

**EFFECT OF GIVING BIRTH BEFORE
ARRIVAL (BBA) ON PREGNANCY OUTCOME
AMONG BOOKED MOTHERS AT COAST
PROVINCIAL AND GENERAL HOSPITAL
(CPGH)**

**SUBMITTED BY
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DEDICATION

To my parents Mr. and Mrs. Chiraghdin Ali Chiraghdin, and my siblings, whose unwavering support, love and affection inspired and spurred me on towards attainment of greater heights of excellence in my education.

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DECLARATION

I hereby declare that this research is my original work done under the supervision and guidance of my supervisors Dr. Omondi Ogutu, Prof. Muia Ndavi and Prof. Fredrick Were. This dissertation has not been submitted to any other university for a degree course.

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LIST OF ABBREVIATIONS

ANC	-	Antenatal Clinic
ART	-	Antiretroviral Therapy
AS	-	Apgar Score
BBA	-	Birth Before Arrival
CPGH	-	Coast Provincial and General Hospital
ERC	-	Ethics and Research Committee
FANC	-	Focused Antenatal Care
HIV	-	Human Immunodeficiency Virus
IBP	-	Individualized Birth Plan
IV	-	Intravenous
KDHS	-	Kenya Demographic Health Survey
KNH	-	Kenyatta National Hospital
LBW	-	Low Birth Weight
LMP	-	Last Monthly Period
L/W	-	Labour Ward
MDGs	-	Millennium Development Goals
NBU	-	New Born Unit
OBA	-	Output Based Aid
PPH	-	Postpartum Haemorrhage
PNMR	-	Perinatal Mortality Rate
POC	-	Products of Conception
SPSS	-	Statistical Package for Social Sciences
TBA	-	Traditional Birth Attendant
UN	-	United Nations
UoN	-	University of Nairobi
WHO	-	World Health Organization

ABSTRACT

Background: Birth before arrival (BBA) at hospital delivery unit is still common even in modern obstetric practice and it carries significant adverse maternal and neonatal outcomes all over the world but more so in low income countries like Kenya. Some of the risk factors associated with BBA are lack of or poor quality antenatal care, lack of or poor infrastructure, insecurity, adverse weather conditions, socio-cultural barriers for women to seek health care, unaffordable health care and inaccessible health facilities. . Antenatal care, childbirth and delivery are essential and should be affordable and accessible to all mothers. Three of the eight Millennium Development Goals (MDGs) address the concerns arising in birth before arrival to hospital. These are MDG numbers 3, 4 and 5 which state that countries should promote gender equality and empower women, reduce child mortality and improve maternal health respectively

Objective: To determine the effect of birth before arrival (BBA) on pregnancy outcomes at Coast Provincial and General Hospital.

Setting: Coast Provincial and General Hospital (CPGH) maternity unit.

Study Design: A 1:1 matched case-control study

Study Population: Postnatal mothers (BBA and hospital delivered) admitted to CPGH maternity unit

Sample size: A sample size of 156 was used consisting of 78 cases and 78 controls matched for age (+/- 5years) and parity (para 1, multipara and grand multipara).

Methodology: Cases were recruited sequentially until the desired size of case population was reached. Cases comprised of mothers who delivered outside CPGH maternity unit but had planned a hospital delivery and were admitted after delivery. For each case recruited, one control matched for age and parity was selected randomly using balloting method. Controls comprised of mothers who had booked/planned hospital delivery and delivered at CPGH labour ward within 24 hours of case recruitment. Upon recruitment, both cases and controls were assessed in terms of their social demographic characteristics, risk factors and maternal and neonatal outcomes. Data was collected using an interviewer-administered questionnaire. The questionnaire was structured and

pre-coded for ease of data collection and uniformity. Data analysis was done using Epi info and SPSS software version 17.0 for descriptive statistics and measures of association and correlation. Data was then presented in tables.

Results: The mean age of the study participants was 25.2, with a range of between 24 to 27 years. Majority of the participants were married (87.2%), had at least primary school level of education (57.1%), were housewives (56.4%) and were para 1 (53.8%). Area of residence was found to be a significant factor in having a BBA (OR 11.5; 95% CI 5.2-25.4). No significant association was found between BBA and maternal level of education, marital status and occupation. Non-satisfactory antenatal care ($p < 0.001$) and lack of birth and emergency preparedness ($p < 0.001$) during the antenatal period significantly influenced the risk of having BBA. BBA mothers were more at risk of developing postpartum complications compared with mothers who had a hospital delivery (AOR 17.0 and p -value < 0.001). The complications experienced by the BBA mothers are postpartum haemorrhage (29.5%), puerperal sepsis (24.4%) and birth injuries (20.5%). There were significant adverse neonatal outcomes amongst the BBA babies, warranting NBU admission, as opposed to those babies who were delivered in hospital (AOR 8.3; 95% CI 4.4-15.1 and p -value < 0.001). The indications for admission to the NBU were (in order of frequency): prematurity (40.7%), respiratory distress (25.3%), birth asphyxia (13.2%) and neonatal sepsis (2.2%).

Conclusion and recommendation: Birth before arrival to hospital delivery unit is associated with adverse maternal and neonatal outcomes. The risk factors associated with BBA are preterm delivery, short duration of labour and residence out of Mombasa Island. Lack of or inadequate birth and emergency preparedness during antenatal care also contribute significantly to out of hospital deliveries.

It is thus prudent to put emphasis and counsel the mothers on birth and emergency preparedness during antenatal care in each visit in order to avert this situation. Improvement of infrastructure to avoid delays in reaching the health facilities for delivery is necessary. Also, new health facilities offering maternity services should be built in Mombasa mainland for easy accessibility by the mothers in labour.

INTRODUCTION

The world leaders at the United Nations (UN) General Assembly in the year 2000 committed themselves to and adopted the Millennium Development Goals (MDGs) in order to achieve international development. ¹ These are eight goals that are to be achieved by the year 2015. These MDGs are interdependent; all MDGs influence health and health influences the MDGs. Three of these MDGs influence directly maternal and perinatal health and these are: ¹

MDG 3: To promote gender equality and empower women.

Target 3.A. Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education by no later than 2015.

MDG 4: To reduce child mortality.

Target 4.A. Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.

MDG 5: To improve maternal health.

Target 5.A. Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio and the proportion of deliveries assisted by skilled birth attendant should be 90% by the year 2015.

Target 5.B. Achieve, by 2015, universal access to reproductive health.

Birth before arrival to hospital delivery unit is still common even in modern obstetric practice. It is defined as birth outside a designated delivery unit of a health facility when the mother had booked or planned for hospital delivery. Some of the potential risk factors to having BBA are: ^{2, 3, 4, and 5}

- Maternal age-young mothers and increasing maternal age predispose to BBA.
- Parity-high parity is a risk for BBA.
- Gestation at the time of delivery- preterm delivery at index pregnancy or past history of preterm delivery predisposes to BBA.
- Low socio-economic status.
- Lack of or low level of education.

- Short duration of labour. Precipitate labour may lead to BBA.
- Lack of birth and emergency preparedness during antenatal period.

The ‘three delay’ model in seeking maternal health services has been used to audit maternal and perinatal morbidity and mortality worldwide.⁶ This model divides delay in seeking health care into three phases. In BBA, the first two delays are major contributors:
6

- Phase 1 delay – Delay in decision to seek health care.

