather than expectant management of the second twin is generally recommended. This involves an artificial rupture of membranes, oxytocin augmentation, and/or breech extraction. With this management the delivery interval and the risk of caesarian section for the second twin are reduced with improved perinatal outcome.(37)

From the afore mentioned studies, it leads to conclusion that with twin pregnancies, early diagnoses, close fetal surveillance, adequate prenatal care, an appropriate birth plan and skilled attendants experienced in delivering twins reduce the risk associated with increased morbidity and mortality.

Conceptual Framework

The occurrence of twin pregnancy is influenced by several factors genetic, advanced maternal age, race and use of artificial reproductive technology. Inherently twin pregnancies have been associated with higher incidence of maternal and perinatal complications such as PIH, GDM, APH, PPH, IUGR, operative delivery and preterm labour, perinatal mortality and morbidity is influenced by maternal condition, chorionicity, gestation and weight at delivery as well as mode of delivery. Early diagnosis allows for the establishment of chorionicity, increased surveillance for expected complications as well as formulation of a birth plan suitable for the type of twin pregnancy.

Figure 1: Diagrammatic Conceptual framework



JUSTIFICATION

Twin pregnancies put mothers at increased risk of morbidity and mortality, as well as contributing to increased perinatal deaths.

Although a twin gestation is associated with increased perinatal morbidity and mortality as well as increased maternal morbidity, optimal management of this high-risk pregnancy is associated with improved outcome for the mother and her baby. Globally, the incidence of twin pregnancy is increasing due to increase use of ART as well as delay in child bearing. This makes studies on twin gestation important, especially on the outcome of the babies, which is reflection of the type of care received during the antenatal and intrapartum period. Periodic review of management of twin pregnancy is necessary to improve management of these high-risk pregnancies.

There have been few local studies on this topic and the link between perinatal outcome and mode of delivery has not been addressed in studies done at KNH. There is currently no standard operating procedure for management of twin pregnancy at the institution.

This study purposed to establish the maternal and perinatal outcomes based on the routine practices at KNH, which will form a basis for the establishment of SOPs for management of twin pregnancy at the institution.

RESEARCH QUESTION

What are the maternal and perinatal outcomes of women with twin pregnancy who delivered in Kenyatta National Hospital between 1st January 2015 and 31st December 2015?

OBJECTIVES

Broad objective

To determine the maternal and perinatal outcomes of women with twin pregnancies delivering at Kenyatta National Hospital (KNH) in 2015.

SPECIFIC OBJECTIVES

1. Determine the maternal outcomes and delivery complications among women with twin pregnancies delivering at KNH
2. Determine the modes of delivery of women delivering twin pregnancies at KNH
3. Determine the perinatal outcomes including condition at birth, birth weight, newborn unit admission of babies delivered to women with twin pregnancies delivering at KNH
4. Compare the outcome of the first and second twin based on the mode of delivery in KNH.

METHODOLOGY

Study design:

This was a hospital based descriptive cross-sectional study; patient's files with a diagnosis of twin pregnancy that delivered in Kenyatta National Hospital were retrieved from KNH records office.

Study site and setting:

The study was conducted at the Department of Reproductive Health, Kenyatta National Hospital located in Upper Hill, Nairobi.

KNH is a major referral hospital for the whole country and receives patients in the wider region of East and Central Africa. It also serves as a teaching hospital for The

University of Nairobi College of Health Sciences and Kenya Medical Training College.

The department of reproductive health KNH is managed by about 40 specialist consultant obstetrician/gynaecologists, 75 senior house officers in post graduate training, medical officer interns, clinical officers and several senior nurses and midwives divided into 4 Units.

KNH labour ward delivers 1100 to 1400 mothers/month; the labour ward is manned by a registrar in training under the supervision of 2 consultants on a daily basis. Every patient is assigned a midwife to monitor labour. There are also medical and clinical officer interns who are involved in patient management. It also includes 2 maternity theatres that run 24 hours, with registrars and consultants attending to patients.

There are 3 antenatal clinics each week one for each Unit and an extra antenatal booking clinic for the first visit. There is also a consultation room at the hospital casualty open on a 24hour basis covered by a SHO from reproductive health department, handling acute obstetrics and gynaecology cases. These are the entry point for patients delivering at KNH.

There are no established standard operating procedures for twin pregnancy, routinely mothers with twin pregnancy with the first twin in cephalic, with no other obstetric complications are delivered vaginally. Mothers with twin pregnancy with the first twin in breech are offered elective caesarean section at 38 weeks gestation. Majority of the vaginal deliveries are conducted by the assigned midwife. Twin pregnancies are reviewed by the registrar on duty upon admission to labour ward or ante-natal ward. Labour monitoring for twin pregnancies in labour ward is done by the assigned midwife. Deliveries for uncomplicated twin pregnancies are conducted by the midwife, however the registrar on duty is consulted should a complication arise.

Study population:

Women with twin gestation who delivered at KNH Department of Reproductive Health between 1st January 2015 and 31st December 2015.

Inclusion criteria:

1. Women with twin pregnancy delivering at KNH labour ward.
2. Gestation of more than 28 weeks, from the first day of her last menstrual period or first trimester ultrasound. If both are available the ultrasound was used.

Exclusion criteria:

1. Twins born before arrival to KNH labour ward.

Sample size:

The sample size was calculated using Fishers formula with finite population correction.(38)

$$n = \frac{NZ^2P(1 - P)}{d^2 (N - 1) + Z^2P(1 - P)}$$

n = sample size with finite population correction

N=Population size; 287 women that had a diagnosis of twin pregnancy that delivered in KNH between 1st January 2015 and 31st December 2015.

