

**PREVALENCE OF TEENAGE PREGNANCY AND ASSOCIATED ADVERSE
OUTCOMES COMPARED TO ADULT PREGNANCY SEEN IN MSAMBWENI
AND KWALE HOSPITALS: A COMPARATIVE CROSSECTIONAL STUDY**

Principal Investigator:

Dr. Safia Said Mohamed, MBChB

H58/80923/2015

Senior House Officer,

Department of Obstetrics and Gynaecology,

School of Medicine, College of Health Sciences,

University of Nairobi.

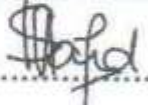
**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE AWARD OF DEGREE OF
MASTER OF MEDICINE IN OBSTETRICS AND GYNECOLOGY AT THE UNIVERSITY OF
NAIROBI**

2021

DECLARATION

I hereby declare that this is my original work, and has not been presented at any other university for the award of a degree.

Dr. Safia Said Mohamed, MBChB


Signature:  Date: 31.07.2021

APPROVAL OF SUPERVISORS

This dissertation has been submitted with our approval as supervisors.

Professor S.B Ojwang (MD, MMED Obs/ Gyn, Dip GynOncology)

Department of Obstetrics & Gynecology, University of Nairobi

Signature:  Date: 5/8/2021

Dr. Diana K. Ondieki (MBChB, MMED Obs/ Gyn)

Department of Obstetrics & Gynecology, University of Nairobi

Signature:  Date: 06/08/2021

D E D I C A T I O N

This book is dedicated to my deceased parents Said and Asha to whom I owe my hardwork and diligence and my siblings who have supported me throughout this journey.

CERTIFICATE OF AUTHENCINITY

This dissertation has been presented at the Department of Obstetrics and Gynecology and is hereby approved.

Professor. Omondi Ogutu (MBChB, MMED Obs/Gyn, FCOG)

Chairman, Department of Obstetrics and Gynecology'

University of Nairobi

Signature:.....



Date:.....

8/7/2021

A C K N O W L E D G E M E N T

First and foremost, I would like to thank God for making all this come together, without Him, it would not have been possible.

I am eternally grateful to the people who made this work possible.

The Kwale County Director of Health, DrBusaidy, for facilitating my approval for data collection;

My research assistants, Mr. Daniel and Sr. Mercy who were instrumental in data collection at Msambweni and Kwale Hospital respectively;

Sr. TimaMbwana for helping me navigate through the challenges in collecting data at Msambweni Hospital where she works;

Mr. Samson Muuo and DrHibo Ibrahim for their constant advice and moral support during my proposal writing;

Mr. MurimaNg'ang'a for his guidance in data entry and analysis;

I would like to convey very special thanks to my supervisors Prof. Ojwang and Dr. Ondieki. They guided me through each and every stage of the project, helping me temper my raw ambition with realistic goals, choose the right language of communication, and execute the study in the most effective way.

I would also like to thank my classmates, teachers and mentors, for their contribution to this work in one way or another.

I learnt a lot from all of you

LIST OF ABBREVIATIONS

ANC	Ante-Natal Care
CI	Confidence Interval
EDHS	Ethiopian Demographic and Health Survey
KDHS	Kenya Demographic and Health Survey
KNBS	Kenya National Bureau of Statistics
LBW	Low Birth Weight
PET	Preeclampsia Toxemia
PPROM	Preterm Premature Rupture of Membranes
RR	Relative Risk
SD	Standard Deviation
SSA	Sub-Saharan Africa
VDRL	Venereal Disease Research Lab
WHO	World Health Organization

O P E R A T I O N A L D E F I N I T I O N S

Early Neonatal – Period from birth to 6 days after delivery (WHO)

Fetal death – Death in utero after 20 weeks gestation

Low birth weight – Birth weight of <2500g

Maternal mortality- Death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the duration and site of pregnancy from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes (WHO)

Neonatal – Period from birth to 28 days after delivery

Perinatal – Period from 28 weeks of gestation to 7 days after birth (WHO)

Preterm birth – Births below 37 weeks gestation

Stillbirth – Death at birth after 28 weeks of gestation and weighing >500g

Teenage- The age between 10 and 19 years (WHO)

T A B L E O F C O N T E N T S

DEDICATION.....	ii
Declaration.....	iii
ACKNOWLEDGEMENT.....	v
List of abbreviations	vi
OPERATIONAL DEFINITIONS	vii
Table of contents	viii
LIST OF TABLES AND FIGURES.....	xi
Abstract.....	xii
chapter one: Introduction	1
Background	1
CHAPTER TWO: LITERATURE REVIEW.....	3
Conceptual Framework.....	6
Narrative conceptual framework.....	6
Justification.....	8
Research Question	9
Hypothesis.....	9
Objectives	9
Broad Objective	9
Specific Objectives	10
chapter three: Methodology	11

Introduction.....	11
Study design.....	11
Study siteand setting	11
Study population	12
Inclusion criteria	13
Exclusion criteria	13
Sample size and sampling procedure	13
Data Variables.....	15
Data collection	15
Data quality assurance	15
Research ethics.....	15
Data management.....	16
Study limitations	17
CHAPTER FOUR: RESULTS	18
Prevalence of teenage pregnancies	18
Characteristics of Antenatal care	20
Outcomes of Antepartum and intra partum period	22
Perinatal outcomes.....	25
Congenital malformations.....	26
CHAPTER FIVE:DISCUSSION.....	28

CONCLUSIONS AND RECOMMENDATIONS.....	32
REFERENCES.....	34
Appendix I: DATA ABSTRACTION FORM.....	42
.....	44

LIST OF TABLES AND FIGURES

Table 1: Prevalence of teenage pregnancies in Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	30
Table 2: Characteristics of the teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	31
Figure 1: – Level of education of the teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	32
Table 3: Antenatal care (ANC) attendance and antenatal profile/results of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	33
Figure 2: Utilization of antenatal care services of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	34
Table 4: Distribution of the antepartum complications of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	35
Table 5: Perinatal outcomes of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	38
Table 6: Congenital malformations of the newborns of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1 st August 2017 and 31 st July 2019.....	39

A B S T R A C T

Introduction: Globally, teenage pregnancy is a significant public health problem. These pregnancies have been reported as the commonest cause of death in teenage girls in middle and low-income countries as well as a bigger risk of fetal and maternal complications.

Objective: The study sought to determine the prevalence of teenage pregnancy and its adverse maternal and perinatal outcomes compared with the adult mothers in Msambweni and Kwale Hospitals, Kenya.

Material and methods: This was a comparative cross sectional study involving secondary data from records of deliveries in the study hospitals. Socio demographic data, antenatal history, pregnancy complications, and perinatal outcomes including congenital malformations of the newborns were assessed.

Results: Hospital records of 195 teenagers and 195 adult mothers were reviewed. Prevalence of teenage pregnancy in both hospitals was found to be 8.8%. There was poorer ANC attendance, more cesarean deliveries, higher risk of vaginal tears, prolonged and difficult second stage as compared to their adult counterpart. Among the babies born to teenage mothers, the risk of having low birth weight and low Apgar score was higher.

Conclusion: This study showed a prevalence of 8% which was lower prevalence than the KDHS of 24% and provided evidence of lower utilization of ANC by teenage pregnant women as well as higher occurrences of both intra partum and postpartum complications. Perinatal complications were higher in teenage mothers than in the adult mothers. Overall, the study underscores the fact that teenage pregnancy is high risk and should be prevented but if it occurs, comprehensive antenatal follow-up is mandatory.

Key words: Teenage Pregnancy, Adverse maternal outcomes, Adverse perinatal outcomes

C H A P T E R O N E : I N T R O D U C T I O N

Background

In Sub-Saharan Africa (SSA), improving maternal and newborn health is among the most pressing public health concerns [1]. The high rates of neonatal and maternal mortality and morbidity is attributable to multiple causes including malnutrition and micronutrient deficiencies, infectious diseases, obstetric and gynecological complications with inadequate antenatal, perinatal and postnatal care caused by inadequate financial resources [2].

Worldwide, about 1 in every 6 people is a teenager (13-19 years) [3]. Almost one-tenth of all births, globally, are to teenagers, and more than 90% of them occur in third world nations [4]. The decreasing age at menarche, improved diet and enhanced standards of living of the young generations are the key factors for high rate of teenage pregnancies. A recent report by the WHO showed that globally, the teenage rate of birth was 49 in 1000 girls aged between 15 and 19 years [1].

It remains estimated that 44% of SSA's population is aged below 15 years, thus making the region the youngest region in the world. Nevertheless, from both medical and public health perspectives, teenage is a largely neglected period of life despite sexual and reproductive health being among the most essential health challenges for teenagers in SSA [6].

Teenage pregnancies are linked with great maternal and child morbidity and mortality in addition to impacting negatively the social and economic development of a nation [5]. They are also related to an elevated possibility of adverse pregnancy and birth outcomes when evaluated against their older counterparts [4]. Teenagers are likely to experience complicated pregnancy including unsafe abortion and are more likely to become mothers again. Besides, their babies are

more likely to be born premature and face a considerably higher rate of dying than those born to older women. Moreover, they are at a higher risk of undernourishment, hampered psychological, emotional and physical growth, incongruous social connection with parents and low educational outcomes [4,7,8].