This is attributed to:

1. Failure of the mother to recognize labour or other obstetric complications. This may be a result of non-attendance of ANC or lack of or improper preparation during ANC visits.
2. Low status of women in the society.
3. Socio-cultural barriers to seeking care-women’s mobility restricted, women’s inability to command resources, inability to make decision, beliefs and practices surrounding childbirth and delivery, poor nutrition and low level of education amongst women.

- Phase 2 delay – Delay in reaching health facility.

This is attributed to:

1. Lack of or poor infrastructure – proper roads are lacking or they are in bad condition.
2. Adverse weather conditions - floods, rain. These weather conditions compounded by poor infrastructure and transport system may cause delay in the woman in labour to reach a health facility. The woman in labour may also totally decide to stay indoors and opt for home delivery.
3. Lack of security is also a major contributor to BBA especially amongst the slum dwellers. This is worse when the woman has to leave her house at night to seek health services for fear of putting her life at risk.

4. Accessibility of health facility- health facility far from the homestead.
5. Affordability of delivery services – delivery in health facilities may be considered expensive due to poverty.

Birth before arrival at hospital has significant adverse maternal and neonatal impacts all over the world but more so in low income countries like Kenya. It is a cause of increased perinatal morbidity and mortality.^{2, 3, 4, 5}

The perinatal morbidities associated with BBA include hypothermia, asphyxia, respiratory distress, low birth weight, neonatal sepsis and increased rate of mother to child transmission of Human Immunodeficiency Virus (HIV).^{2, 3, 4, 5} The case fatality amongst the BBA babies with the aforementioned complications still remains high even in specialized care nursery. Presence of a skilled birth attendant to assist in delivery and to offer prompt care to the newborn is thus important to avert this situation.

Maternal complications as a result of having a BBA are postpartum haemorrhage due to uterine atony, retained placenta and products of conception (POC), obstetrical lacerations and tears, and puerperal sepsis.^{2, 3, 4} These conditions are amongst the big five causes of maternal mortality.

As a result of maternal and neonatal complications arising due to BBA, both maternal and neonatal hospital stay can be prolonged. The unanticipated prolonged hospital stay has significant social, emotional and financial adverse impact to the family at large.

Kenya has adopted the World Health Organization (WHO) goal-oriented Focused Antenatal Care (FANC) to promote the health and survival of mothers and babies.^{7, 8} The WHO recommends a minimum of four antenatal visits with the aim of identification of high-risk pregnancies and appropriate referral to an equipped centre through an efficient referral system. Antenatal care (ANC) is an essential obstetric care and thus the Government of Kenya has ensured that the ANC services are available at all health facilities from the lowest level to the highest. Visits at ANC are also used as entry points for a range of other services, thus promoting comprehensive integrated service delivery. The key ANC functions are to identify, prevent and manage life-threatening complications during pregnancy and childbirth. FANC also aims to give holistic individualized care to each woman to help maintain the normal progress of her pregnancy

through timely guidance and advice on birth and emergency preparedness. Individualized birth plan is one of the basic components of FANC and it must be addressed in all the antenatal visits from the first to the very last one. It covers all the aspects of birth preparedness, complication readiness and emergency preparedness.

Birth preparedness entails: ^{7,8}

- Educating the mother on her expected date of delivery and to recognize normal symptoms of labour.
- Identifying with her help a health facility for her delivery; one that is easily accessible and affordable.
- Preparing for transport to the place of delivery.
- Planning for costs associated with birth.
- Preparing for supplies for the mother's care and the care of her newborn.
- Helping the mother to identify a decision maker and source of support for her and her family during childbirth and the immediate postnatal period.

Complication readiness and emergency planning entails: ^{7,8}

- Educating the mother on danger signs during pregnancy.
- Advising her to save money for any emergency care that she may need during pregnancy.
- Identifying a decision maker in case an emergency arises and a person to accompany her to hospital.
- Deciding on who will take care of her family while she is away.
- Planning on means of transport to a prior identified health facility.

LITERATURE REVIEW

There is an international commitment to maternal and newborn health. The UN identified maternal morbidity and mortality as an urgent public health priority that needs to be addressed. A series of global conferences were thus organized by the UN to mobilize international commitment to combat the problem.

The global campaign to reduce maternal morbidity and mortality was launched in February 1987, three UN agencies – the United Nations Population Fund (UNFPA), the World Bank and WHO – sponsored the international safe motherhood initiative conference in Nairobi.

The MDGs emerged from the UN Millennium Declaration at the UN General Assembly in the year 2000 and were adopted by world leaders to be achieved by 2015.¹ These provide a framework for the entire international community to work together towards a common end - making sure that human development reaches everyone, everywhere.

Three of the eight MDGs cover directly issues of maternal and neonatal health; these are listed below:¹

1. Goal # 3 - Promote gender equality and empower women.
2. Goal # 4 - Reduce child mortality. Reduction of infant mortality to below 35 per 1000 live births and reduction by two thirds the under-five mortality rate.
3. Goal # 5 - Improve maternal health.

The indicators for improved maternal health are:

- Reduction by three quarters the maternal mortality ratio.
- Increased proportion of births attended by skilled health personnel- 90% of deliveries to be conducted by skilled birth attendants and institutional deliveries in 80% of cases.
- Increased antenatal care coverage (at least one visit and at least four visits for every pregnant mother).

According to the Kenya Demographic and Health Survey (KDHS) 2008-09, 92% of pregnant women received antenatal care from trained medical provider either from

doctors (29%) or nurses and midwives (69%).¹⁰ This indicates a rise since 2003 when the antenatal care coverage was 88%.⁹

On the quality of ANC services according to the 2008-9 KDHS, only 43% of mothers were informed of the signs of pregnancy complications.¹⁰ In the KDHS survey on quality of ANC, the component of birth and emergency preparedness was not looked into. Forty three percent (43%) of births in Kenya are delivered in a health facility while 56% of births take place at home.¹⁰ This shows a decline in home deliveries from 59% in 2003. Births to older women and births of higher order are more likely to occur at home. Deliveries of mothers in rural areas are more than twice as likely to occur at home compared to those in urban areas. The proportion of children born at home decreases as the level of education and the wealth quintile of the mother increases. Children whose mothers had more antenatal care visits during pregnancy are less likely to deliver at home.¹⁰

Reasons cited for home deliveries are health facility too far or lack of transport or both in 42% of cases, 21% thought hospital delivery was not necessary, 17% attributed home delivery to short labour and 18% delivered at home due to high cost.¹⁰

Worldwide, one third of births take place at home without the assistance of skilled attendant.¹¹ Overall 44% of births in Kenya are delivered under the supervision of a skilled birth attendant-nurse or midwife. Traditional birth attendants (TBAs) continue to play a vital role in delivery assisting with 28% of births. Relatives and friends assist 21% of births while 7% of mothers do not receive any form of assistance.¹⁰

The WHO recommends 4 facilities providing Basic Emergency Obstetric Care (BEmOC) and 1 facility offering Comprehensive Emergency Obstetric Care (CEmOC) per 500,000 people. In Kenya, according to the Kenya Service Provision Assessment (KSPA) of 2004 coverage rates for basic and comprehensive EmOC are 2.7 and 1.7 facilities per 500,000-population respectively.¹²

World Health Organization advocates for 'skilled care at every birth' to reduce the burden of maternal and perinatal morbidity and mortality.¹¹ The WHO defines a skilled birth attendant as 'an accredited health professional - such as a midwife, nurse or doctor - who has been educated or trained to proficiency in the skills to manage normal

(uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in mothers and newborns’.