Z=Statistic for 95% confidence=1.96

P= Risk of preeclampsia in twin pregnancy. (Prevalence -20%, P=0.2) (6)

d =precision (desired precision = 5%, d = 0.05).

$$n = \frac{287 \times 1.96^2 \times 0.2(1 - 0.2)}{0.05^2 (287 - 1) + 1.96^2 \times 0.2(1 - 0.2)}$$

$$n = \frac{176.41}{0.715 + 0.614}$$

$$n = \frac{176.41}{1.329}$$

$$n = 132$$

All the files with the prerequisite information in the study period, were reviewed in this study. A total of 203 files met the criteria and were included.

Sampling method

KNH Health information Department maintains a database of all disease conditions and medical procedures as coded by the WHO International Statistical Classification of Disease and related Problems (ICD -10) and International Classification of Procedures in Medicine.

ICD-10 Code for twin pregnancy is O30.0. All files of patients with a diagnosis of twin pregnancy are assigned the code O30.0. A print out from the database of In-Patient numbers under the above codes from 1st January 2015 to 31st December 2015 was used to retrieve the files.

All the files of twin deliveries in 2015 were sequentially reviewed and data collected from the files with the prerequisite information.

Data collection

Information from the files was used to retrieve information by a pre tested structured questionnaire/abstraction form prepared by the principal investigator. Information collected included socio-demographic data, previous gynaecological and obstetric history. Information on the current pregnancy; records of radiological tests done, antepartum complications, gestation at delivery, mode of delivery, intrapartum maneuvers, birth weight, APGAR score at 5min, admission to NBU as well as the reason for admission.

The abstraction form was filled by the principal investigator and a trained research assistant.

Data management

The data quality management plan involved both quality assurance to prevent errors and quality control to detect and remedy any errors that may occur. Quality assurance included training the research assistant on data collection tools, providing standard operating procedure manual for use during data collection and supervision of initial data collection by the principal investigator until the assistant attains desired level of proficiency. For quality control each questionnaire was inspected for completeness at the end of data collection by the principal investigator. In cases where data was missing from records a specific code will be assigned for missing values.

Data was then entered into a database designed in MS Office Access (2007). Range and consistency checks were built into the database as a quality assurance measure aimed at reducing data entry errors. Data was transferred from Access databases to SPSS 20 for data cleaning and analysis. During data cleaning each variable in the database was inspected to check for invalid entries, and inconsistencies. In cases where data entry errors were noted cleaning involved validating entries by referring back to the study questionnaire. Any inconsistency between the questionnaire and data contained in the database were resolved by re- checking the questionnaire and re-entering the data contained in the records. Research data that will no longer required following the end of the data retention default period (duration of postgraduate studies, examination and defense) will be destroyed.

Data analysis and presentation

Data analysis was conducted using SPSS (version 20). The analysis proceeded in three stages beginning with univariable analysis, bivariation analysis and finally multivariable analysis. For the univariable analysis, each single variable was analyzed

in turn. Categorical variables were analyzed using frequency distributions presenting frequencies along with percentages.

To determine the maternal outcomes in mothers delivering twins the proportion of mothers with normal labor progress and those with maternal complications were calculated. Similarly, for the perinatal outcomes and the percentages of newborns with low birth weight, and proportion of babies admitted to newborn unit was calculated. Discordance in outcomes of first and second twins was calculated as percentage of baby-pairs with difference in outcome divided by total number of baby-pairs. The outcomes of the babies with difference in outcome were compared based on the modes of delivery. Chi-square test was used to compare the outcomes of these babies and significance was defined using a cut-off value of 0.05. Findings were presented using tables and text. Multivariable logistic regression was used to identify independent predictors of pregnancy outcome for the factors that were significantly associated with maternal or neonatal outcome.

Ethical considerations:

Clearance to conduct the study was obtained from the department of Obstetrics and gynecology and subsequent permission to carry out the study was sought from Kenyatta National Hospital/ University of Nairobi Ethics and research Committee. Consent and approval was also sought from Kenyatta National Hospital records department, the custodians of the patient data utilised in this study.

Any information obtained from the files about the patient was only used for the sole purpose of this study. No names, telephone number, postal or physical address or any other identifying information was retrieved from the files. Strict confidentiality was maintained at all times by the researcher and research assistants.

RESULTS

Demographic characteristics of women with twin pregnancies

Table 1: Demographic characteristics of mothers delivering twins in KNH

	Frequency (n)	Percent (%)
Age		
<20 years	14	6.9
20-25 years	47	23.2
26-30 years	77	37.9
31-35 years	33	16.3
>36 years	32	15.8
Marital status		
Single	22	10.8
Married	181	89.2
Education		
Primary	64	31.5
Secondary	76	37.4
College/ university	63	31
Occupation		
Employed	39	19.2
Small business	46	22.7
House wife	96	47.3
Student	13	6.4
Family history of Twins		
No	163	80.3
Yes	14	6.9
Not indicated	26	12.8
Family history		
Maternal	11	5.4
Paternal	3	1.5

Table 1 summarizes the demographic characteristics of mothers with twin pregnancies in KNH. Most mothers were aged 26-30 years (77/ 203; 37.9%) and 20-25 years (47/ 203; 23.2%), and were single (181/203; 89.2%). There were 76 (37.4%) mothers with secondary level education and the remaining had either primary or tertiary level education. Most (46/ 203; 22.7%) mothers were housewives; 39 (19.2%) were employed and 46 (22.7%) were doing small businesses.