A report by the Kenya Health and Demographic Survey of 2014 show that pregnancy rates quickly increase from 15 (3.2%) to 19 (39.9%) years [9]. Whereas the number of teenagers who began motherhood dropped from 23% in the KDHS, 2003 to 18% in the 2008–2009 KDHS, the KHDS, 2014 reported no change [9,10].

According to the Kenya National Bureau of Statistics (KNBS) report, coastal region of Kenya is among the areas with the highest burden of teenage pregnancies [10]. There is thus a need to design pragmatic intervention programs to reduce these pregnancies. However, this is hampered by the limited number of published literature focusing on teenage pregnancies in Kwale County. To address this gap, at least in part, the proposed study seeks to assess the prevalence of teenage pregnancies in Kwale Region, as well as compare the attendant maternal and perinatal outcomes with their adult counterpart.

CHAPTER TWO : LITERATURE REVIEW

Teenage is a time where there is a childhood shift to adulthood. The World Health Organization describes the age between 10 to 19 years as the adolescent phase [11]. This is an intermediate period that requires exceptional attention and continued support. There are emotional somatic, psychological and social ups and downs that place their existence at higher risk [12]. Subsequently, most teenagers are exposed to undesirable pregnancy, rape, casual sexual behavior, unsafe abortion, childbearing at a young age, sexually transmitted diseases including HIV/AIDS [13,14]. At the same time, teenagers do not get sufficient information and services on reproductive health [14]. These circumstances make the problems accompanying reproductive health in teenagers very serious and complicated. In sub-Saharan Africa, the scale of teenage pregnancy account for 28%; which is greater than the world average of 6.5% [15,16]. Globally, it is estimated that teenage girls (15 to 19 years) deliver about 16 million infants annually. This represents about 11% of births worldwide. Further 95% of these deliveries occur in middle and low income nations, where problems from childbirth and pregnancy are a primary cause of death among teenagers [11]. Though fertility rates among teenagers have dropped since 1990, progress has stagnated in this era, largely in Sub-Saharan Africa and Latin America, where, respectively, nearly one half and one third of females deliver before 20 years [12,13]. A multi country study done in middle income regions indicated that the prevalence of teenage pregnancy was dissimilar amongst regions; while in Pakistan and India the prevalence did not go beyond 10%, in SSA and Latin America it ranged from between 16% to 27%. Early teenage

pregnancies (<15 years) remained almost absent in south Asian regions, but continued to be 0.2% and 1% in the SSA and Latin America. [17].

A recent study conducted in Ethiopia revealed that, more than a quarter (79.6%) of the study population (women between 20–24 years) had experienced pregnancy earlier than 20 years [18]. In Bangladesh, the prevalence of teenage pregnancies is estimated to be 72.5% [19]. The proportion of teenage pregnancies in Portugal is about 51.5% [20]. A survey done in Western Nigeria reported a prevalence of teenage pregnancies of 22.9% [21]. A research on teenage pregnancies and associated factors in South Africa found that the proportion of teenage pregnancies was 19.2% [22]. The corresponding figure for Uganda was 6.5% [23] and that of Zambia was 11.7% [24]. An analysis of 5-year period data in Hungary reported 12,845 births out of which 274 (2.1%) were teenage pregnancies with 275 newborns [25]. In Kenya, analysis of data on teenage first births derived from the KDHS revealed that there is a high burden of teenage pregnancies with the proportion of women giving birth before 20 years being estimated to be 46.9% (95% confidence interval 44.5-49.2% [26]

Pregnancy in teenage has been related to an increased threat of adverse outcomes like low birth weight (LBW), preterm birth, perinatal deaths, obstructed labor and maternal deaths [27-29]. A WHO multi-country survey found greater risks of puerperal endometritis, eclampsia as well as systemic infections but lower risks of cesarean deliveries and preeclampsia in teenage mothers than with the adult mothers between the ages of 20 to 24 years. The results from the study also revealed that teenage pregnancy individually had increased risks of preterm delivery, low birth weight and severe neonatal conditions, and a bigger risk of early neonatal death [27]. A study done in Ethiopia, teenage deaths that related to maternal causes were estimated at 22%.

Additionally, the Ethiopian research projected that every year, 9000 new fistula cases occur with one in every three occurring in teenagers. The study also reported that unsafe abortions were more prevalent among teenagers with about 2.5 million teenagers having the abortion resulting in 68,000 deaths annually [30]. There is a dearth of published literature on the prevalence and outcomes of teenage pregnancies particularly from low resource backgrounds where maximum adverse outcomes occur.

Teenage mothers give birth to babies who are more likely to be of lower weight at birth giving rise to concomitant effects in the long term. Moreover, mothers less than 18 years, have a greater risk that their child will die in their first year by 60%. [31]. According to the EDHS, 2011 report; infant and neonatal death rates are higher amongst those born to teenagers compared to those born to adult mothers [30].

Another study by Althabe et al revealed that pregnancy in teenagers was not related to worse maternal outcomes, however, it was linked to poorer perinatal outcomes, predominantly in teenagers who are younger [17]. The study team postulated that the increased risks observed among the teenagers were associated with biological immaturity rather than with inadequate delivery or antenatal care or socio-economic factors.

A hospital-based research on pregnancy outcomes conducted in Kiambu County, Kenya, showed that anaemia was more prevalent in teenagers compared to adult mothers (16.0% vs. 2.4% respectively, $p < 0.001$). Moreover, cephalopelvic disproportion occurred in 8% of the teenagers compared to 1.6% among the non-teenagers ($p = 0.018$) while preterm deliveries occurred in 5.6% of the teenagers compared to 0.8% in adult mothers ($p = 0.031$). Postpartum hemorrhage occurred in 7.2% of the teenagers compared to 0.8% of the non-teenagers ($p < 0.001$).

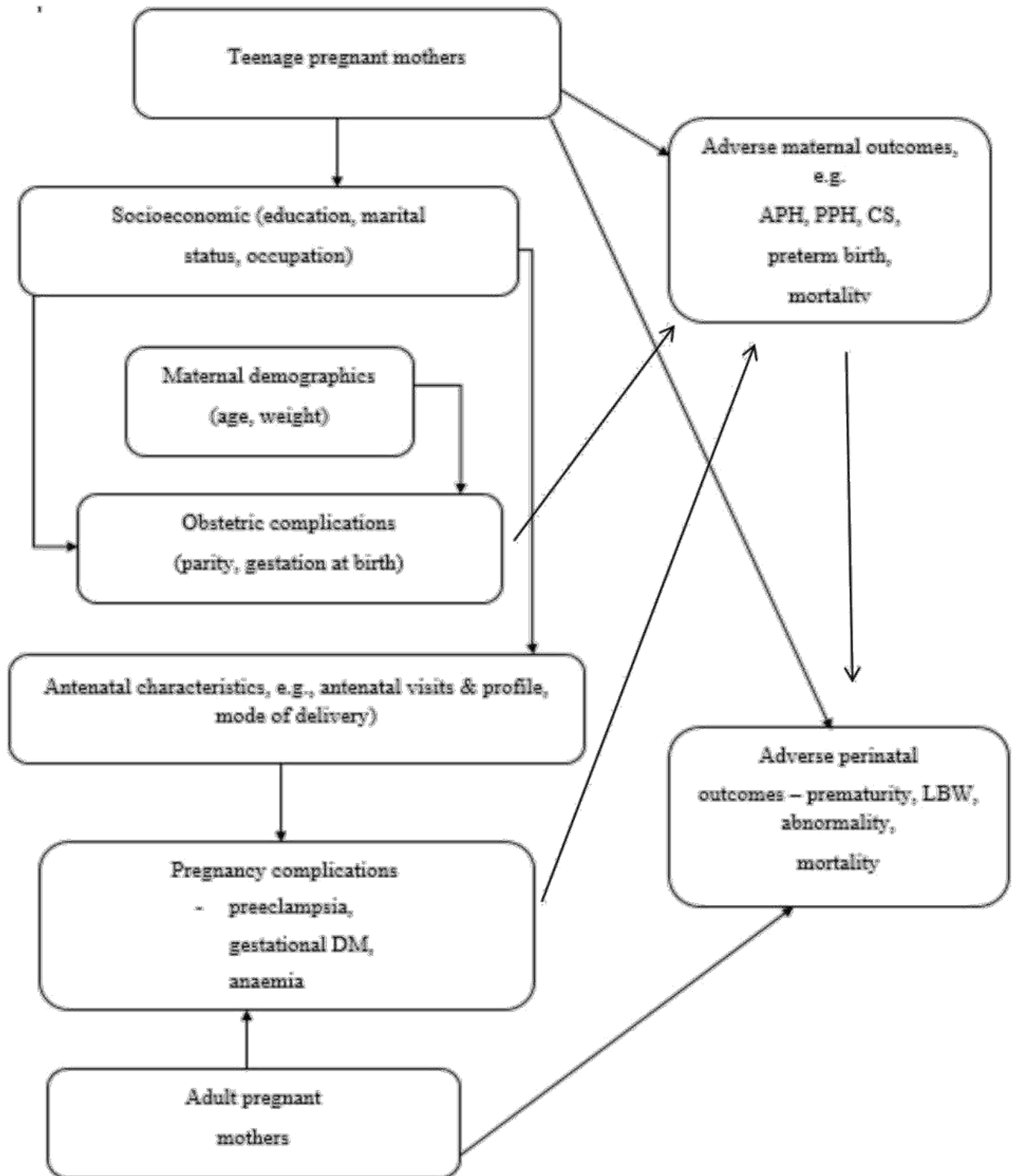
Puerperal sepsis occurred in 7.2% of the teenagers and 1.6% among the non-teenagers ($p < 0.031$). The mean birthweight of the teenagers' children was lower compared to those of the older women (2.9 kg against 3.1 kg, $p = 0.015$) [32]. Another study on teen pregnancies conducted in rural Western Kenya showed a substantial burden of teen pregnancies (23.3%) which the research associated with being single and having sexual partners as risk factors [33]. In Bungoma District, Western Kenya, a high prevalence of anemia (61%) was recorded among pregnant teenage girls attending antenatal clinics in the local health facilities [34].