Traditional birth attendants, who are not formally trained, do not meet the definition of a skilled birth attendant.

During childbirth, skilled attendants monitor progress of and manage labour, are vigilant for complications, conduct clean deliveries. They also know how to manage abnormalities and complications and make appropriate and timely referrals to a facility at a higher level.

Preventing the mother to child transmission of HIV is also a task of skilled birth attendants. It starts in pregnancy with HIV testing, provision of Antiretroviral Therapy (ART), counseling on infant feeding, advising on safer sexual practices and family planning counseling. Delivery of HIV positive mothers must be in a health facility.

In the postnatal period, the range of care varies from helping mothers and babies initiate breastfeeding to managing both maternal and neonatal complications or offering appropriate and timely referral to avoid death or disability.

Physical access to health facilities seems to be very good in Kenya with almost 80% of the population living within 5 km of a health facility.¹²

In a case-control study done at Kenyatta National Hospital (KNH), the incidence of BBA was found to be 5.4% of all deliveries. Of these 15% delivered at home, 30% delivered on their way to hospital, 43.8% delivered in casualty and 1.3% delivered in transit from casualty to labour ward (LW).²

Reasons cited for BBA are lack of transport, unawareness of labour, being alone in the house, hiding a pregnancy and preferred home delivery.² Another study identified the risk factors as low education level, past history of previous delivery, past history of preterm delivery, unawareness of true labour, present preterm labour and lack of antenatal care.³

The incidence of BBA is variable worldwide. In Australia the incidence of BBA is 0.14% and this is still considered significant. Of these, 71% had precipitate labour and 51% occurred in the patient’s first or second pregnancy.⁴

In Kathmandu, the prevalence of BBA was found to be 0.78%. Of these 82.2% were para one and two and only 4.4% were primigravidas. Of the BBA mothers 84.4% of them had antenatal visits but 63.15% were not satisfied with the antenatal services. The reasons found for having BBA in this study was lack of birth preparedness as 73.68% of the mothers did not have a discussion during antenatal visit on plan of delivery. Other important factors leading to BBA was found to be delay in getting transport. In addition unusually short labour or dismissal of patients as not being in true labour may account for a few cases of BBA.⁵ Thus adequate counseling during ANC about symptoms and signs of labour pains and prior decision about place of delivery is thus important in averting the situation of having BBA.

Birth before arrival at hospital is a significant cause of adverse maternal and neonatal outcomes. The mothers presenting with BBA with poor outcomes had complications like postpartum haemorrhage and sepsis.² In yet another case-control study, there was no significant difference in morbidity between BBA mothers and mothers who had hospital delivery.¹³

A study was done in Baptist Hospital, Ogbomosho, Nigeria to examine why very few mothers booked for hospital care and to identify the post-delivery complications that lead them to seek professional help. In this study 65% of BBA mothers were delivered by TBAs and 73.7% of them sought medical help following retained placenta leading to post-partum haemorrhage.¹⁴

The perinatal mortality rate (PNMR) in Kenya now stands at 37 per 1,000 live pregnancies,¹⁰ a marginal decline from the 40 deaths per 1000 pregnancies recorded in the 2003 KDHS.⁹ Perinatal mortality rate is a good indicator of the state of health care system in general and the health status of the mother at the time of delivery.

Neonatal complications arising from BBA are respiratory distress, apnea, neonatal sepsis and hypothermia. The case fatality among the neonates of BBA as opposed to those who had been delivered in hospital was found to be higher.²

The survival of a neonate and complications that follow immediately after delivery depend on the gestation at delivery, birth weight and the immediate care offered to the baby. The place of delivery has thus no direct impact on the outcome of the neonate but

the presence of skilled birth attendant to offer the required vital and immediate care to the newborn is necessary. A hospital delivery is therefore superior to an out-of-hospital delivery. Approximately 97% of newborns are healthy. Term newborns are evaluated in the delivery room immediately following birth to assure they do not require respiratory or circulatory support, have no birth related trauma or congenital anomalies requiring immediate intervention and are transitioning as expected to extra-uterine life.¹⁵

The perinatal mortality of newborns admitted to newborn unit (NBU) even in the best centers in Kenya is high. A study done at Moi Teaching and Referral Hospital (MTRH), Eldoret, the seven-day mortality rate of infants admitted to Special Care Nursery, MTRH was 19.7%. Birth asphyxia and respiratory distress accounted for most deaths.¹⁶

Having adopted the MDGs and wishing to achieve them by 2015, Kenya and her global partners for development have put in place several health care programs to ensure that there is improved maternal health and a reduction in child mortality.

The WHO recommended focused ANC package was introduced in Kenya in 2001 as a pilot project. Several studies done to assess FANC have shown that the program is feasible, acceptable and sustainable.^{7,8} The comprehensive FANC service in Kenya is as recommended by the WHO, with additional components to respond to national health needs. The new components amongst others include individual birth plan. Kenya also invested heavily in developing job aids including a pamphlet for developing individual birth plan.

The voucher system or output based aid (OBA) to promote health care utilization was conducted in two Nairobi slums (Korogocho and Viwandani) and three rural districts- Kisumu, Kiambu and Kitui. The vouchers are sold at highly subsidized prices (KShs. 200) providing a direct subsidy to the poorest people allowing them to access safe motherhood services ultimately increasing uptake of these services. Phase I of this project is completed and is promising while phase II is still ongoing.¹⁷

Malcolm Potts suggested 6 ways in reducing maternal mortality in resource poor settings. One of the recommendations was to increase the number of women delivering in health facilities, and funding through OBA.¹⁸

One of the measures initiated to improve maternal and perinatal health is the initiation of maternal shelters. A maternal shelter is a facility within easy reach of a hospital or a health centre where a pregnant woman can stay towards the end of her pregnancy to await labour.

A decade after the MDGs were adopted, Countdown to 2015 Initiative takes stock of the progress made so far towards achievement of UN MDGs numbers 1, 4 and 5. The countdown promotes the use of evidence to enhance decision and policymaking and increase health investments at the country level. ¹⁹

STUDY JUSTIFICATION

Birth before arrival at hospital delivery unit contributes significantly to adverse maternal and neonatal outcomes. Maternal complications associated with BBA are postpartum haemorrhage, puerperal sepsis and birth injuries. All these complications can result in maternal death. Neonatal complications associated with BBA are birth asphyxia, prematurity, hypothermia and neonatal sepsis. Neonatal death may result from these complications. Overall, BBA is a financial burden to both the individual and the health sector as a whole.

In Kenya, most studies and health surveys done only look at home and hospital deliveries but do not consider deliveries taking place between the house and health facility. Thus the reasons for mothers getting BBA babies have not been adequately looked into.

There are very few studies on BBA done in Kenya and none done in the Coastal region therefore necessitating such a study to be done at CPGH.

The policy makers in this country may use the findings of this research to identify the gaps in antenatal care services and also come up with guidelines in order to improve maternal and newborn health.