There were 14 (6.9%) mothers who reported history of twin delivery within the family and 11 (64.7%) of these mothers indicated that family history of twin delivery occurred in the maternal lineage with 2 (11.8%) reporting twin delivery in the paternal lineage.

Table 2: Reproductive characteristics of women delivering twins at Kenyatta National hospital in 2015

	Frequency (n)	Percent (%)
Parity		
Primigravida	63	31
2	53	26
3	49	24
>4	38	18
ANC attendance (visits)		
0	18	8.9
1-3	44	21.7
>4	141	69.4
Diagnosis of twin pregnancy made in ANC period	164	80.8
Diagnostic method		
Clinical diagnosis	9	4.4
Obstetric Ultrasound	155	76.4
Chorionicity		
Monochorionic	27	13.3
Dichorionic	130	64.0
Not indicated	46	22.7
Mode of delivery planned		
Yes	68	35.6
No	112	58.6
Mode of delivery		
Vaginal delivery	30	15
Caesarean section	161	80.5
Combined	9	4.5
Type of caesarean section		
Elective	25	15.1
Intrapartum	141	84.9
Gestational age at delivery		
28-31⁺⁶	13	6.4
32-33⁺⁶	17	8.4
34-37⁺⁶	79	38.9
>38	94	46.3

Table 2 summarises the reproductive characteristics of women who delivered twin pregnancies in Kenyatta National Hospital in 2015.

Majority of the women were primigravidas 63(31%), only 38(18%) had more than 4 previous deliveries. There were 159 (78.3%) mothers who reported that twin pregnancy was diagnosed during ANC period, and 155 (76.4%) of the diagnoses were made using obstetric ultrasound.

130(64%) of the twins delivered were dichorionic, 27(13.3%) were monochorionic and 46(22.7%) chorionicity could not be determined from the records reviewed.

Out of the 203 twin deliveries occurring in KNH, 68 (35.6%) had a planned mode of delivery. Most 161 (80.5%) twin deliveries were conducted through cesarean section and 141 out of this cesarean section were done as emergency operations.

Table 3: Frequency of ante-partum complications

	Frequency (n)	Percent (%)
Premature labour	139	53.7
PIH	52	25.6
PPH	34	17.0
PROM	33	16.3
Anaemia	26	12.8
PPH	25	12.3
Polyhydramnios	15	7.4
APH	8	3.9
Eclampsia	4	2.0
Hyperemesis	3	1.5
Venous thrombosis	2	1.0
Gestational diabetes	1	0.5

Table 3 presents the pregnancy related problems that occurred in twin pregnancy gestation. The most common complication was preterm delivery with 139(53.7%) delivering before 37 completed weeks. There were 52 (25.6%) mothers who had pregnancy induced hypertension, PROM was reported in 33 (16.3%) of mothers, anemia in 26 (12.8%) and PPH occurred in 25 (12.3%).

Table 4 Indications for cesarean section

Indication	Frequency	Percent
	(N=173)	
1st twin breech presentation	55	27.1
Previous Cesarean delivery	16	7.9
NRFS	16	7.9
Prolonged labour	14	6.8
Twin pregnancy/not keen on vaginal delivery	13	6.0
PIH/pre-eclampsia	12	5.9
IUFD in one twin	8	3.9
Retained 2nd twin	8	3.9
Malpresentation	8	3.9
Cord prolapse	6	3.0
Preterm labour	5	2.5
Post-datism	5	2.5
Eclampsia	2	1.0
APH	2	1.0
Congenital anomaly	1	0.5

Table 4 describes the indications for the cesarean sections, the frequency represents both emergency and elective C/Ss done at the facility. The most common indication was 1st twin in Breech accounting for 55(27.1%) of the cases, previous cesarean delivery as an indication was found in 16(7.9%) of the mothers. NRFS and prolonged labour accounted for 16(7.9) and 14(6.8%) respectively.

Table 5: Indications for admission to NBU

Indication	1 st Twin Frequency (N=54)	Percent	2 nd twin Frequency (N=45)	Percent
Prematurity/LBW	19	35.2	14	31.1
LBW	7	13.0	5	11.1
Respiratory distress	19	35.2	16	35.6
Neonatal sepsis	1	1.9	1	2.2
Asphyxia	3	5.5	4	8.9
Maternal condition	5	9.2	5	11.1

Table 5

19 (35.2%) of the 1st twins and 15 of the 2nd (31.1%) twins admitted to NBU was due to prematurity and LBW. Admissions secondary to respiratory distress were 19 (35.2%) for the 1st twins and 16 (35.6%) for the second twins.

Asphyxia accounted for 5.5% (3) of the admissions of the 1st twin and 8.9% (4) for the second twins.

Multivariate analysis

Table 6: Diagnosis during ANC period and delivery planning

	Diagnosis of twin pregnancy in ANC		OR (95% CI)	P
	Yes	No		
Mode of delivery planned				
Yes	66(97.1)	2(2.9)	1.0	
No	79(70.5)	33(29.5)	13.78(3.2-59.6)	<0.001
Mode of delivery				
Vaginal delivery	14(46.7)	16(53.3)	1.0	
Caesarean section	139(86.3)	22(13.7)	7.2(3.1-16.8)	<0.001
Combined	6(66.7)	3(33.3)	2.29(0.4-10.8)	0.299

Table 6: There was a significant association between twin pregnancy diagnosis during ANC period and the planning for delivery ($p < 0.001$). Out of the mothers with a planned mode of delivery, 66 (97.1%) were diagnosed with twin pregnancy during ANC period compared to 79 (70.5%) of those with no planned mode of delivery (OR = 13.78, 95%CI 13.78-59.61).