Conceptual Framework

Narrative conceptual framework

The independent variables in the study included features of the two comparison groups, namely; pregnant adult mothers aged between 20 and 34 years and pregnant teenage mothers. In particular, the following sociodemographic attributes of the mothers was investigated: age, area of residence, marital status, employment status and the level of education. Other independent variables that were studied include parity, previous live births, antenatal clinic attendance and profile, the method of delivery, gestational age at birth and maternal complications. The dependent variables in the study were the adverse outcomes, both maternal and perinatal. The maternal adverse outcomes of interest in the study were antepartum hemorrhage, obstructed labor, postpartum hemorrhage, caesarean section, puerperal sepsis, hypertensive disorders and death. The perinatal outcomes assessed in this research included congenital malformations, preterm birth, low birth weight, stillbirth, neonatal and perinatal deaths. Figure 1 is a conceptual framework that illustrates the relationship between socio demographic or other factors and adverse outcomes, modified from Victora et al [35].

Diagrammatic conceptual framework (Victora et al)



Justification

There is no current published research in Kwale on the adverse maternal and fetal outcomes of teenage mothers in spite of teenage pregnancies impacting negatively on the health and socioeconomic welfare of this age group. The pregnancies cause greater risks in the health of the child and mother [10]. Mothers less than 18 years have a greater than 60% chance that their infant will die within the initial year of life [1]. Additionally, babies of teenage mothers have an increased likelihood of having low birth weight with the danger of attendant negative implications in the long run [30]. Moreover, research has shown that stillbirths as well as early neonatal death are higher by 50% amongst babies born to teenagers [34]. Unsafe abortions are also more widespread among teenagers and result in higher deaths [30]. Teenage pregnancy also limits the girls' potential; they drop out of school and are hence more likely to be jobless. This could also have an effect on the rates of growth of population and the total fertility rates [3].

In Kenya and particularly in the Coastal region, teenage pregnancy and early motherhood has remained a key social and health concern because of its association with higher morbidity and mortality. As per the 2014 KDHS report, 18% of teenage women between 15 and 19 years are already mothers or are pregnant with their first child. Further, the report showed that while rural-urban variances are small, the prevalence of early childbearing varies by area, ranging from 10% in Central region to 21% in Rift Valley and 24% in Coast regions. Kwale County ranks 7th among the counties with the highest percentage of teenage girls who have begun childbearing with recent estimates showing that 24.2% women aged between 15 and 19 years have a child or are pregnant with their first child. Of note also is the fact that the proportion of teenagers who have begun childbearing in Kenya has not changed since the 2008-09 KDHS [10].

There is a need to know the burden of teenage pregnancy and have up-to-date information on the current status of the burden associated with teenage pregnancies in two major hospitals in Kwale County as well as the attendant adverse outcomes compared with the adult pregnancy. The information is important in designing and implementing strategies aimed at curbing the problem in the region as well as informing future studies on teenage pregnancy.

Research Question

What is the prevalence of teenage pregnancy and the associated adverse maternal and perinatal outcomes compared to adult mothers who delivered at Msambweni County Referral Hospital and Kwale Sub-County Hospital between 1st August 2017 and 31st July 2019?

Hypothesis

The Null hypothesis: There is no difference in the adverse maternal and perinatal outcomes between teenage and adult mothers who delivered at Msambweni County Referral Hospital and Kwale Sub-County Hospital between 1st August 2017 and 31st July 2019

Objectives

Broad Objective

To determine the prevalence of teenage pregnancy and compare adverse maternal and perinatal outcomes among teenage and adult mothers who delivered at Msambweni County Referral Hospital and Kwale Sub-County Hospital between 1st August 2017 and 31st July 2019

Specific Objectives

Among teenage and adult mothers who delivered at Msambweni County Referral Hospital and Kwale Sub County Hospital between 1st August 2017 and 31st July 2019, to;

1. Determine the prevalence of teenage pregnancies.
2. Compare the adverse maternal outcomes.
3. Compare the adverse perinatal outcomes and congenital malformations

CHAPTER THREE:

METHODOLOGY

Introduction

The methodology chapter outlined the design used to conduct the research, data gathering techniques utilized in the study in light of the objectives of the survey and the research questions addressed in this research. The sections outlined are; study site, study population, research design, sample size determination, sampling method, procedures for collection of data and instruments for capturing data deployed in the survey and data management and statistical analysis.

Study design

This research was a comparative cross sectional study in which records of 195 teenage mothers and 195 adult mothers were reviewed to determine the prevalence of teenage pregnancy as well as compare maternal and perinatal outcomes among adolescent and adult mothers who have delivered in the hospitals. The fact that the exposure and outcomes being studied in these two groups of women had already occurred and can be examined at the same time, permits the adoption of a comparative cross sectional study design in this research (35).

Study site and setting

The study sites were two health facilities located in Kwale County, Kenya; Msambweni County Referral Hospital and Kwale Sub-County Hospital. Kwale County is among the six Counties in Coast. It borders Kilifi County to the North East, Taita Taveta to the North West, Taita Taveta and Kilifi to the North, Tanzania to the South, and to the East, Mombasa County and Indian Ocean. Kwale has an area of 1,043 km². The area has an estimated population of 151,978 residents

[9].The number of women in the reproductive age group in Kwale County is estimated to be 197,802. The fertility rate in this County,stands at five children per woman, which is greater than the national average of 3.9 births per woman. Kwale is among the counties with highest prevalence of teenage pregnancies in Kenya with recent estimates indicating that the proportions of women between 15 to 19 years who had a live birth and who are pregnant with their first child being 18.9% and 5.3% respectively [10]. The County has three (3) county hospitals, sixty- four (64) dispensaries and eight (8) health centerin Kwale , Msambweniand Kinango sub Counties. The ratio of doctor and nurse population stands at 1: 76,741 and 1: 3,133 respectively.Msambweni hospital is a teaching and referral hospital with a casualty unit, female ward, a pediatric ward, a male ward, a maternity ward, a theater, a radiology unit and an intensive care unit. It employs 3 consultants, qualified medical and clinical officers and their interns and nurses among other health professionals. It receives high risk patients from the whole county.Persons living here are predominantly of Digo tribe. Kwale sub county hospital has a casualty unit, a male ward, a pediatric ward, a female ward, a maternity ward and a theatre. It receives patients within the sub County and occasionally from Kinango sub County. Persons living here are predominantly of Duruma tribe.

Study population

The records of all women who met the eligibility criteriawere reviewed and relevant data extracted for the study.

Inclusion criteria

Teenager mothers (10 - 19 years) as well as adult mothers (20 – 34 years) who delivered in the study health facilities from 1st August 2017 and 31st July 2019 were included in the study.

Exclusion criteria

Missing data of women who delivered in the study health facilities from 1st August 2017 and 31st July 2019, women who had chronic illnesses (e.g. malignancy, chronic hypertension) before pregnancy, those who had multiple pregnancies and women above 35 years were excluded because advanced maternal age is already a risk to mother and fetal outcome..

Sample size and sampling procedure

The minimum required sample size for the study was determined using the following formulae [35]:

$$N = \frac{\left\{ Z_{\alpha} \sqrt{2\bar{p}\bar{q}} + Z_{\beta} \sqrt{p_1 \left[1 + R - p_1 (1 + R^2) \right]} \right\}^2}{\left\{ p_1 (1 - R) \right\}^2}$$

Where;

N is the sample size for each group

$$\bar{p} = 1/2 p_1 (1 + R), \quad \bar{q} = 1 - \bar{p}$$

Z_{α} is the standard normal deviation for a given level of significance (1.962 for 5% level of significance)

Z_{β} is the standard normal deviation for a given power (0.84 for a power of 80%)

P_1 is the anticipated proportion of the adult mothers-newborn dyad having at least one adverse outcome. This will be based on a study done in Turkey which reported a LBW prevalence of 18.2% [38]

R is the anticipated relative risk of a mothers-newborn dyad having at least one adverse outcomes, i.e., $R = P_2 / P_1$ where P_2 is the anticipated proportion of teenage mothers-newborn dyad having at least one adverse outcome, i.e., 34%. Thus, $R = P_2 / P_1 = 0.34 / 0.182 = 0.535$

$$\bar{p} = \frac{1}{2} \{0.182(1 + 0.535)\} = 0.261; \bar{q} = 1 - 0.261 = 0.739$$

$$N = \frac{\{1.96\sqrt{2} * 0.261 * 0.739 + 0.84\sqrt{0.182[1 + 0.535 - 0.182(1 + 0.535^2)]}\}^2}{\{0.182(1 - 0.261)\}^2} = 176.4$$

Considering an attrition rate of 10% ($0.1 \times 177 = 18$), the sample size will be $177 + 18 = 195$.