CONCEPTUAL FRAMEWORK

Narrative

Birth before arrival at hospital delivery unit contributes significantly to adverse maternal and neonatal outcomes. Maternal complications associated with BBA are postpartum haemorrhage, puerperal sepsis and birth injuries. All these complications can result in maternal death. Neonatal complications associated with BBA are birth asphyxia, prematurity, hypothermia and neonatal sepsis. Neonatal death may result from these complications.

Some of the risk factors associated with BBA are lack of or inadequate birth and emergency preparedness during antenatal period, delays in seeking health care and reaching the health facility.

Maternal socio-demographic characteristics that contribute significantly to BBA are young maternal age, low level of education, poor socio-economic status and patriarchal society.

Preterm delivery and short duration of labour are also risk factors for having BBA.

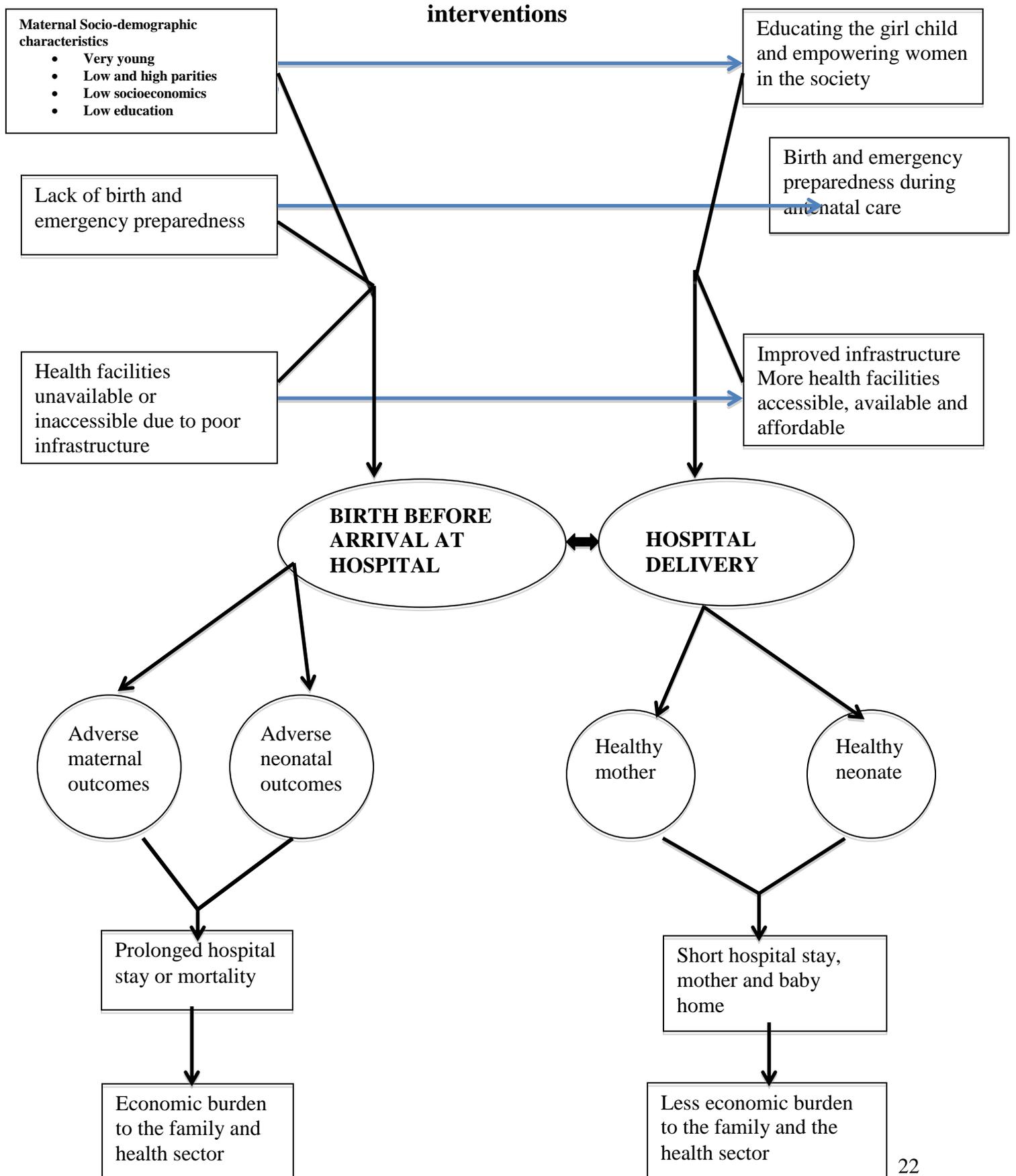
The unanticipated prolonged hospital stay for the mother and the baby has negative economical impact on the individual and the health sector as a whole.

Interventions through policy makers can be instituted to ensure that all pregnant mothers deliver in health facilities.

Educating the girl child and empowering women in the society, birth and emergency preparedness during antenatal care, improving the infrastructure and making health facilities available and accessible for the populations will avert the situation of having BBA.

Chances of having a healthy mother and newborn upon delivering in a health facility are increased. Adverse maternal and neonatal outcomes are minimal in hospital deliveries. The hospital stay is short and overall there is no financial burden to the mother and the health sector.

Conceptual Framework



RESEARCH QUESTION

- What is the effect of giving birth before arrival (BBA) on pregnancy outcomes at Coast Provincial and General Hospital (CPGH)?

HYPOTHESIS

Null Hypothesis

- Giving birth before arrival (BBA) at Coast Provincial and General Hospital (CPGH) has no effect on the pregnancy outcomes.

OBJECTIVES

Broad Objective

Risk factors and outcomes of giving birth before arrival (BBA) on pregnancy outcome among booked mothers at Coast Provincial and General Hospital.

Specific Objectives

- 1) To determine the association between maternal socio-demographic characteristics and the risk of BBA.
- 2) To determine the association of health education in antenatal clinic (ANC) and the risk of BBA.
- 3) To determine the association between BBA and maternal and neonatal outcomes.

METHODOLOGY

Study Design

This was a 1:1 matched case-control study carried out over a period of four months (August 2011 to December 2011). The cases were matched with controls for age (± 5 years) and parity (para 1, multipara and grandmultipara). The case-control approach was used as BBA is a rare occurrence and cohort approaches would require large populations and prohibitive expense and follow-up time.

Study Setting

The study was conducted at Coast Provincial and General Hospital. This is a provincial referral hospital and it also serves as a teaching hospital for Mombasa and Port Reitz Medical Training Colleges. The hospital is situated on Mombasa Island. It caters for patients living in Mombasa and its environs in Coast Province.

The study was carried out in labour ward (LW), Postnatal ward (PNW), mothers' hostel and Newborn unit (NBU). Labour ward receives both booked and un-booked mothers in labour for delivery. It also admits mothers with ante partum complications like haemorrhage, severe pre-eclampsia and eclampsia for stabilization and admission to antenatal ward (ANW) or delivery. Postnatal ward admits stable mothers who have delivered in hospital labour ward and BBA mothers within the first 24 hours of delivery. Birth before arrival mothers must pass through labour ward for initial medical evaluation and stabilization before admission to PNW. In PNW, 6 hours after normal vaginal delivery stable mothers with sick babies in NBU are discharged to the Mothers' hostel while those whose babies are well are discharged home. The NBU admits newborns from hospital maternity unit, sick babies in PNW, referrals from other hospitals and BBA babies within 24 hours of delivery who have complications.