Table 7: Mode of delivery compared to sociodemographic and reproductive characteristics

	C/S	SVD	OR(95%CI)	P
Age				
<20 years	9(64.3)	5(35.7)	1.00(1.00-1.00)	
20-25 years	37(78.7)	6(12.8)	3.43(0.85-13.79)	0.083
26-30 years	63(81.8)	10(13.0)	3.50(0.97-12.60)	0.055
31-35 years	27(81.8)	5(15.2)	3.00(0.70-12.80)	0.138
>36 years	25(78.1)	4(12.5)	3.47(0.76-15.87)	0.108
Marital status				
Single	16(72.7)	5(22.7)	1.00(1.00-1.00)	
Married	145(80.1)	25(13.8)	1.81(0.61-5.39)	0.285
Education				
Primary	45(70.3)	14(21.9)	1.00(1.00-1.00)	
Secondary	66(86.8)	7(9.2)	2.93(1.10-7.84)	0.032
College/ university	50(79.4)	9(14.3)	1.73(0.68-4.38)	0.248
Occupation				
Employed	30(76.9)	7(17.9)	1.00(1.00-1.00)	
Small business	36(78.3)	7(15.2)	1.20(0.38-3.81)	0.757
House wife	77(80.2)	12(12.5)	1.50(0.54-4.17)	0.439
Student	9(69.2)	4(30.8)	0.52(0.12-2.21)	0.379
	9(100.0)	0(0.0)	1.00(1.00-1.00)	
History of twin delivery				
No	131(80.4)	26(16.0)	1.00(1.00-1.00)	
Yes	11(78.6)	3(21.4)	0.73(0.19-2.79)	0.643
Not indicated	19(73.1)	1(3.8)	3.77(0.48-29.42)	0.205
Chorionicity				
1	27(96.4)	1(3.6)	1.00(1.00-1.00)	
2	130(79.3)	25(15.2)	0.19(0.03-1.48)	0.114
Not indicated	1(33.3)	2(66.7)	0.02(0.00-0.42)	0.012

Table 7: There was significant association between the mode of delivery and level of education (p – 0.032). Out of the mothers with secondary level education, 66(86.8%) had a cesarean delivery compared to 7(9.2%) who had a vaginal delivery. Chorionicity did not influence mode of delivery in this study(p - 0.11)

Table 8: Pregnancy complications among mothers delivering twins at KNH
Pregnancy complications

	Yes (n = 120)	No (n = 78)	Total	OR(95% CI)	P
Age					
<20 years	7(50.0)	7(50.0)	14(6.9)	1.0	
20-25 years	33(70.2)	14(29.8)	47(23.2)	2.36(0.70-7.98)	0.168
26-30 years	38(49.4)	39(50.6)	77(37.9)	0.97(0.31-3.04)	0.964
31-35 years	17(51.5)	16(48.5)	33(16.3)	1.06(0.30-3.71)	0.924
>36 years	25(78.1)	7(21.9)	32(15.8)	3.57(0.93-13.66)	0.063
Gravidity					
Primigravida	34(54.0)	29(46.0)	63(31.3)	1.0	
Gravida 2	31(59.6)	21(40.4)	52(25.9)	1.26(0.60-2.65)	0.543
Gravida 3	31(64.6)	17(35.4)	48(23.9)	1.56(0.72-3.36)	0.262
Gravida 4 and above	22(57.9)	16(42.1)	38(18.9)	1.17(0.52-2.64)	0.701
ANC visits					
< 3 visits	26(59.1)	18(40.9)	44(22.4)	1.0	
4 or more visits	92(65.2)	49(34.8)	141(71.9)	1.30(0.65-2.60)	0.459
Diagnosis of twin pregnancy made in ANC period					
Yes	95(59.7)	64(40.3)	159(81.1)	1.0	
No	25(56.8)	19(43.2)	36(18.4)	0.89(0.45-1.74)	0.726

Table 8 shows that there was no significant association between maternal age and pregnancy related problems ($p > 0.05$), gravidity ($p > 0.05$) or numbers of ANC visits attended ($p = 0.459$).

Table 9: Early perinatal outcomes of babies delivered to women with twin pregnancies in KNH

	Birth order				AOR (95% CI)*	McNemar's χ^2
	First twin		Second twin			
	n	%	N	%		
Sex						
Male	117	58.5	108	54	1.24(0.79-1.97)	0.323
Female	83	41.5	92	46		
Birth weight in grams						
<1000g	3	1.5	3	1.5		
1001 – 1499g	12	6	23	11.5		
1500 – 1999g	23	11.5	12	6		
2000 – 2499g	64	32	69	34.5		
>2500g	98	49	93	46.5	0.86(0.51-1.44)**	0.535**
Condition of babies at birth						
Alive	195	97.5	182	91		
Dead - MSB/FSB	5	2.5	18	9	5.33(1.53-25.6)	0.003
APGAR score at 5 minutes						
<7	18	9.1	20	10.7		
>7	180	90.9	167	89.3	0.4(0.04-2.44)	0.257
Admission to neonatal unit						
Yes	54	27.3	45	22.5		
No	144	72.7	155	77.5	1.82(0.83-4.20)	0.106
* AOR(95% CI) adjusted for pairing between babies delivered to same mother						
**Based on a comparison of underweight (<2500 g) and normal (\geq 2500 g) weight deliveries						

Table 9 compared perinatal outcomes of babies delivered to women with twin pregnancies according to birth order. There was significantly higher mortality in second compared to first twin with mortality rates of 9% and 2.5%, respectively ($p = 0.003$). Second twins had a five-fold higher odds of mortality compared to first twins (AOR = 5.33, 95% CI 1.53-25.6). There was no significant association between birth order and low birth weight ($p = 0.535$), low APGAR ($p = 0.257$) or NBU admission ($p = 0.106$).