The total minimum required sample size for the study was $195 \times 2 = 390$ study subjects. The sample was distributed using probability proportionate to size approach as shown in Table 1.

Table 1 Distribution of the sample among the study hospitals

Health facility	Estimated annual teenage deliveries	Sample		
		Adult mothers	Teenage mothers	Total
Msambweni	220	101	101	202
Kwale	204	94	94	188
TOTAL	424	195	195	390

The records that met the eligibility criteria were sampled randomly, based on the dates of delivery, till the desired sample size was attained.

Data Variables

Maternal outcomes: Ante partum and postpartum hemorrhage, obstructed labor, hypertensive disorders in pregnancy, Caesarean deliveries, puerperal sepsis, and maternal mortality.

The *perinatal outcomes* are: preterm birth, stillbirth, LBW, early neonatal deaths, perinatal deaths, Apgar scores (<7) at 5 minutes, neonatal deaths and congenital malformations.

Data collection

Records of 390 women who delivered at the two study hospitals between August 2017 and August 2019 were obtained from the records department of the hospitals. Data was then abstracted using a prescribed check list (Appendix I). Data was divided into maternal and perinatal/ neonatal outcomes. Maternal socio-demographics, obstetric/ antenatal history and the outcomes/ complications were captured. Neonatal characteristics and perinatal outcomes were taken from the mother's files including congenital abnormalities.

Data quality assurance

Data quality assurance measures were undertaken in order to improve on validity and reliability of the study's findings. The research assistants were trained on how to extract maternal and newborn data from the hospital's records. Quality control was performed as a continuous process. Also, the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for reporting observational studies was deployed in this research in order to enhance the quality of reporting in this study [39].

Research ethics

Ethical clearance was sought from the Scientific and Ethics Review Committee of Kenyatta National Hospital/University of Nairobi (Appendix II). Approval to conduct the study

was requested from the hospitals' administration at Kwale. This study was about auditing patients' files and there was no direct contact with the study participants. The abstracted data was coded and anonymized and stored in a password protected computer only accessible to the principal investigator and no information was released to any unauthorized third party. All information was handled with utmost confidentiality throughout the study. The research assistants were trained on ethical research conduct and confidentiality. Patient identifiers were not used.

Data management

The data was entered in Microsoft Excel spread sheet. The data was coded, processed and cleaned to get rid of inconsistencies and duplications. Data was imported into Statistical Package for Social Sciences (IBM SPSS v. 21) for data cleaning, categorization of variables and subsequent analysis. The final copy of the data was used for statistical analysis and a second copy of the data was archived for future referencing.

Descriptive analyses included calculating the frequency and proportions for the categorical variables. Continuous data was summarized as mean \pm standard deviation (sd) or median (inter quartile range) where appropriate. Fisher's exact test and Pearson's chi square (χ^2) was used to test associations between the categorical variables. Odds ratio (OR) with the corresponding 95% confidence interval (CI) as well as the p-value was reported. Logistic regression analysis was done to adjust for the potential confounders. All the data was analyzed using IBM SPSS v. 21. A p-value of less than 0.05 was considered statistically significant. The results were presented as tables.

Study limitations

Our study has a number of limitations particularly because of the retrospective characteristic of the investigation. It was not possible to assess some aspects which are known to be associated with undesirable pregnancy outcomes, including weight gain during pregnancy, malaria in pregnancy, pre-pregnancy body mass index, family income and uptake of ANC interventions including malaria prophylaxis among others. Additionally, our study was hospital-based and, therefore, our findings may not be generalizable to all populations and different settings. Another limitation in this research is the relatively small size of the studied cohorts whose analysis does not support the study of rare outcomes such as neonatal mortality and congenital malformations of the newborns. The accuracy of Apgar score and degree of vaginal/perineal tears could not be ascertained. There was also a lack of a digital registry which was mitigated by manual retrieval of patients' numbers from the maternity registry (ANC wards, labor ward and postnatal wards) at Kwale and Msambweni Hospitals.

CHAPTER FOUR: RESULTS

Prevalence of teenage pregnancies

In this study, records of 195 teenage women and 195 adult women who delivered in the two hospitals were reviewed in this study. Table 1 presents the prevalence of teenage pregnancies in the sampled hospitals during the study period. Out of the 9682 deliveries that occurred during the period under consideration, 848 were of teenage women (8.8%, 95% CI 8.2% - 9.3%).

Table 1: Prevalence of teenage pregnancies in Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Hospital	Total deliveries	Teenage births		95% Confidence interval
		n	%	
Msambweni	5944	440	10.9	10.0 - 12.0
Kwale	3738	408	7.4	6.8 - 8.1
Total	9682	848	8.8	8.2 - 9.3

Demographic characteristics of the studied mothers

The present study reviewed a total of 390 records of adult and teenage mothers in the ratio of 1:1. Their sociodemographic characteristics are outlined in Table 2. Analysis of maternal age showed that the mean \pm SD age of the adult and teenage mothers who were enrolled in the study was 28.3 ± 4.62 and 17.2 ± 1.43 years, respectively. Majority of the mothers (343, 89.8%) were unemployed: adult mothers who were unemployed were 158 (82.7) while their teenage counterparts who were unemployed were 185 (96.9%). Most of the mothers hailed from a rural area (138 adult mothers (70.8%) and 168 teenage mothers (86.2%)). Adult and teenage mothers

who were primiparous were 64 (32.8%) and 147 (75.4%), respectively. Of the 211 participants who were found to be primiparous, 147 were teenagers and 64 were adults respectively. Most of the adult mothers were found to be multiparous: out of 179 women, 131 (67.2%) were adults and 48 (24.6%) were teenagers. Most women had 1-3 live births: out of 236 participants, 119(61%) were adult mothers and 117(60%) were teenagers. Most adult mothers had more than three live births: 55(28.2%) compared to 16(8.2%).

Table 2: Characteristics of the teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Characteristics	All		Adults		Teenagers	
	n	%	n	%	n	%
<i>Maternal Age (mean± SD) years</i>	22.8 ± 6.52		28.3 ± 4.62		17.2 ± 1.43	
Marital status						
Married	273	70.0	168	86.2	105	53.8
Single	117	30.0	27	13.8	90	46.2
Employment status						
Employed	39	10.2	33	17.3	6	3.1
Unemployed	343	89.8	158	82.7	185	96.9
Residence						
Urban	84	21.5	57	29.2	27	13.8
Rural	306	78.5	138	70.8	168	86.2
Parity						
Primipara	211	54.1	64	32.8	147	75.4
Multipara	179	45.9	131	67.2	48	24.6
No. of live births						
1 -3	236	60.5	119	61.0	117	60.0
>3	71	18.2	55	28.2	16	8.2

A total of 79 mothers (20.6%) had no formal education constituted by 42 adult mothers (22.0%) and 37 teenage mothers (19.3%). Adult mothers who had attained primary, secondary and tertiary education, were, 86 (45.0%), 34 (17.8%) and 29 (15.2%) respectively. The corresponding figures for their teenage counterparts were, respectively, 113 (58.9%), 38 (19.8%) and 4 (2.1%) respectively (Figure 1).