Coast Provincial and General Hospital (CPGH) is the preferred site of study as it is a level V hospital with a fully equipped newborn unit, maternity unit and an intensive care unit. The conduct of the study was also facilitated by the availability of the hospital-based surveillance system at the Coast Provincial and General Hospital.

Study Population

The study population consisted of cases and controls admitted to LW, PNW and Mothers' hostel. Each case was matched with one control.

The cases included mothers presenting with BBA at CPGH. Birth before arrival mothers were defined as postnatal mothers admitted within 24 hours of delivery who had booked or planned for hospital delivery but could not make it to hospital maternity unit in time and had to deliver outside a health facility delivery unit. The outcome of their newborns was also assessed.

For each case, one control was selected matched for age (± 5 years of case) and parity (Para 1, multipara and grand multipara). Controls constituted of mothers who had a normal vaginal delivery, and had booked for hospital delivery, at CPGH maternity unit within 24hours of the case admission. When more than one control was available that matched with the index case, a list was drawn up, the names of each possible control was written on a piece of paper and sealed in envelope, envelopes were put in a jar and the nurse covering the ward at that time (oblivious of what the principal investigator or research assistants were doing) was asked to pick one envelope from the jar (randomization). The mother whose name was on the paper in the envelope picked was then selected as the control.

A ratio of 1:1 was chosen because this is the most efficient way of sampling and gives greater precision for the same sample size. It was also presumed that there would be no shortage of cases during the study period.

Inclusion criteria (both cases and controls):

- 1) Mothers within 24 hours of delivery.
- 2) Gestation at the time of delivery should be 20weeks or more.
- 3) Weight of the neonate should be 500grams or more.
- 4) Mothers should have attended ANC and booked or planned for hospital delivery.
- 5) Mothers should have had a singleton vaginal delivery.
- 6) Consented patients.

Exclusion criteria (both cases and controls):

- 1) Mothers who had planned for home delivery but due to maternal and/or neonatal complications presented to hospital.
- 2) Mothers delivered by Caesarian section.
- 3) Mothers who could not provide informed consent-too sick or unconscious.

Sample size

This study looked at independent cases and controls with one control per case. A previous study at Kenyatta National Hospital indicated that 30-40% of the mothers who attended antenatal clinic knew about birth and emergency preparedness while 60-70% of those who attended antenatal clinic did not know about birth and emergency preparedness.²⁰

In order to demonstrate a difference in birth and emergency preparation between the two groups, a sample size of 76 participants per arm will be sufficient at a power of 90%. The Type I error is set at 0.05. We used the Fishers Exact test to evaluate the null hypothesis. The formula below was used to determine the sample size.

$$n = \frac{[Z_{\alpha} \sqrt{2\Phi(1-\Phi)} + Z_{\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}]^2}{\delta^2}$$

Where;

- n = sample size for each arm of the study
- p_1 = the hypothesized proportion of knowledge of birth and emergency preparedness in the case arm (40%)
- p_2 = the hypothesized proportion of knowledge of birth and emergency preparedness in the control arm of the study (70%)
- $\Phi = (p_1+p_2)/2$
- Z_{α} = normal deviate corresponding to a 95% confidence interval in a two tailed test (=1.96)
- Z_{β} = z score derivative for power of the test set at 90% (1.282)
- δ = minimum difference between the two proportions

$$\left[\frac{(Z \alpha \sqrt{2pq} + Z\beta \sqrt{p_1(1-p_1) + p_2(1-p_2)})^2}{(p_1 - p_2)^2} \right]$$

$$\left[\frac{(Z \alpha \sqrt{2pq} + Z\beta \sqrt{p_1(1-p_1) + p_2(1-p_2)})^2}{(0.7 - 0.4)^2} \right]$$

$$\left[\frac{(2.056 + 0.842\sqrt{0.45})^2}{(0.3)^2} \right]$$

$$\left[\frac{(2.056 + 0.565)^2}{(0.09)} \right]$$

n = 76

The minimum sample size calculated was seventy six (76) participants per arm. As this was an ongoing study and a one-time contact with the study participants, no contingency or additional study participants was necessary to cater for withdrawal from study or loss to follow-up.

Recruitment and consenting procedures

Cases were recruited sequentially as they were admitted to the maternity unit 24 hours a day, 7 days a week by the principal investigator or the research assistants until the desired sample size was achieved. Upon recruitment of a case, one control matched for age and parity and having delivered within 24 hours of case admission was selected among the inpatient postnatal mothers.

When more than one control was available that matched with the index case, a list was drawn up, the names of each possible control was written on a piece of paper and sealed in envelope, envelopes were put in a jar and the nurse covering the ward at that time (oblivious of what the principal investigator or research assistants were doing) was asked to pick one envelope from the jar (randomization). The mother whose name was on the paper in the envelope picked was then selected as the control. Out of 78 controls recruited, only 9 controls were selected by the described balloting method. This was done to minimize selection bias in choosing the control. In the other circumstances, only one control was available to match with the case recruited.

The cases and controls upon identification were approached individually and requested to participate in the study. Explanation was given to the study population on the need and usefulness of this particular study to the investigator. These patients were educated on their rights as participants and an informed consent obtained before recruitment. None of the cases and controls approached declined to give consent.

A total of 156 participants were recruited comprising of 78 cases and 78 controls.

Data collection

Upon recruitment of participants, data was collected using a structured pre-coded questionnaire administered by the principal investigator or research assistants to the study population.

The interviews were conducted in LW immediately upon admission and stabilization of mothers presenting with BBA for the cases while interviews for controls were conducted 1 hour after vaginal delivery.

Information was also obtained from the ANC card record on past ANC visits, estimation of gestation at the time of delivery and the antenatal profiles. Details on maternal and

neonatal outcomes were retrieved from the patients' files. Correlating and retrieving medical information from existing medical records minimizes on recall bias.

Outcome Measures

The following variables were measured during the study:

1. Gestation at delivery.
2. Quality of antenatal care-number of visits, ANP done, birth and emergency preparedness.
3. Adverse maternal outcomes- postpartum haemorrhage, puerperal sepsis
4. Neonatal outcome- Birth weight, Apgar score, adverse outcomes like prematurity, neonatal sepsis, asphyxia, low birth weight and neonatal death.

Quality Assurance

Four midwives working in Coast PGH maternity unit were trained as research assistants. They were re-trained in history taking and physical examination. They were also taught on how to fill the questionnaire in a standardized and uniform manner.

The questionnaire was piloted before data collection was carried out. This was done for one month in August 2011. Modifications were made to the questionnaire to suit the study and the participants and it was standardized for data collection.

Standard definitions of terminologies were given and diagnostic criteria for the medical conditions were outlined.

For every case recruited in the study, one control matched for age and parity was selected as comparison to the case.

Double entry of data and consistency checks were done before analysis was carried out.

A consultant paediatrician/neonatologist participated in the study.

Data Collection Instruments

Data was recorded in a structured pre-coded structured questionnaire that was administered to the study population by the research assistants and filled promptly.