Table 10: Early perinatal outcomes of babies delivered through cesarean section to women with twin pregnancies in KNH

	Birth order				AOR (95% CI)*	McNemar's χ^2
	First twin		Second twin			
	N	%	N	%		
Sex						
Male	92	57.1	90	55.9	1.06(0.64-1.74)	0.811
Female	69	42.9	71	44.1		
Birth weight in grams						
<1000g	3	1.9	0	0		
1001 – 1499g	2	1.2	15	9.3		
1500 – 1999g	15	9.3	12	7.5		
2000 – 2499g	54	33.5	59	36.6		
>2500g	87	54	75	46.6	0.65(0.35-1.14)**	0.109**
Condition of babies at birth						
Alive	158	98.1	150	93.2		
Dead - MSB/FSB	3	1.9	11	6.8	3.67(1.08-20.5)	0.033
APGAR score						
<7	11	6.8	14	9		
>7	150	93.2	141	91	0.25(0.01-2.53)	0.179
Admission to neonatal unit						
Yes	40	24.8	32	19.9		
No	121	75.2	129	80.1	2.33(0.84-7.41)	0.074
* AOR(95% CI) adjusted for pairing between babies delivered to same mother						
**Based on a comparison of underweight (<2500 g) and normal (\geq 2500 g) weight deliveries						

Table 10 show perinatal outcomes among babies delivered through caesarean section to mothers with twin pregnancy are compared in table 8 according to birth order. The odds of mortality were approximately three times higher among second twins delivered through CS (AOR = 3.67, 1.08-20.5). The remaining perinatal outcomes were not significantly associated with birth order: babies sex (p = 0.811), low birth weight (p = 0.109), low APGAR (p = 0.179), NBU admission (p = 0.074).

Table 11: Perinatal outcomes of babies delivered through SVD to women with twin pregnancies in KNH

	Birth order				OR (95% CI)*	McNemar's χ^2
	First twin		Second twin			
	n	%	N	%		
Sex						
Male	20	66.7	14	46.7	4.0(0.8-38.7)	0.058
Female	10	33.3	16	53.3		
Birth weight in grams						
<1000g	0	0	3	10		
1001 – 1499g	10	33.3	8	26.7		
1500 – 1999g	8	26.7	0	0		
2000 – 2499g	8	26.7	10	33.3		
>2500g	4	13.3	9	30	6.0(0.73-276)**	0.059**
Condition of babies at birth						
Alive	28	93.3	26	86.7		
Dead - MSB/FSB	2	6.7	4	13.3	NA	0.157
APGAR score						
<7	6	21.4	6	23.1		
>7	22	78.6	20	76.9	NA	0.317
Admission to neonatal unit						
Yes	13	43.3	13	43.3		
No	17	56.7	17	56.7	1.0(0.23-4.35)	1.00
* OR(95% CI) based						
**Based on a comparison of underweight (<2500 g) and normal (\geq2500 g) weight deliveries						

Table 11 shows that there was no significant association between perinatal outcomes and birth order among twins delivered through SVD: babies' sex ($p = 0.058$), low birth weight ($p = 0.059$), condition at birth ($p = 0.157$), low APGAR ($p = 0.317$) and NBU admission ($p = 1.00$).

DISCUSSION

Out of the 15,766 deliveries conducted in 2015, twins comprised of 287 deliveries, a frequency of 1 in 55 deliveries, this is comparable to previous studies to other studies, one in 58, one in 46 and one in 48 done in the country(4–6). Only 1 of the 203 study participants had documented use of ART, therefore the others can be considered to be naturally occurring. KNH is a public facility catering to women of lower socio-economic status, ART maybe not be accessible to majority of the patients due to high cost. With increasing access to ART, the twinning rate may increase as studies have shown(7)

Previous studies show an increase in twinning with advancing age, increasing parity and use of ART(7). In this study the frequency of twins did not increase with age or parity. 68% of the mothers were younger than 30 years of age, with those over 36 years comprising 15.8%. Most of the mothers were also of low parity with 31% being primigravida and only 18% with a parity of more than 4.

Premature labour was the most common maternal complication in the study with 54.7% of the mothers delivering before that 37 completed weeks of gestation. This was similar to other studies and can be explained by physiological changes occurring in the maternal body. Similar observations were reported by Mazhar in Pakistan, he reported a preterm rate of 51.6%, Nwakwo et al in Nigeria also reported a rate of 41%(9,25). Probably, the most likely reason for preterm labour could be physiological stimuli to the onset of labour, uterine over distention, placental corticotrophin-releasing hormone and lung maturity factors, may be stronger in multiple pregnancies due to the increased fetal and placental mass as described by previous studies conducted elsewhere(9,39).However, these factors were not investigated in the present study. Maternal complications included PIH, anemia and PROM occurred with similar frequency to other studies (4,6,25).