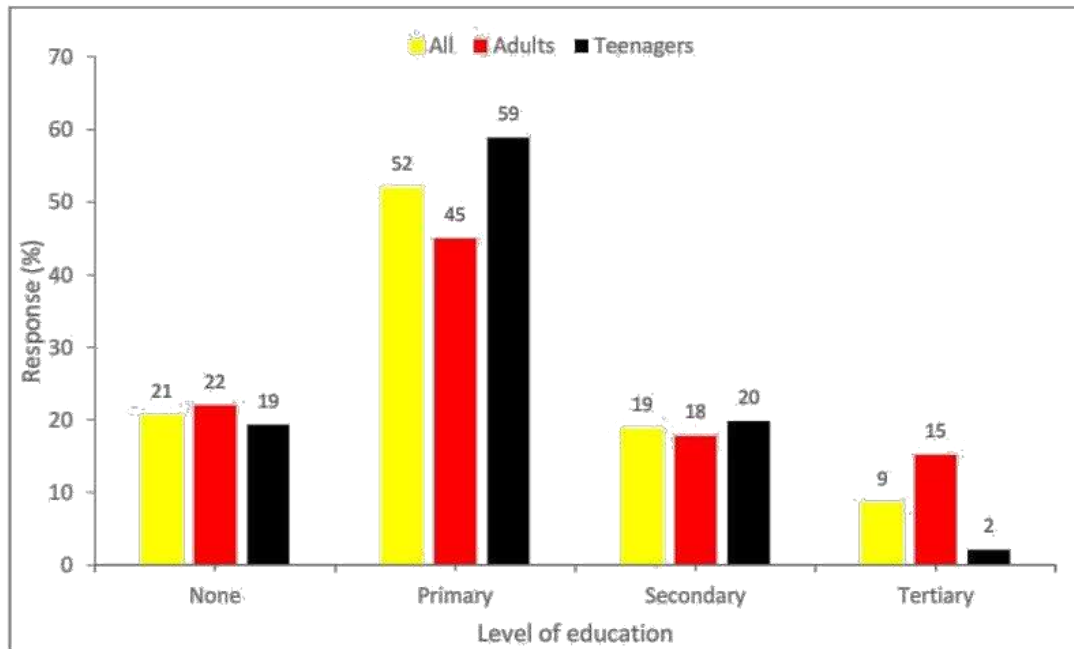


Figure 1 – Level of education of the teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Characteristics of Antenatal care

Table 3 presents the details on the antenatal clinic attendance and antenatal profile/results of the mothers who were studied. The results from VDRL were no different between the two groups of mothers ($p=0.562$). Although not statistically significant, the prevalence of anemia was higher in teenage mothers when compared to adult mothers (44.6% against 38.5% respectively, $p=0.218$).

Analysis of mothers by HIV status revealed that there was no significant difference between the study groups (p=0.411).

Table 3: Antenatal profile/results of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Characteristic	Total		Adults		Teenagers		P-value
	n	%	n	%	n	%	
VDRL							
Positive	3	0.8	2	1.0	1	0.5	0.562
Negative	387	99.2	193	99.0	194	99.5	
Hemoglobin (11 g/dl)							
Anemia (<11 g/dl)	162	41.5	75	38.5	87	44.6	0.218
Normal (≥ 11.0 g/dl)	228	58.5	120	61.5	108	55.4	
HIV status							
Positive	6	1.5	4	2.1	2	1.0	0.411
Negative	384	98.5	191	97.9	193	99.0	

Antenatal care (ANC) clinic attendance varied significantly between the two study groups: all the seven mothers (3.6%) who did not make any visit to the ANC clinic were teenagers. Further, more adult mothers made at least four ANC contacts during the pregnancy period (146 (74.9%) adult mothers compared to 124 (64.2%) teenage mothers, p=0.006) (Figure 2).

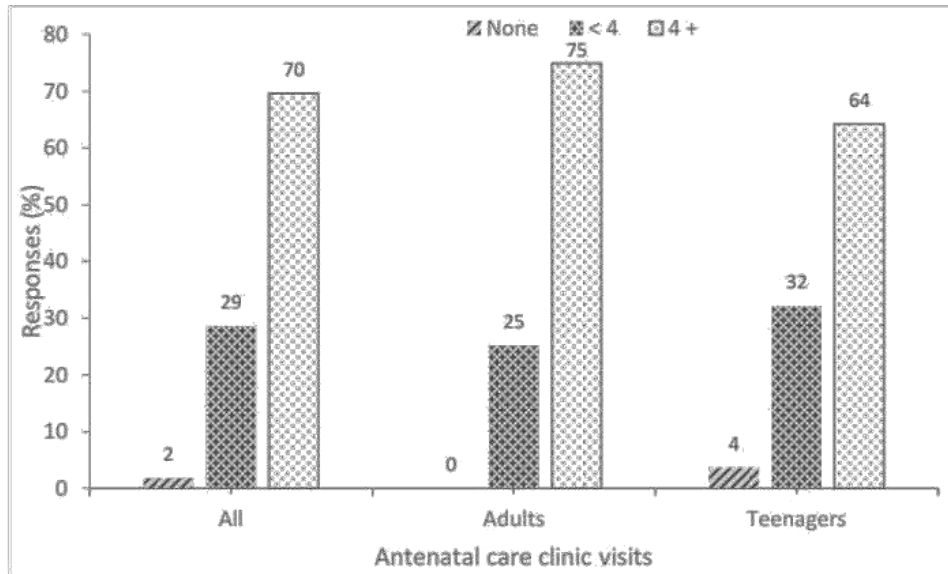


Figure 2 – Utilization of antenatal care services of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Outcomes of Antepartum and intra partum period

The findings on the distribution of the antepartum complications in teenage and adult mothers are highlighted in Table 4. The proportion of teenage and adult mothers who had a previous history of preterm deliveries was 2.6% in both groups (odds ratio (OR) 1.00 (95% confidence interval (CI) 0.29 - 3.51), $p=1.000$). Between the two study groups, there was no significant difference in the proportion of mothers who had any hypertensive disorders during pregnancy (OR 1.21 (95% CI 0.51 - 2.88), $p=0.661$), PET (OR 1.26 (95% CI 0.49 - 3.27), $p=0.629$); gestational hypertension (OR 2.01 (95% CI 1.82 - 2.22), $p=0.317$); eclampsia (1.00 (0.06 - 16.12), $p=1.000$); Maternal sepsis (OR 1.00 (95% CI 0.06 - 16.12), $p=1.000$); placenta previa (OR 2.01 (95% CI 1.82 - 2.22), $p=0.156$); post-partum hemorrhage (1.81 (95% CI 0.74 - 4.41), $p=0.188$); chorioamnionitis (OR 1.00 (95% CI 0.06 - 16.12), $p = 1.000$); vacuum delivery (0.66 (0.11 - 4.01), $p=0.653$). The number of teenage and adult mothers who had preterm

delivery (<37 complete gestational weeks) were 32 (18.3%) and 34 (18.4%) respectively (OR 0.99 (95% CI 0.58 - 1.73), p=0.982). The gestational age (weeks) at birth ranged 28 to 44 weeks with a mean \pm SD of 37.3 ± 0.131 in teenage mothers and 37.5 ± 0.08 g in adults mothers. Investigations into the mode of delivery revealed that the proportion of teenage mothers who delivered by Caesarean section was higher when evaluated against the adult mothers although this was not statistically significant (23.1% versus 15.9% respectively, OR 1.59 (95% CI 0.96-2.64), p=0.073). Moreover, teenage mothers had higher odds of vaginal/ perineal tears (OR 2.46(1.35 - 4.47), p=0.003); episiotomy (OR 1.64 (95% CI 1.03 - 2.61), p=0.036); prolonged second stage (OR 6.11 (95% CI 2.30 - 16.22), p=0.001); and difficult second stage (OR 4.67 (95% CI 0.99 - 21.96), p=0.032).

Table 4: Distribution of the antepartum complications of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Complication	Total		Teenagers		Adults		OR (95% CI)	P-value
	n	%	n	%	n	%		
Previous history of preterm deliveries								
Yes	10	2.6	5	2.6	5	2.6	1.00(0.29-3.51)	1.000
No	380	97.4	190	97.4	190	97.4	Ref	
Hypertensive disorders in pregnancy (gest. HTN/PET/Eclampsia)								
Yes	22	5.6	10	5.1	12	6.2	1.21(0.51-2.88)	0.661
No	368	94.4	185	94.9	183	93.8	Ref	
PET								
Yes	18	4.6	8	4.1	10	5.1	1.26(0.49-3.27)	0.629

No	372	95.4	187	95.9	185	94.9	Ref	
Gestational hypertension								
Yes	1	0.3	0	0.0	1	0.5	2.01(1.82-2.22)	0.317
No	389	99.7	195	100.0	194	99.5	Ref	
Eclampsia								
Yes	2	0.5	1	0.5	1	0.5	1.00(0.06-16.12)	1.000
No	388	99.5	194	99.5	194	99.5	Ref	
Anemia during pregnancy								
Yes	111	28.5	57	29.2	54	27.7	1.08(0.70-1.68)	0.736
No	279	71.5	138	70.8	141	72.3	Ref	
Puerperal sepsis								
Yes	2	0.5	1	0.5	1	0.5	1.00(0.06-16.12)	1.000
No	388	99.5	194	99.5	194	99.5	Ref	
Mode of delivery								
Caesarean section	76	19.5	45	23.1	31	15.9	1.59 (0.96-2.64)	0.073
Vaginal delivery	314	80.5	150	76.9	164	84.1	Ref	
Vaginal Tears								
Yes	57	14.6	39	20.0	18	9.2	2.46(1.35-4.47)	0.003
No	333	85.4	156	80.0	177	90.8	Ref	
Episiotomy								
Yes	98	25.1	58	29.7	40	20.5	1.64(1.03-2.61)	0.036
No	292	74.9	137	70.3	155	79.5	Ref	
Placenta previa								
Yes	2	0.5	0	0.0	2	1.0	2.01(1.82-2.22)	0.156
No	388	99.5	195	100.0	193	99.0	Ref	
Chorioamnionitis								