The questionnaire was divided into five sections:

1. Section A- socio-demographic data to describe the study population and to enable comparison between the cases and controls.
2. Section B- Quality of antenatal care and birth and emergency preparedness.
This section assesses the adequacy of antenatal care offered during antenatal visits, maternal knowledge of labour and obstetric emergencies and how and where to seek for medical attention in such situations.
3. Section C- Circumstances of index delivery.
This section seeks information on the time of onset of labour, duration of labour, decision making, infrastructure, adequacy of security from the house to the health facility, availability and presence of a birth partner, birth attendant and immediate care given to the new born upon delivery.
4. Section D- Maternal outcomes
 - Adverse maternal outcomes- postpartum haemorrhage due to retained placenta, uterine atony and tears; puerperal sepsis diagnosed by foul smelling lochia, fever and abdominal tenderness.
 - Interventions instituted- Blood transfusion, intravenous fluid infusion, repair of tears, removal of placenta, I.V antibiotics, oxytocin, oxygen therapy, hysterectomy.
5. Section E- Neonatal outcomes
Quantitatively the birth weight of the baby was taken and qualitatively the condition of the baby was assessed for any adverse outcome-asphyxia, prematurity, sepsis, hypothermia

ETHICAL CONSIDERATIONS

Consent was obtained from the study participants before administering the questionnaire. The consent form contained a signature form for the participant and witnesses. The research assistants and the principal investigator were introduced to the patient by the primary nurse attending to the patient. The principal investigator and research assistants informed the patient on the objectives of the study and the patient was asked to voluntarily participate by providing an informed consent.

Information on the Principal Investigator and the Kenyatta National Hospital and University of Nairobi Ethics and Research Committee (KNH/UoN ERC) and their telephone numbers were availed to the patients in case they needed to contact them at any given time.

All interviews were conducted in private and confidentiality was ensured throughout the study. Data was de-identified. The participants were assured of confidentiality and informed that their names were not going to be used.

No drug was administered and no procedures were undertaken. Also no specimen was collected from the participants.

This study was conducted following the approval of the Ethics and Research Committee.

DATA MANAGEMENT AND STATISTICAL ANALYSIS

The data was entered into Statistical Package of Social Science™ (SPSS) version 17.0 for Windows (SPSS, Chicago, IL, USA). Data cleaning, consistency checks were performed before analysis. Exploratory data analysis of key variables including demographic data consisted of basic univariate and bivariate analysis was conducted. In order to identify preliminary associations, potential confounders and effect modifiers, cross-tabulations were performed for key risk factors and outcome variables. Bivariate comparison was performed using paired t-tests for continuous variables and McNemar's chi-squared test for categorical variables. Finally, a multivariate conditional logistic regression model was fitted adjusting for variables identified as potential confounders. No effect modification was observed. The adjusted effect measure, odds ratio (OR), and its 95% confidence intervals (CI) are reported. For hypothesis testing of strength of association, either the likelihood ratio test (LRT) or the Wald test was used. All analysis was produced with the SPSS software.

STUDY LIMITATIONS

Recall bias by the study participants was one of the study limitations. The study relied on the subjects' recall and availability of existing medical records. It may be difficult to validate the information given by the subjects. This limitation was minimized by retrieving and correlating some information from the participants' antenatal card records and the in patient files and by limiting the delivery-interview time to no more than 24 hours.

Selection bias was another limitation in this study. The cases were matched with the controls for age and parity in a ratio of 1:1. The recruitment of cases was sequential while that of the controls, when more than two were available, was randomized by balloting. These procedures were done to minimize on selection bias.

Gestational age at the time of delivery was a confounder as it is a known potential risk factor for BBA and contributes adversely to the neonatal outcome and survival. The controls were not matched for gestation due to difficulty in getting a match for gestation within the proscribed study period.

Gestational age at the time of delivery was adjusted for during data analysis in order to assess neonatal survival and outcome objectively.

The study was conducted at Coast PGH, which is situated in Mombasa city. This study thus reflects on circumstances of BBA in urban and peri-urban setting and thus does not adequately reflect the true situation in rural areas and therefore cannot be generalized.

The study site was still preferable due to logistics, time and budgetary conveniences.

RESULTS

Over a period of four months between September 2011 and December 2011, a total of 156 postnatal mothers at CPGH were enrolled into the study. They comprised of 78 mothers who had delivered on their way to hospital (cases) but had planned or booked to deliver in hospital. They were matched for age (± 5 years) and parity (para 1, multipara and grandmultipara) with 78 mothers who had a vaginal delivery at CPGH maternity and had booked or planned for hospital delivery (controls).

Table 1: The socio-demographic characteristics by cases and controls, (N=156)

Socio-demographic characteristic	Cases (N=78)	Controls (N=78)	AOR (95% CI)	P-value
Age; years (mean) (95% CI)	25.2 (24.0, 26.5)	25.2 (24.2,26.1)	-----	-----
Marital status; count (%)				
– Married	66 (84.6)	70 (89.7)	0.45 (0.27-0.86)	0.128
– Single	12 (15.4)	6 (7.7)		
– Widowed/divorced	0 (0.0)	2 (2.6)		
Level of Education; count (%)				
– None	6 (7.7)	7 (9.0)	1.29 (0.91-1.85)	0.719
– Primary	48 (61.5)	41 (52.6)		
– Secondary	19 (24.4)	23 (29.5)		
– College/University	5 (6.4)	7 (9.0)		
Residence; count (%)				
– Outside Mombasa Island	67 (85.9)	27 (34.6)	11.5 (5.2-25.4)	0.050
– Within Mombasa Island	11 (14.1)	51 (65.4)		
Occupation; count (%)				
– Housewife	49 (62.8)	39 (50.0)	1.85 (1.28-2.68)	0.050
– Unemployed	7 (9.0)	5 (6.4)		
– Self employed	14 (17.9)	29 (37.2)		
– Employed	8 (10.3)	5 (6.4)		

As shown in table 1, the mean age of the study participants was 25.2, with a range of between 24 to 27 years. Majority of the participants were married (87.2%), had at least primary school level of education (57.1%) and were housewives (56.4%). Area of residence was found to be a significant factor in having a BBA (OR 11. 5; 95% CI 5.2-

25.4). Significantly, the BBA mothers were housewives (OR 1.85; 95% CI 1.28-2.68 and p value 0.05). Those living outside Mombasa Island being 11.5 times more at risk. Age was well matched for in the study as the average age for cases, controls and total was the same (25.2 years).

Table 2: Obstetric Characteristics of the study participants and the risk of having BBA

Obstetric Characteristic	Case (N=78)	Control (N=78)	P-value
Parity; count (%)			
-Para 1	42 (53.8)	42 (53.8)	---
-Para 2-4	25 (32.1)	25 (32.1)	
-Para 5 and more	11 (14.1)	11 (14.1)	
Gestation at delivery; mean weeks (95% CI)	34.7 (33.4,35.9)	38.2 (37.4,39.0)	<0.001
Duration of labour; mean hours (95% CI)	7.9 (6.6,9.3)	9.7 (8.6,10.7)	0.038

As per table 2, majority of the study participants (53.8%) were para 1. The cases and controls were matched for parity. The mean gestational age at the time of delivery for both cases and controls was 36.5 weeks. The mean gestational age of delivery for the cases was 34.7 weeks and that of the controls was 38.2 weeks. The overall mean duration of labour was 8.9 hours, that of the cases was 7.9 hours and the controls was 7.9 hours. Thus, delivery before term ($p < 0.001$) and short duration of labour ($p = 0.038$) were found to be significant risk factors for having BBA. Preterm labours are usually short compared to labours that occur at term.