The optimal safe mode of delivery of twins remains a challenge and a subject of controversy among obstetricians. For majority of the mothers in this study the mode of delivery was caesarean delivery accounting for 80.5% of all twin deliveries compared to 15% delivered by vaginal delivery and 4.5% combined caesarean and vaginal delivery. The rate of caesarean section in this study is high compared to other studies. A study by Musili and Karanja at Pumwani, a maternity hospital in Nairobi found the rate of caesarian section to be 35.2%(6).Nwakwo et al reported a 50.4% caesarian section rate, the study was conducted in a Nigerian tertiary facility comparable to KNH(25). The increase in the rate of cesarean delivery for twin pregnancies may reflect clinicians preference and may have been informed by previous studies that showed an increased risk of morbidity and mortality for the second twin associated with vaginal deliveries and decreased risk associated with cesarean delivery(29,30). However Barret et al in a large multi-centre prospective study has shown no difference in the morbidity and mortality rate of the second twin with either caesarean or vaginal delivery(15). Other factors that may have contributed to the high caesarean section rate in this study maybe because KNH is a tertiary facility managing patients referred from other facilities for specialized care and thus they may have comorbid conditions, a decline in skills required for safe delivery of the second twin among clinicians such as internal podalic version, assisted breech delivery and breech extraction of the second twin. Determinants of the mode of delivery were not investigated in this study.

Majority of the twins in the study were live births in this study, 97.5% for the first twins and 91% for the second twins. Second twins were 5 times more likely to suffer mortality than first twins and this was statistically significant p value - 0.003(OR- 5.33,CI 1.53-25.6), this finding was similar to other studies. Mortality was

significantly higher among second compared to first twins delivered through CS with 11 (6.8%) deaths occurring in second twins compared to 3 (1.9%) deaths in first twins ($p = 0.033$). In the vaginal delivery group, the difference in the still birth rate was not statistically significant ($p=0.157$). 10.7% of the second twins had an apgar score of less than 7 at five minutes, compared to 9.1% of first twins, the difference was not statistically significant ($p=0.257$). Birth order did not affect admission to NBU with 27.3% of first twins and 22.5% of the twins. The rates of admission to NBU and an apgar score of less than 7 at five minutes were comparable in babies delivered via cesarean section and vaginally. Nwankwo *et al.* reported second twins were 6 times more likely to suffer mortality than first twins ($p= 0.030$), they also found a better perinatal outcome in babies delivered by caesarean section than those delivered vaginally both for first and second twins in terms of lesser number of still birth(25). Smith *et al.* in their studies in UK reported that the odd ratio for death of second twin was higher in term twin that was delivered vaginally compared to those delivered by caesarean section. A similar publication led by the same author noted no association between birth order and neonatal outcome in twins delivered before 36 weeks gestation(29,30). The difference in the findings between previous studies and this study could be due a the a high C/S rate compared to the other studies and hence a small proportion of the mothers delivered vaginally (30 – 15.5%), the small sampling frame for vaginal deliveries may not have led to lack of detection of an effect in perinatal outcomes measured in this study.

CONCLUSION

This study found a twinning rate of 1 in 55 deliveries, which was similar to other studies done in Kenya. In this study majority were less than 30years of age and of low parity. Premature labour was the most common maternal complication. Other maternal complications such as PIH, PROM and PPH had occurred with comparable frequency with other studies.

The rate of cesarean section rate in KNH was noted to be high at 80.5%, this significantly higher than previous similar studies. Second twins were found to at higher risk of mortality than first twins, however birth order did not affect the rates of admission to NBU or an apgar score of less than 7 at 5 minutes.

The findings in this study while comparable to similar studies elsewhere, the C/S rate was found to be high and shows the need for the standardization of care for mothers with twin pregnancy at the facility both in the antenatal and intrapartum period.

STUDY LIMITATIONS

This study employed a retrospective approach with secondary data which is prone to have missing data problems. Strict application of the planned data quality management ensured that no additional missing data was introduced during data collection. The data that was truly missing in each of the variables under consideration in this study was assumed to occur through the missing completely at random (MCAR) mechanism and hence complete-case analysis was applicable. In case of MCAR assumption no bias was introduced in the estimates obtained by conducting a complete case analysis. Secondly, to protect against the impact of missing data on sample size considerations the remaining number of cases with variable values had to meet the calculated minimum sample size so as to be considered as a potential exposure.

RECOMMENDATIONS

1. Establishment of SOP for management of twin pregnancy at the institution.
2. Early diagnosis and establishment of chorionicity of twins
3. Future research
 - Prospective study, may identify some of the maternal complications that may have had low rates due to poor documentation.
 - Prospective study to identify determinants of mode of delivery and assessment competency in skill such as breech deliveries, breech extraction and internal version among clinicians working in KNH labour ward.