Yes	2	0.5	1	0.5	1	0.5	1.00(0.06-16.12)	1.000
No	388	99.5	194	99.5	194	99.5	Ref	
Post-partum hemorrhage								
Yes	22	5.6	14	7.2	8	4.1	1.81(0.74-4.41)	0.188
No	368	94.4	181	92.8	187	95.9	Ref	
Vacuum delivery								
Yes	5	1.3	2	1.0	3	1.5	0.66(0.11-4.01)	0.653
No	385	98.7	193	99.0	192	98.5	Ref	
Prolonged second stage								
Yes	32	8.2	27	13.8	5	2.6	6.11(2.30-16.22)	0.001
No	358	91.8	168	86.2	190	97.4	Ref	
Difficult second stage								
Yes	11	2.8	9	4.6	2	1.0	4.67(0.99-21.96)	0.032
No	379	97.2	186	95.4	193	99.0	Ref	
Preterm delivery <37 wks								
Yes	66	18.3	32	18.3	34	18.4	0.99(0.58-1.73)	0.982
No	294	81.7	143	81.7	151	81.6	Ref	

Perinatal outcomes

The results of the analysis of perinatal outcomes in the two study groups are presented in Table 5. The mean \pm SD weight was significantly lower in children born of teenage mothers when compared to those of adult mothers (2741.5 ± 39.0 g vs. 2938.3 ± 37.4 g, respectively, $p < 0.001$). A significantly higher prevalence of low birth weight was observed among children of teenage mothers (59, 30.3%) than their counterparts sired by older mothers (41, 21.0%) (OR 1.63 (95% CI 1.03 - 2.58), $p = 0.037$). The number of neonatal deaths among teenage mothers' cohort was 7 (3.6%) while in the adult mothers' cohort there were two neonatal deaths (1.0%) (OR 3.59 (95%

CI 0.74 - 17.52), p=0.092). Between the two groups of mothers, there was no significant variations in the observed proportions of fetal deaths (OR 2.02 (95% CI 1.82-2.23), p=0.082). At the 5th minute children born of teenage mothers had about three fold higher odds of having a low Apgar score compared to those of older mothers (OR 3.38 (OR 1.08 - 10.54), p=0.027)

Table 5: Perinatal outcomes of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Characteristic	Total		Teenagers		Adults		OR (95% CI)	P-value
	n	%	n	%	n	%		
Mean weight ± SD(g)			2741.5±39.0		2938.3±37.4			<0.001
Birth weight								
Low (< 2500 g)	100	25.6	59	30.3	41	21.0	1.63(1.03-2.58)	0.037
Normal (≥2500 g)	290	74.4	136	69.7	154	79.0	Ref	
Apgar score (5 min)								
Low (<7)	17	4.4	13	6.7	4	2.1	3.38(1.08-10.54)	0.027
High (≥7)	371	95.6	182	93.3	189	97.9	Ref	
Fetal death								
Yes	3	0.8	3	1.5	0	0.0	2.02(1.82-2.23)	0.082
No	387	99.2	192	98.5	195	100.0	Ref	
Neonatal death								
Yes	9	2.3	7	3.6	2	1.0	3.59(0.74-17.52)	0.092
No	381	97.7	188	96.4	193	99.0	Ref	

Congenital malformations

There was no significant difference in the prevalence of congenital malformations of the newborns in the adult and teenage mothers' cohort as shown in Table 6.

Table 6: Congenital malformations of the newborns of teenage and adult mothers who delivered at Msambweni and Kwale Hospitals between 1st August 2017 and 31st July 2019

Malformation	Total		Teenagers		Adults		OR (95% CI)	P-value
	n	%	n	%	n	%		
Neural tube defects/hydrocephalus								
Yes	3	0.8	2	1.0	1	0.5	2.01(0.18)22.35)	0.562
No	387	99.2	193	99.0	194	99.5	Ref	
Abdominal wall defect (gastroschisis)								
Yes	2	0.5	1	0.5	1	0.5	1.00(0.06)16.12)	1.000
No	388	99.5	194	99.5	194	99.5	Ref	
Urogenital defects								
Yes	1	0.3	1	0.5	0	0.0	2.01(1.82)2.22)	0.317
No	389	99.7	194	99.5	195	100.0	Ref	
Musculoskeletal defects								
Yes	5	1.3	3	1.5	2	1.0	1.51(0.25)9.13)	0.653
No	385	98.7	192	98.5	193	99.0	Ref	

C H A P T E R F I V E : D I S C U S S I O N

In order to design cost-effective interventions aimed to further decrease maternal and neonatal mortality in sub-Saharan Africa, identification of high risk cohorts among pregnant women is of high priority. In line with this, our research examined the relationship between teenage pregnancy and the risk of adverse maternal and perinatal outcomes in a hospital based setting. Our data showed that about one in ten deliveries in the study area are of teenage women. The study highlighted poor antenatal care (ANC) clinic attendance among the teenage mothers when compared to their older counterparts. The study also showed that teenage mothers were just as likely as adult mothers to deliver by Caesarean section. Antepartum complications including vaginaltears, episiotomy, prolonged second stage and a difficult second stage were most frequently reported among the teenage mothers. Additionally, investigations about adverse perinatal outcomes indicated that infants born of teenage mothers were more likely to have a low Apgar score (at 5 minutes) and low birth weight.

Teenage pregnancies were prevalent in the study area with about one-tenth of the deliveries being those of teenage women. The study was hospital-based and thus the proportion described in this study most probably represents a very conservative estimate of teenage pregnancies. Studies have documented that most of the deliveries in the study area are home-based [10,54,55]. Our study reported a much lower prevalence of teenage births compared to what was reported in a research conducted in the Buea Health District, Cameroon, where 13.3% of all hospital births were to teenage mothers [56]. In the same country, a retrospective register analysis of singleton deliveries in a secondary-level care hospital situated in a semi-urban area showed a prevalence of teenage deliveries of 8.7% (95% CI 7.0–10.7%); an estimate which is not different from our

current study [57]. Higher prevalence of teenage pregnancies was documented in a community-based cross-sectional study conducted in Wogedi, northeast Ethiopia; the prevalence of teenage pregnancy was 28.6% (95% CI 24.9-32.5%) [58]. The disparities in the findings, could be attributed at least in part, to the variations in the study settings.

The nature of healthcare services that a woman receives during pregnancy, has a substantial impact on the outcomes of the pregnancy. Timely ANC attendance helps in early identification of high risk pregnancies hence providing an opportunity to put in place mitigation measures ultimately reducing the risk of poor pregnancy outcomes. In the current study, utilization of ANC was lower in the teenage mothers' cohort when assessed against their older equals. This corroborates findings from previous studies which have shown that teenage pregnancies are often characterized by late initiation of pre-natal care, poor health behaviors during the prenatal period and, eventually poorer pregnancy outcomes [42, 43].

The findings from the current study showed no significant difference in gestational hypertension among non-teenage and teenage mothers. Conversely, previous research has demonstrated a trend of increasing pregnancy-induced hypertension, preeclampsia and eclampsia with increase in maternal age [44]. The reason for the observed discrepancy in our research could be due to the retrospective nature of the study and using routine hospital data but it may call for further investigations using other study designs.

In young women the pelvic bones and the birth canal are still immature and are undergoing growth. This raises the risk of prolonged and obstructed labor [45]. This theory of immaturity may explain the observation made in our study whereby prolonged second stage and difficult

second stage were documented more frequently among the teenage mothers as compared to the adult mothers.

The clinical use of episiotomies in obstetric emergencies like shoulder dystocia and to prevent vaginal tears is still being practiced. Our study reported higher rates of episiotomy and vaginal tears in teenage mothers. This is in concordance with the findings from a study done in Turkey, which showed higher episiotomy rates among teenage mothers [38].

In our study the teenage mothers were more likely to give birth by caesarian section. In concurrence with this finding, a study done in Kiambu, Kenya, showed that the proportion of teenagers who had a caesarean section due cephalopelvic disproportion were more compared to the adults (8.0% compared to 1.6% respectively, $P < 0.018$) [32,38,46,47]. This is contrary to a study done by Briggs et al which showed a significantly lower proportion of teenage mothers had cesarean deliveries (48). This was because the adult mothers had higher pre-pregnancy body mass index (BMI) and increased weight gain during pregnancy, which were independent risk factors for cesarean sections.

Low birth weight is of critical concern since it is known to be a principal cause of morbidity and mortality in neonates and infants. Our data showed that infants born of teenage mothers had a higher likelihood of having a low birthweight. In another study, Nderitu et al found that, on average, infants of teenage mothers had lower birth weight with the mean birthweight of newborns of teenage and adult mothers being 2.9 kg and 3.1 kg respectively ($p=0.015$) [32]. This is also similar to a study done by Mukhopadhyay et al [49] and Karai et al [25] which found that teenage mothers had lower birth-weight babies compared to the adult mothers. Nevertheless, our

results should be interpreted with some cautions considering that the study area is known to be endemic for malaria. It is estimated that, in regions of high malaria transmission, infections with plasmodium may cause about 19% of low birth weight deliveries [50]. Data on malaria infection and utilization of attendant control measures such as intermittent preventive treatment of malaria in pregnancy was not available.