Table 3: Quality of antenatal care, birth and emergency preparedness by cases and controls

	Cases (N=78)	Controls (N=78)	AOR (CI=95%)	P-value
Quality of antenatal care; count (%)				
- Not Satisfactory	62 (79.5)	35 (44.9)	4.7	<0.001
- Satisfactory	16 (20.5)	43 (55.1)	(2.3-9.7)	
Emergency preparedness; count (%)				
- No	46 (59.0)	27 (34.6)	2.7	<0.001
- Yes	32 (41.0)	51 (65.4)	(1.4-5.2)	
Birth preparedness; count (%)				
- No	48 (61.5)	22 (28.2)	4.1	<0.001
- Yes	30 (38.5)	56 (71.8)	(2.1-8.0)	

As shown in table 3, 79.5% of cases had not received satisfactory antenatal care services, 59% of them had not been prepared for emergency situations and 61.5% were not prepared for child birth. On the other hand, majority of controls had satisfactory antenatal care and had been prepared for birth and emergency. Therefore, non-satisfactory antenatal care ($p<0.001$) and lack of birth and emergency preparedness ($p<0.001$) during the antenatal period significantly influenced the risk of having BBA.

Table 4: Adverse maternal outcomes by cases and controls

Outcome	Cases (N=78)	Controls (N=78)	AOR (CI=95%)	P-value
Maternal Complication; count (%)				
- Yes	69 (88.5)	12 (22.2)	17.0	<0.001
- No	19 (11.5)	56 (71.8)	(1.8-62.4)	
Postpartum Haemorrhage; count (%)				
- Yes	23 (29.5)	2 (2.6)	9.90	<0.001
- No	55 (70.5)	76 (97.4)	(1.7-57.8)	
Birth Injuries; count (%)				
- Yes	32 (20.5)	9 (11.5)	5.3	<0.001
- No	46 (79.5)	69 (88.5)	(2.3-12.2)	
Puerperal Sepsis; count (%)				
- Yes	19 (24.4)	1 (1.3)	24.8	<0.001
- No	59 (75.6)	77 (98.7)	(3.2-190.5)	

As shown in table 4, 51.9% of the postnatal mothers developed postpartum complications. BBA mothers were more at risk of developing postpartum complications compared with mothers who had a hospital delivery (AOR 17.0 and p-value <0.001). The complications experienced by the BBA mothers are postpartum haemorrhage (29.5%), puerperal sepsis (24.4%) and birth injuries (20.5%). Contrary, for the controls, only 2.6% had postpartum haemorrhage, 5.3% had birth injuries and 1.3% had puerperal sepsis.

Table 5: Neonatal outcomes by cases and controls

Outcome	Cases (N=78)	Controls (N=78)	AOR (CI=95%)	P-value
NBU admission				
– Yes	53 (68.0)	10 (12.8)	8.3	<0.001
– No	25 (32.0)	68 (87.2)	(4.4–15.1)	
Indication for NBU (n=62)				
– Prematurity	31 (34.1)	6 (6.6)	-----	-----
– Asphyxia	9 (9.9)	3 (3.3)		
– Sepsis	1 (1.1)	1 (1.1)		
– Respiratory distress	22 (24.2)	1 (1.1)		

In table 5 above, of the babies born, 62 (40.5% of the total babies born) were admitted to the New Born Unit. There were significant adverse neonatal outcomes amongst the BBA babies, warranting NBU admission, as opposed to those babies who were delivered in hospital (AOR 8.3; 95% CI 4.4-15.1 and p-value <0.001). The indications for admission to the NBU were (in order of frequency) were: prematurity (40.7%), respiratory distress (25.3%), birth asphyxia (13.2%) and neonatal sepsis (2.2%).

DISCUSSION

This was a case control study carried out at the Coast provincial and General Hospital to determine the risk factors and the outcomes associated with BBA. One hundred and fifty six mothers (156) were recruited in the study.

The socio-demographic characteristics associated with having BBA in this study was found to be residence outside Mombasa Island, the mother being a housewife. There was no significant association between marital status and level of education with the risk of having BBA among the study participants. In a local study done at KNH in 1991, lack of transport, unawareness of labour, mothers being alone in the house, hiding a pregnancy were among the risks cited for having BBA⁵. This is comparable with the findings in our study.

Gestation at delivery and duration of labour was significantly different between the BBA mothers and hospital delivered mothers in our study. On average, the BBA mothers delivered at 34.7 weeks and the hospital delivered mothers at 38.2 weeks. Preterm delivery is thus associated significantly with the risk of having BBA. Short duration of labour, 7.9 hours for BBA mothers and 9.7 hours for hospital delivered mothers, was significantly associated with the risk of having BBA.

Poor quality of antenatal care and lack of birth and emergency preparedness during antenatal care was shown in this study to be significantly associated with the risk of having BBA.

Another case-control study done in Asia by Titapant et al identified the risk factors as low education level, past history of previous BBA delivery, past history of preterm delivery, unawareness of true labour, present preterm labour and lack of antenatal care⁶. Our study also had similar findings but failed to show an association between maternal level of education and the risk of having BBA. In Australia the incidence of BBA is 0.14% and this is still considered significant. Of these, 71% had precipitate labour and 51% occurred in the patient's first or second pregnancy⁷. The association of parity and the risk of having BBA in our study was not assessed as the cases and controls were matched for parity and age.

The study also showed that BBA was significantly associated with adverse maternal outcomes. The maternal complications associated with BBA in order of frequency are postpartum haemorrhage (29.5% of cases), puerperal sepsis (24.4% of cases) and birth injuries (20.5% of cases); these three are among the five commonest causes of maternal mortality worldwide. In a case-control study done at KNH, the mothers presenting with BBA with poor outcomes had complications like postpartum haemorrhage and sepsis⁵. In yet another case-control study done in Asia, there was no significant difference in morbidity between BBA mothers and mothers who had hospital delivery⁹. In Ogbomosho, Nigeria a study was conducted to identify the post-delivery complications of BBA mothers that lead them to seek professional help. In this study 65% of BBA mothers were delivered by TBAs and 73.7% of them sought medical help following retained placenta leading to post-partum haemorrhage¹⁰. Unlike the study done in Asia, our study showed significant maternal morbidity in the BBA mothers compared to hospital delivered mothers just like the local study done at KNH and Nigeria in West Africa.

There was significant association in our study between BBA and the risk of having adverse neonatal outcomes. The adverse neonatal outcomes associated with BBA were prematurity, birth asphyxia, respiratory distress and birth asphyxia. These complications contribute to neonatal morbidity and mortality. Neonatal complications arising from BBA are respiratory distress, apnea, neonatal sepsis and hypothermia. The case fatality among the neonates of BBA as opposed to those who had been delivered in hospital was found to be higher⁵. The same findings were reflected in our study.

The mothers living outside the island have to travel a longer distance to reach the hospital and thus are more prone to deliver before they arrive to the hospital delivery unit. Because the society is patriarchal, most housewives depend on the male relatives for finances and decision-making thus leading to delay in getting to hospital. Preterm labour on the other hand is short and pregnant mothers are usually unaware and unprepared. Child birth and delivery for BBA mothers is not conducted by a skilled birth attendant so aseptic techniques are not observed and both the mothers and the newborns are prone to getting sepsis; the perineum is not supported so the mothers are likely to get birth injuries. The initial care given to the newborns or even resuscitative measures lack in

babies born outside hospital and thus are prone to getting respiratory distress, birth asphyxia and hypothermia.