TIMELINE

Activity	2016 March	2016 April	2016 May	2016 June	2016 July	2016 August	2016 September	2016 October
Proposal writing	✓	✓	✓					
Proposal presentation				✓	✓			
Presentation to ERC						✓	✓	
Data collection							✓	
Data processing							✓	✓
Report writing								✓
Study presentation								✓

BUDGET

Item	Total cost (kshs)
Biostatistician fee	20, 000
Stationary & printing costs	4,000
Internet hours	2,000
KNH/UON ERC fee	2,000
Miscellaneous	2,000
Research Assistant	20,000
GRAND TOTAL	50,000

Source of funds – personal savings

References

1. Baldwin VJ. Pathology of Multiple Pregnancy. 1st Edition. Springer Science & Business Media; 2012. 414 p.
2. Gabbe SG NJ, Simpson J.L, editor. Obstetrics Normal and Problem Pregnancies. 4th edition. ed2002.
3. Smits J, Monden C. Twinning across the Developing World. PLoS ONE [Internet]. 2011 Sep 28 [cited 2014 Dec 9];6(9). Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3182188/>
4. A 2 year review of some aspects of twin delivery in Kenyatta National Hospital. MMed Thesis. University of Nairobi, 1978. University of Nairobi;
5. Mutungi, A. K. A prospective study of twin delivery at Kenyatta National Hospital- The antenatal care and delivery. M.Med Thesis. University of Nairobi. 1990.
6. Musili F., Karanja J. G. MULTIFOETAL PREGNANCIES AT A MATERNITY HOSPITAL IN NAIROBI. East Afr Med J. 2009 Apr 4;85.
7. Wilcox LS, Kiely JL, Melvin CL, Martin MC. Assisted reproductive technologies: estimates of their contribution to multiple births and newborn hospital days in the United States. Fertil Steril. 1996 Feb;65(2):361–6.
8. American College of Obstetricians and Gynecologists Committee on Practice Bulletins-Obstetrics, Society for Maternal-Fetal Medicine, ACOG Joint Editorial Committee. ACOG Practice Bulletin #56: Multiple gestation: complicated twin, triplet, and high-order multifetal pregnancy. Obstet Gynecol. 2004 Oct;104(4):869–83.
9. Mazhar SB, Peerzada A, Mahmud G. Maternal and perinatal complications in multiple versus singleton pregnancies: a prospective two years study. JPMA J Pak Med Assoc. 2002 Apr;52(4):143–7.
10. Kiely JL. The epidemiology of perinatal mortality in multiple births. Bull N Y Acad Med. 1990 Dec;66(6):618–37.
11. Ghai V, Vidyasagar D. Morbidity and mortality factors in twins. An epidemiologic approach. Clin Perinatol. 1988 Mar;15(1):123–40.
12. Armson BA, O’Connell C, Persad V, Joseph KS, Young DC, Baskett TF. Determinants of perinatal mortality and serious neonatal morbidity in the second twin. Obstet Gynecol. 2006 Sep;108(3 Pt 1):556–64.
13. Bjelic-Radisic V, Pristauz G, Haas J, Giuliani A, Tamussino K, Bader A, et al. Neonatal outcome of second twins depending on presentation and mode of delivery. Twin Res Hum Genet Off J Int Soc Twin Stud. 2007 Jun;10(3):521–7.
14. Barrett JFR. Delivery of the term twin. Best Pract Res Clin Obstet Gynaecol. 2004 Aug;18(4):625–30.

15. Barrett JFR, Hannah ME, Hutton EK, Willan AR, Allen AC, Armson BA, et al. A Randomized Trial of Planned Cesarean or Vaginal Delivery for Twin Pregnancy. *N Engl J Med*. 2013 Oct 3;369(14):1295–305.
16. Fletcher GE ZT, Pramanik AR, Ford SP. Multiple Births. <http://emedicine.medscape.com/article/977234-overview#a6>.
17. Vogel JP, Torloni MR, Seuc A, Betrán AP, Widmer M, Souza JP, et al. Maternal and perinatal outcomes of twin pregnancy in 23 low- and middle-income countries. *PloS One*. 2013;8(8):e70549.
18. Adegbola O, Akindele OM. Twin pregnancies in Sub-Saharan Africa - Lagos experience. *J Matern-Fetal Neonatal Med Off J Eur Assoc Perinat Med Fed Asia Ocean Perinat Soc Int Soc Perinat Obstet*. 2012 Nov;25(11):2447–50.
19. Jahn A, Kynast-Wolf G, Kouyaté B, Becher H. Multiple pregnancy in rural Burkina Faso: frequency, survival, and use of health services. *Acta Obstet Gynecol Scand*. 2006;85(1):26–32.
20. Walraven GE, Mkanje RJ, van Roosmalen J, van Dongen PW, Dolmans WM. Comparison of perinatal outcome in rural Tanzania as obtained from a prospective community-based survey and hospital data. *Trop Geogr Med*. 1994;46(1):11–3.
21. van Roosmalen J. Multiple pregnancy as a risk factor in rural Tanzania. *Trop Geogr Med*. 1988 Jul;40(3):196–200.
22. Clinical aspects of multiple pregnancies, in *Obstetric and Gynecology*. 1996, Erasmus University Rotterdam: Rotterdam.
23. Nwankwo TO, Aniebue UU, Ezenkwele E, Nwafor MI. Pregnancy outcome and factors affecting vaginal delivery of twins at University of Nigeria Teaching Hospital, Enugu. *Niger J Clin Pract*. 2013 Dec;16(4):490–5.
24. Akaba GO, Agida TE, Onafowokan O, Offiong RA, Adewole ND. Review of Twin Pregnancies in a Tertiary Hospital in Abuja, Nigeria. *J Health Popul Nutr*. 2013 Jun;31(2):272–7.
25. Nwankwo TO, Aniebue UU, Ezenkwele E, Nwafor MI. Pregnancy outcome and factors affecting vaginal delivery of twins at University of Nigeria Teaching Hospital, Enugu. *Niger J Clin Pract*. 2013 Dec;16(4):490–5.
26. Kullima AA, Audu BM, Geidam AD. Outcome of twin deliveries at the University of Maiduguri Teaching Hospital: a 5-year review. *Niger J Clin Pract*. 2011 Sep;14(3):345–8.
27. Mutahir JT, Pam VC. Obstetric outcome of twin pregnancies in Jos, Nigeria. *Niger J Clin Pract*. 2007 Mar;10(1):15–8.
28. Akaba GO, Onafowokan O, Agida TE, Offiong RA, Achonwa CJ. Fetal outcome of twin gestations in a Nigerian teaching hospital. *Niger J Med J Natl Assoc Resid Dr Niger*. 2013 Mar;22(1):48–51.