In the current study there was no difference in the occurrence of perinatal/neonatal deaths between the two cohorts of mothers. A review of published literature is not conclusive on this matter with prior investigations on perinatal mortality in adult and teenage pregnancies yielding conflicting findings. Some surveys have demonstrated an elevated risk of neonatal death among infants born to teenage mothers [49]. In keeping with our data, other studies have documented no difference in the risk of neonatal mortality among infants born of teenage women compared to those of older women [51]. Our study also showed an increased likelihood of babies born to teenage mothers to have lower Apgar scores (<7) at 5 minutes. This is similar to a study done in United States [52] but contrary to a study done in Thailand which showed no difference in Apgar scores among the two groups [47].

Our study did not find a significant difference in the rates of congenital abnormalities of the newborns born to teenage mothers compared to adult mothers. This was contrary to a review done by Akusherstvo et al which showed increased incidences of congenital malformations in the central nervous system, gastrointestinal and musculoskeletal systems [53].

C O N C L U S I O N S A N D R E C O M M E N D A T I O N S

The present health-facility based study demonstrated that the prevalence of teenage pregnancies in the study area is about 9%. Our study also provided evidence of lower utilization of ANC by teenage pregnant women as well as higher occurrences of both intra-partum and postpartum complications such as vaginal tears, episiotomy, prolonged second stage and a difficult second stage in teenage mothers when assessed against non-teenage mothers. Neonatal and fetal complications including low birth weight, low Apgar scores (5 minutes) were higher in the cohort of teenage mothers group than in the adult mothers. Overall, the study underscores the fact that teenage pregnancy is high risk and should be prevented but if it occurs, comprehensive antenatal follow-up is mandatory. The information generated from our study may be helpful when providing teenage pregnancy care in a bid to continue plans to reduce the prevalence even further and minimize adverse outcomes in both the mother and the neonate. Increased efforts are needed by the policy makers to reduce the prevalence of teenage pregnancy even further. From a public health perspective, teenage pregnant women comprise a relatively easy to identify population which is responsive to targeted and tailored antenatal care programs. Development and implementation of custom-made antenatal care as well as facilitation of early attendance of antenatal care by teenage pregnant women should thus be a priority to improve adolescent reproductive health. Closer surveillance of teenage mothers should be initiated earlier during pregnancy to reduce perinatal morbidity and mortality. Future studies should focus on ways of reducing the numbers of teenage pregnancies and ways of optimizing utilization of antenatal care

among teenage pregnant women as well looking into associations of teenage pregnancy and its adverse outcomes with inadequate antenatal care and parity of the mother.

R E F E R E N C E S

1. WHO. Maternal and perinatal health. WHO (cited 30 June 2019). http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/en/
2. Kinney MV, Kerber KJ, Black RE, et al. Sub-Saharan Africa's mothers, newborns, and children: where and why do they die? PLoS Med 2010;7:e1000294.
3. WHO. Teenagers: Health Risks and Solutions. Geneva: World Health Organization; 2017. Available from: <http://www.who.int/mediacentre/factsheets/fs345/en/>
4. Yakubu I, Salisu WJ. Determinants of teenager pregnancy in sub-Saharan Africa: a systematic review. Reproductive Health, 2018 Dec;15(1):15.
5. WHO. Teenager Pregnancy. Geneva: World Health Organization; 2014. Available from: <http://www.who.int/mediacentre/factsheets/fs364/en/>
6. Sexual health and rights of teenagers: a dialogue with sub-Saharan Africa (cited 19 April 2019). http://www.academia.edu/10977260/Sexual_health_and_rights_of_teenagers_A_dialogue_with_sub-Saharan_Africa.
7. Amjad S, MacDonald I, Chambers T, Osornio-Vargas A, Chandra S, Voaklander D, Ospina MB. Social determinants of health and adverse maternal and birth outcomes in teenager pregnancies: A systematic review and meta-analysis. Paediatric and perinatal epidemiology. 2019 Jan;33(1):88-99.

8. Grønvik T, Sandøy IF. Complications associated with teenager childbearing in Sub-Saharan Africa: A systematic literature review and meta-analysis. *PloS one*. 2018 Sep 26;13(9):e0204327.
9. Kenya National Bureau of Statistics (KNBS). Kenya Demographic and Health Survey 2008–09. Nairobi. KNBS. 2010.
10. KNBS. Kenya Health and Demographic Survey 2014. Nairobi. KNBS. 2015.
11. World health organization (WHO). Programming for teenager health and development: report of WHO/UNFPA/UNICEF study group on programming for teenagers health. Geneva: WHO; 1999.
12. Federal Democratic Republic of Ethiopia: Ministry of Health: Teenager Reproductive Health Extension Package. In. Addis Ababa; 2003.
13. United Nations Children’s Fund (UNICEF): World population day: Young People and Family Planning: Teenage Pregnancy 2008.
14. United Nations Children’s Fund (UNICEF). The state of the world’s children 2011: Teenage an age of opportunity. New York: UNICEF; 2011.
15. United Nations Economic Commission for Africa (UNECA), African Union, African Development Bank Group U. Assessing Progress in Africa toward Development Goals the Millennium: Food security in Africa: Issues, challenges and lessons. Addis Ababa: UNECA; 2013.

16. United Nations Population Fund (UNFPA). Adolescent pregnancy: A Review of the Evidence. New York: UNFPA; 2013.
17. Althabe et al.: Adverse maternal and perinatal outcomes in teenager pregnancies: The Global Network's Maternal Newborn Health Registry study. *Reproductive Health* 2015 12(Suppl 2):S8.
18. Birhanu et al. Predictors of teenage pregnancy in Ethiopia: a multilevel analysis. *BMC Public Health* (2019) 19:601. <https://doi.org/10.1186/s12889-019-6845-7>.
19. Sayem AM, Nury ATMS. Factors associated with teenage marital pregnancy among Bangladeshi women. *BMC Reprod Heal*. 2011;8(16).
20. Santosa MI, Rosário F. A score for assessing the risk of first-time teenager pregnancy in Portugal; 2011.p. 28.
21. Amoran OE. A comparative analysis of predictors of teenage pregnancy and its prevention in a rural town in Western Nigeria. *Int J Equity Health*.2012; 11:37.
22. Mchunu GPK, Tutshana B, Seutlwadi L. Teenager pregnancy and associated factors in South African youth. *Afr Health Sci*. 2012;12:4.
23. Gideon R. Factors Associated with Teenager Pregnancy and Fertility in Uganda: Analysis of the 2011 Demographic and Health Survey Data. *Am J Sociol Res*. 2013;3(2):30–5.
24. Nwogwugwu C. Socio-Demographic Determinants of Teenager Fertility in Zambia. Johannesburg: University of the Witwatersrand; 2013.
25. KaraiAdrienn, ZitaGyurkovits, TiborAndrásNyári, TamásSári, GáborNémeth

- &HajnalkaOrvos (2019) Adverse perinatal outcome in teenage pregnancies: an analysis of a 5-year period in Southeastern Hungary, *The Journal of Maternal-Fetal & Neonatal Medicine*, 32:14,2376-2379, DOI: 10.1080/14767058.2018.1438393.
26. Neal SE, Chandra-Mouli V, Chou D. Adolescent first births in East Africa: disaggregating characteristics, trends and determinants. *Reproductive health*. 2015 Dec;12(1):13.
27. Ganchimeg T, Mori R, Ota E, Koyanagi A, Gilmour S, Shibuya K, et al: Maternal and perinatal outcomes among nulliparous teenagers in low and middle-income countries: a multi-country study. *BJOG* 2013,120(13):1622-1630.
28. Weng YH, Yang CY, Chiu YW: Risk Assessment of Adverse Birth Outcomes in Relation to Maternal Age. *PLoS One* 2014, 9(12):e114843.
29. Mukhopadhyay P, Chaudhuri RN, Paul B: Hospital-based perinatal outcomes and complications in teenage pregnancy in India. *J Health Popul Nutr* 2010, 28(5):494-500.
30. Central Statistical Agency: Addis Ababa: Ethiopia, ICF International, Calverton: Maryland: USA: Ethiopia Demographic and Health Survey (EDHS) 2011: 2012.
31. World Health Organization (WHO). Preventing early pregnancy and poor reproductive outcomes among teenagers in developing countries. In. Edited by Department of Maternal Newborn Child and Teenager Health. Geneva: WHO; 2011.