Recall bias by the study participants was one of the study limitations. The study relied on the subjects' recall and availability of existing medical records. This limitation was minimized by retrieving and correlating some information from the participants' antenatal card records and their in patient files. This was done to validate the information given by the subjects.

Selection bias was another limitation in this study. Selection of the control group was at times difficult. The cases were matched with the controls for age and parity in a ratio of 1:1. The selection of cases was sequential while that of the controls, when more than two were available, was randomized by balloting. These measures were undertaken to minimize on selection bias and confounders (age and parity).

Gestational age at the time of delivery was a confounder as it is a known potential risk factor for BBA and contributes adversely to the neonatal outcome and survival. The controls were not matched for gestation due to difficulty in getting a match for gestation within the proscribed study period. Gestational age at the time of delivery was adjusted for during data analysis in order to assess neonatal survival and outcome objectively. During the study period night curfews had been instituted as a security measure. This could have influenced the outcome of the study results.

This study was conducted at Coast PGH, which is situated in Mombasa city. This study thus reflects on circumstances of BBA in urban and peri-urban setting and thus does not adequately reflect the true situation in rural areas and therefore cannot be generalized. Policy makers in this country, in looking for ways to improve maternal and newborn health, can use the study results.

CONCLUSION

1. The risk factors associated with BBA are preterm delivery, short duration of labour and residence out of Mombasa Island. Lack of or inadequate birth and emergency preparedness during antenatal care also contribute significantly to out of hospital deliveries. There was no significant association between BBA and marital status, level of education and occupation.
2. Adverse maternal outcomes were significantly associated with BBA. Some of the complications associated with BBA are postpartum haemorrhage, puerperal sepsis and birth injuries.
3. Babies born before arrival at hospital were significantly at risk of developing neonatal complications that warrant NBU admission. The adverse neonatal outcomes are neonatal sepsis, prematurity, respiratory distress and birth asphyxia

RECOMMENDATIONS

1. In view of the significant adverse maternal and neonatal outcome associated with birth before arrival at hospital delivery unit, emphasis should be put on birth and emergency preparedness during antenatal care to avert this situation.
2. More health facilities with maternity services should be put outside Mombasa Island for availability and easy accessibility to the mothers in labour.
3. Improvement of infrastructure between the mainland and the Island is necessary to avoid delays in reaching the health facilities for delivery for those pregnant mothers who live in Mombasa Mainland.

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Appendix 1

CONSENT FORM

My name is Dr. Tanwira Chiragdin, a postgraduate student in the Department of Obstetrics and Gynaecology, University of Nairobi. I am conducting a study on **risk factors and maternal and neonatal outcomes in birth before arrival to hospital maternity unit**. Please read through this form carefully before signing and accepting to participate in the study.

The study entails comparing mothers who had intentions of delivering in the hospital maternity unit but for one reason or another could not do so with those mothers who managed to deliver in the hospital maternity unit. The babies of these two groups of mothers will also be compared. Your management in this ward will not be altered whatsoever by participating in the study and there is no study intervention that will be administered. You'll be subjected to an interview that will be carried out by the principal investigator or research assistants.

The results of this study may be used in the future by policy makers to improve on antenatal care and make essential and emergency obstetric care universally accessible and acceptable. No health risks will be encountered during this study.

Participation into this study is voluntary. Accepting or declining to participate in this study will not in anyway influence the treatment that will be offered to you or your baby. Dropping out of this study carries no consequences and you are free to do so at any stage of the study.

The information obtained in this study will be handled with confidentiality throughout the study period. You shall be interviewed in privacy. No names shall be used to identify the participants. Data will be de-identified before analysis.

I hereby, without enticement or coercion, agree to participate in this study.

Participant's signature: _____.

Date: _____.

Witness's signature: _____.

Date: _____.

In case of queries or further information, please contact the following persons:

1) **Principal investigator**-Dr. Tanwira Chiragdin

Telephone: 0722801072

2) **Supervisors** -Prof. Muia Ndavi

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3) KNH/UoN Ethics and Research Board

4) Kenyatta National Hospital. Telephone: 020-2726300 Ext 44102

Appendix 11

QUESTIONNAIRE

Serial number.....

Date.....

CASE-BIRTH BEFORE ARRIVAL

Or

CONTROL-MATERNITY DELIVERY

SECTION A: SOCIODEMOGRAPHIC DATA

1. Age in completed years

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2. Marital status

Married

Single

Separated/Divorced

Widowed

3. Highest education level attained

None

Primary

Secondary

College/University

4. Occupation

Housewife

Unemployed

Self employed

Employed

5. Parity

6. Gestation at delivery in completed weeks (estimated using LMP, obstetric ultrasound or ANC card)

SECTION B: QUALITY OF ANTENATAL CARE/BIRTH AND EMERGENCY PREPAREDNESS.

1. Attended ANC
Yes No
2. No of ANC visits.....
3. Antenatal Profiles done
Yes No
4. HIV status
Not known
Positive
Negative
5. Aware of expected due date
Yes No
6. Educated on danger signs and symptoms of labour
Yes No
7. Expected mode of delivery known
Yes No
8. Health facility for delivery identified
Yes No
9. Mode of transport to place of delivery identified
Yes No
10. Financially prepared for hospital delivery
Yes No
11. Does she have basic supplies for birth
Yes No

SECTION C: CIRCUMSTANCES OF INDEX DELIVERY.

1. Reaction to index pregnancy
 - Wanted
 - Mistimed
 - Un-wanted
2. Time labour startedam/pm
3. Decision to seek medical attention made by
 - Self
 - Husband/Partner
 - Parent
 - Others..... (specify)
4. Who accompanied you to the hospital?
 - No one
 - Husband/Partner
 - Neighbour
 - Other relative
5. Mode of transport to the hospital
 - Public transport
 - Private vehicle
 - Ambulance
 - Walking
6. How far is the hospital from the house?km
7. Time of deliveryam/pm
8. Duration of labour (computed from 1 and 6)hrs
9. Where did you deliver
 - Home
 - In transit to hospital
 - Casualty
 - Maternity unit
10. Who attended to you at delivery
 - Self

- Passers-by
- Accompanying person
- Doctor
- Mid-wife
- TBA

11. Any immediate care given to the new born before arrival to hospital

- Cord tied
- Wiped dry
- Wrapped in warm clothing
- Kangaroo nursing
- Breastfed

SECTION D: MATERNAL OUTCOME.

1. Any adverse maternal outcome

- Post-partum haemorrhage secondary to
 - Uterine atony
 - Retained placenta
 - Obstetric tears
- Puerperal sepsis
- Shock
- Death
- None

2. Interventions upon admission to hospital

- Blood transfusion
- I.V fluids
- Antibiotics
- Manual removal of placenta
- Hysterectomy
- Repair of tears

SECTION E: NEONATAL OUTCOME.

1. Outcome of newborn (at the time of admission)

Alive

Still Born

Died after delivery

2. Birth weightgm

3. Baby

Cried immediately upon delivery

Delayed crying (more than 5min of delivery)

Hasn't cried

For controls, baby's Apgar score

4. Admission to NBU

Yes

No

If yes, what is the indication?

Prematurity

Asphyxia

Sepsis

Respiratory distress

Hypothermia