29. Smith GCS, Shah I, White IR, Pell JP, Dobbie R. Mode of delivery and the risk of delivery-related perinatal death among twins at term: a retrospective cohort study of 8073 births. *BJOG Int J Obstet Gynaecol.* 2005 Aug;112(8):1139–44.
30. Smith GCS, Pell JP, Dobbie R. Birth order, gestational age, and risk of delivery related perinatal death in twins: retrospective cohort study. *BMJ.* 2002 Nov 2;325(7371):1004.
31. Herbst A, Källén K. Influence of mode of delivery on neonatal mortality in the second twin, at and before term. *BJOG Int J Obstet Gynaecol.* 2008 Nov;115(12):1512–7.
32. Olusanya BO. Perinatal Outcomes of Multiple Births in Southwest Nigeria. *J Health Popul Nutr.* 2011 Dec;29(6):639–47.
33. Pharaoh P O, Adi Y. Consequences of in utero death in a twin pregnancy. *Lancet.* 2000;355:1597–602.
34. Glinianaia SV, Obeysekera MA, Sturgiss S, Bell R. Stillbirth and neonatal mortality in monochorionic and dichorionic twins: a population-based study. *Hum Reprod Oxf Engl.* 2011 Sep;26(9):2549–57.
35. Rossi AC, Mullin PM, Chmait RH. Neonatal outcomes of twins according to birth order, presentation and mode of delivery: a systematic review and meta-analysis. *BJOG Int J Obstet Gynaecol.* 2011 Apr;118(5):523–32.
36. Stein W, Misselwitz B, Schmidt S. Twin-to-twin delivery time interval: influencing factors and effect on short-term outcome of the second twin. *Acta Obstet Gynecol Scand.* 2008;(87):346–53.
37. McGrail C D, Bryant D R. Intertwin time interval: How it affects the immediate neonatal outcome of the second twin. *Am J Obstet Gynecol* 2005;192:1420–1422 PubMed. 2005;192:1420–2.
38. Lessard S. An Exact Sampling Formula for the Wright–Fisher Model *Genetics.* 2007 Oct;177(2):1249–54.
39. Stock S, Norman J. Preterm and term labour in multiple pregnancies. *Semin Fetal Neonatal Med.* 2010 Dec;15(6):336–41.

Annex 1

DATA EXTRACTION FORM

Serial Number.....

A. SOCIO-DEMOGRAPHIC CHARACTERISTICS.

1. Age in years. - .

2. Marital status - 1. Single

2. Married

3. Level of education

No formal education/Illiterate

Primary education

Secondary education

College/University education

4. Occupation.

Employed

Small business

House wife

Student

5. History of twin delivery in the family;

NO

YES

6.If YES which side of the family;

Maternal

Paternal

B. OBSTETRIC HISTORY.

8. Gravidity.....Parity.....

9. LMP.....

10. EDD.....

11. Date at delivery.....

12. Calculated GA.....

13. Total number of antenatal visits

≤ 3 visits

> 4 visits

14. Any problem related to the pregnancy encountered

Yes

No

15. If Yes, which one

Low haemoglobin

PIH (Raised Blood pressure)

Eclampsia

Bleeding late in pregnancy (APH)

PPH

Gestational DM

Hyperemesis Gravidarum

Venous thrombosis

16. Was the diagnosis of twin pregnancy made during the antenatal period? 1.

Yes 2. No

17. If Yes, by which method?

Clinical diagnosis

Obstetric ultrasoundGestation at diagnosis

18. If No, Intrapartum diagnosis?

Vaginal

At C/S

19. Was the mode of delivery planned? 1. Yes 2. No

20. Mode of delivery

Vaginal delivery

i) First twin..... ii) Both twins.....

Caesarean Section

i) Second twin..... ii) Both twins.....

21. For vaginal delivery what was the time interval between delivery of the first twin and second twin?

Less than 10 minutes

Between 10 and 20 minutes

Between 21 and 30 minutes

More than 30 minutes

22. For caesarean section delivery was it

Elective

Emergency

23. For emergency what was the indication/s of Caesarean

section.....;(.....);.....(indicate)

No of placentas at delivery

1

2

C. FETAL OUTCOME.

24. Sex of the babies;

First twin;

i) Female..... ii) Male.....

Second twin;

i) Female..... .ii)Male.....

25. Birth weight in grams,

1. First twin.

2. Second twin

26. Condition of the babies at birth;

1. First twin;

- Alive
- Dead – FSB/MSB

2. Second twin;

- Alive
- Dead –FSB/MSB

27. For live babies at birth what were the Apgar scores?

1. First twin; i)

- At five minutes.....
- At ten minutes.....

2. Second twin; i)

- At five minutes.....
- At ten minutes.....

28. Admission to neonatal unit

- First twin

Reasons for admission(specify)

- Second twin

Reasons for admission(specify)