32. Nderitu CM, Wanyoike-Gichuhi J, Ondieki DK, Odawa X. Pregnancy outcome among teenagers and non-teenagers delivering at Kiambu Country Hospital, Kenya. *East African Medical Journal*. 2015;92(8):381-8.
33. Omoro T, Gray SC, Otieno G, Mbede C, Phillips-Howard PA, Hayes T, Otieno F, Gust DA. Teen pregnancy in rural western Kenya: a public health issue. *International Journal of Teenage and Youth*. 2018 Oct 2;23(4):399-408.
34. Shipala EK, Sowayi GA, Kagwiria MP, Were EO. Prevalence Of Anemia Among Teenage Pregnant Girls Attending Antenatal Clinic In Two Health Facilities In Bungoma District, Western Kenya. *J Biol Agri and Healthcare*. 2013;3(6).
35. Victora CG, Huttly SR, Fuchs SC, Ollito MT: The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. *Int J Epidemiol*. 1997, 26 (1): 224-227. 10.1093/ije/26.1.224.
36. Kothari CR. *Research methods and techniques*. New Age International. 2004.
37. Lwanga, S. K., Lemeshow, S., & World Health Organization. *Sample size determination in health studies: a practical manual*. Geneva. WHO. 1991.
38. Demirci O, Yılmaz E, Tosun Ö, Kumru P, Arinkan A, Mahmutoğlu D, Dolgun ZN, Arısoy R, Erdoğan E, Tarhan N. Effect of young maternal age on obstetric and perinatal outcomes: results from the tertiary center in Turkey. *Balkan medical journal*. 2016 May 1;33(3):344-9.
39. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, Strobe Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology

(STROBE) Statement: guidelines for reporting observational studies. *International journal of surgery*. 2014 Dec 1;12(12):1495-9

40. Beyene A, Muhiye A, Getachew Y, Hiruye A, Mammo D, Hailemariam D, Derbew M, Enquselassi F. Assessment of the magnitude of teenage pregnancy and its associated factors among teenage females visiting Assosa General Hospital. *Ethiopian medical journal*. 2015 Jul 1;53
41. Okuyelu OA, Ajayi IO, Okedare AO. Teenage pregnancy and family characteristics as seen among teenagers presenting at two hospitals in Ibadan, Nigeria. *Nigerian Journal of Family Practice*. 2017;8(4):57-66
42. Owolabi OO, Wong KL, Dennis ML, Radovich E, Cavallaro FL, Lynch CA, Fatusi A, Sombie I, Benova L. Comparing the use and content of antenatal care in adolescent and older first-time mothers in 13 countries of west Africa: a cross-sectional analysis of Demographic and Health Surveys. *The Lancet Child & Adolescent Health*. 2017 Nov 1;1(3):203-12.
43. Magadi MA, Agwanda AO, Obare FO. A comparative analysis of the use of maternal health services between teenagers and older mothers in sub-Saharan Africa: evidence from Demographic and Health Surveys (DHS). *Social science & medicine*. 2007 Mar 1;64(6):1311-25.
44. Maternal-prenatal morbidity and mortality associated with adolescent pregnancy in Latin America; cross sectional study. Agustin Conde, Aguedelo, et al. *American journal of obstetrics and Gynecology* 2005; **192**: 342-349.

45. Shaikh S, Shaikh AH, Shaikh SA, Isran B. Frequency of obstructed labor in teenage pregnancy. *Nepal Journal of Obstetrics and Gynaecology*. 2012;7(1):37-40.
46. JahaD,Usta I, Ghulmiyyah L, Nassar A. A review of the risks and consequences of adolescent pregnancy. *Journal of neonatal-perinatal medicine*. 2015 May 18;8(1):1-8.
47. Kovavisarach E, Chairaj S, Tosang K, Asavapiriyant S, Chotigeat U. Outcome of teenage pregnancy in Rajavithi Hospital. *Medical journal of the Medical Association of Thailand*. 2010 Jan 1;93(1):1.
48. Briggs MM, Hopman WM, Jamieson MA. Comparing pregnancy in adolescents and adults: obstetric outcomes and prevalence of anemia. *Journal of Obstetrics and Gynaecology Canada*. 2007 Jul 1;29(7):546-55.
49. Mukhopadhyay P, Chaudhuri RN, Paul B. Hospital-based perinatal outcomes and complications in teenage pregnancy in India. *Journal of health, population, and nutrition*. 2010 Oct;28(5):494.
50. Guyatt HL, Snow RW. Impact of malaria during pregnancy on low birth weight in sub-Saharan Africa. *ClinMicrobiol Rev* 2004;17:760–9.
51. Jolly MC, Sebre N, Robinson HS, Regan L. Obstetrics of pregnancy in women less than 18 years old. *Obstetri. Gynecol* 2000;96:962-966.
52. Chen XK, Wen SW, Fleming N, Demissie K, Rhoads GG, Walker M. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. *International journal of epidemiology*. 2007 Apr 1;36(2):368-73.
53. Sirakov M. Congenital malformations in teenage pregnancy. *Akusherstvoiginekologija*. 2012;51(4):35-40.

54. Omari JM. Health facility delivery among women who have delivered in the last six months in Kwale County-Kenya. Ph.D Thesis, Kenyatta University. 2015.
55. Mochache V, Lakhani A, El-Busaidy H, Temmerman M, Gichangi P. Correlates of facility-based delivery among women of reproductive age from the Digo community residing in Kwale, Kenya. *BMC research notes*. 2018 Dec;11(1):715.
56. Egbe TO, Omeichu A, Halle-Ekane GE, Tchente CN, Egbe EN, Oury JF. Prevalence and outcome of teenage hospital births at the buea health district, South West Region, Cameroon. *Reproductive health*. 2015 Dec;12(1):118.
57. Njim T, Agbor VN. Adolescent deliveries in semi-urban Cameroon: prevalence and adverse neonatal outcomes. *BMC research notes*. 2017 Dec;10(1):227.
58. AyanawHabitu Y, Yalew A, AzaleBisetegn T. Prevalence and Factors Associated with Teenage Pregnancy, Northeast Ethiopia, 2017: A Cross-Sectional Study. *Journal of pregnancy*. 2018;2(2):18.

APPENDIX I: DATA ABSTRACTION FORM

S. No	Variable	Response
Maternal Characteristics		
1.	Age (years)	
2.	Residence	1. Urban 2. Rural
3.	Marital status	1. <input type="checkbox"/> Married 2. <input type="checkbox"/> Single
4.	Employment status	1. <input type="checkbox"/> Employed 2. <input type="checkbox"/> Unemployed
	Education	1. <input type="checkbox"/> Primary 2. <input type="checkbox"/> Secondary 3. <input type="checkbox"/> Tertiary 4. None
5.	Antenatal care visits attended	_____
6.	Antenatal profile and results	
	VDRL	1. <input type="checkbox"/> Positive 2. <input type="checkbox"/> Negative
	Urinalysis	_____
	Hb	_____ g/dl
	Blood group	_____
	HIV status	1. <input type="checkbox"/> Positive 2. <input type="checkbox"/> Negative
7.	Parity and no. of live births	
8.	Previous history of preterm deliveries	1. <input type="checkbox"/> Yes. 2. <input type="checkbox"/> No
9.	Hypertensive disorders in pregnancy (gest. HTN/PET/Eclampsia)	1. <input type="checkbox"/> Yes. <i>Specify</i> _____ 2. <input type="checkbox"/> No
10.	Anemia during pregnancy	1. <input type="checkbox"/> Yes. 2. <input type="checkbox"/> No
11.	Preterm rupture of membranes	1. Yes 2. No
12.	Puerperal sepsis	1. <input type="checkbox"/> Yes, 2. <input type="checkbox"/> No
13.	Gestational age (weeks) at birth	
14.	Mode of delivery	1. <input type="checkbox"/> Vaginal delivery 2. <input type="checkbox"/> Cesarean section
15.	Vaginal Tears and degree of tears	1. <input type="checkbox"/> Yes(_____) 2. <input type="checkbox"/> No
16.	Episiotomy	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
17.	Placenta previa	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
18.	Chorioamnionitis	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
19.	Post-partum hemorrhage	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No

20.	Vacuum delivery	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
21.	Other adverse outcomes. Specify	_____
22.	Prolonged second stage,	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
23.	Difficult second stage	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
24.	Maternal death	1. Yes 2. No
Neonate Characteristics & perinatal outcomes		
1.	Birth weight (g)	_____
2.	Sex	1. <input type="checkbox"/> Male 2. <input type="checkbox"/> Female
3.	Apgar score (5 min)	_____
4.	Fetal death	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
5.	Neonatal death	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
6.	Time at death of neonate Others..... Specify	_____

Congenital malformations of the newborns		
1.	Neural tube defects/hydrocephalus	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
2.	Abdominal wall defect (gastroschisis)	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
3.	Urogenital defects	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
4.	Musculoskeletal defects	1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No
5.	Other. specify	_____

Notes/comments/observations _____



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19678 Code 00202
Telegrams: uonbi/ny
Tel:(254-020) 2726300 Ext 44355



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 725300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

KNH-UoN ERC

Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

Ref: KNH-ERC/A/440

14th November, 2019

Dr.Safia Said Mohamed
Reg. No.H58/80923/2015
Dept.of Obstetrics and Gynaecology
School of Medicine
College of Health Sciences
University of Nairobi



Dear Dr. Mohamed

RESEARCH PROPOSAL: PREVALENCE OF TEENAGE PREGNANCY AND ASSOCIATED ADVERSE OUTCOMES COMPARED TO ADULT PREGNANCY IN MSAMBWENI AND KWALE HOSPITALS; A COMPARATIVE CROSS-SECTIONAL STUDY (P815/09/2019)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 14th November 2019 – 13th November 2020.

This approval is subject to compliance with the following requirements:

- a. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
- c. Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
- d. Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
- e. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
- f. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
- g. Submission of an executive summary report within 90 days upon completion of the study.
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

or more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

