



## ORIGINAL RESEARCH

## Factors Associated with Born Before Arrival and Birth Outcome among Postnatal Women Attending Irchagadera Hospital, Garissa County, Kenya

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### Abstract

**Background:** Born before arrival (BBA) is a childbirth that occurs outside health facility. BBA constitute a high-risk newborn population and have increased perinatal mortality and morbidity. BBA neonatal adverse birth outcome prolong hospital stay. Garissa Counties with the highest number of BBA (2%) compared with national (0.9%).

**Methods:** The study adopted a multistage sampling technique and 122 postnatal mothers were interviewed and data analyzed using Statistic Package of Social Science (SPSS) version 26. Bivariate analysis was conducted to examine possible associations between predictor variables and cervical cancer screening uptake. This was done using Pearson's Chi Square. Association was considered significant when p-value is equal to 0.05. Qualitative data was analyzed by thematic content analysis.

**Results:** The results indicated that marital status ( $p = 0.023$ ), education level ( $p = 0.007$ ), monthly income ( $p = 0.010$ ) and parity ( $p = 0.006$ , duration of labor ( $p = 0.001$ ), mode of previous delivery ( $p = 0.028$ ), and recognition of onset of labor ( $p = 0.001$ ), distance to the health facility ( $p = 0.006$ ), availability of means of transport ( $p = 0.019$ ), status of the road ( $p = 0.007$ ) and time of delivery ( $p = 0.012$ ), ANC attendance ( $p = 0.011$ ), timing of ANC attendance ( $p = 0.003$ ), number of ANC visits ( $p = 0.009$ ), identification for health facility for delivery ( $p = 0.016$ ), identification for means of transport ( $p = 0.028$ ), knowledge of signs and symptoms of labor ( $p = 0.021$ ), knowledge of EDD ( $p = 0.028$ ), financially prepared for hospital delivery ( $p = 0.014$ ), and basic supplies for birth ( $p = 0.010$ ) were significantly associated with BBA.

**Conclusions:** County Government, through responsible departments, to use the new knowledge from this study to improve focused antenatal care during the ANC visits, girl child education and economically empower women to reduce or eliminate Socio-demographic risk factors associated with BBA, in order to reduce BBA deliveries.

### Keywords

Born before arrival, NICU, Neonatal mortality, Factors, Preterm

### Introduction

Born before arrival (BBA) is a childbirth that occurs outside health facility. This occurs when a baby is delivered on way to the hospital [1]. These births occur within women's homes, en route to the hospital or in ambulances and are not attended by a midwife or medical officer. Born before arrival babies constitute a high-risk newborn population and have high perinatal mortality and morbidity [2]. The documentation of BBAs is still lacking in developing countries, developed countries record an incidence between 0.1%-0.3%, which rises exponentially in low income countries to greater than 50% in countries such as India and Ethiopia. The rate of BBAs serves as an index of accessibility to perinatal care; a rate greater than 1.5% signals challenges in health care provision. If such a rate exists, further investigations and appropriate interventions are merited [3].

Globally, BBA contribute to an estimated 4 million neonates' deaths and a similar number of stillborn annually [4]. The highest numbers of neonatal deaths are in south-central Asian countries and the highest rates are generally in sub-Saharan Africa (SSA) where the incidence of BBA is high [4,5]. Most of neonatal deaths (73%) occur during the first week of life, around 36% occur within the first 24 hours and this is the time BBA

neonates with advance outcome die. Up to two thirds of newborn deaths could be prevented if skilled health workers perform effective health measures at birth and during the first week of life [5,6]. However, 5.2 million deliveries including BBA globally, occur without one in attendance [7].

Reducing incidence of BBA and ensuring skilled attendance at birth is widely acknowledged as key to reducing stillbirths and neonatal deaths [8]. In Kenya, Childhood mortality rates (including neonatal) continue to decline; under five 52/1000 live births, infant 39/1000 live births and Neonatal, 22/1000 live births respectively [9]. The neonatal mortality rate of 22 deaths per 1,000 live births indicates that progress remains to be made before Kenya achieves Every Newborn Action Plan's goal of a neonatal mortality rate below 10 deaths per 1,000 live births by 2035 [5]. Although the numbers of BBA births are small, studies have shown high perinatal mortality and morbidity associated with being out of hospitals in emergency situation [10]. Born before arrival have higher rate of perinatal mortality compared to hospital deliveries (hospital deliveries are 7 times safer than BBA) [11]. BBA adverse neonatal birth outcome prolong hospital stay and the anticipated prolonged hospital stay has significant social, emotional and financial adverse impact to the family and the country at large [7]. Garissa is one of the Counties with the highest number of BBA (2%) compared with National (0.9%) [9] and it is among the Counties leading with highest Perinatal and Neonatal mortality rates at 44/1000 pregnancies and 24/1000 live births respectively, compared with National, Perinatal mortality rate of 29/1000 pregnancies and Neonatal mortality rate of 22/1000 live births [9]. Similar studies that have been conducted in Kenya have only been conducted in Urban areas and no such study has been conducted in Garissa County. Our aim was to determine which variables, socio-demographic characteristics, obstetric factors and health system factors (distance to health facility, transport, cost of services, ANC attendance, timing of ANC, birth preparedness etc.) that were associated with a higher risk of BBA.

### Specific objectives of the study

1. To determine maternal socio-demographic risk factors associated with BBA and birth outcome among postnatal women attending Hagadara Main Hospital, Garissa County.
2. To establish obstetric risk factors associated with BBA and birth outcome among postnatal women attending Hagadara Main Hospital, Garissa County.
3. To establish health system factors associated with BBA and birth outcome among postnatal women attending Hagadara Main Hospital, Garissa County.

## Methodology

### Study area

The research was carried out in Hagadara Main Hos-

pital, Garissa County. Garissa County covers an area of 44,175 km<sup>2</sup> is located in Eastern Kenya bordering Somalia to the East, Wajir County and Isiolo County to the North, Tana River County to the West and Lamu County to the South. According to the 2019 Kenya Population and Housing Census the population is 623,060 with a male population of 334,939, a female population of 288,121 and a population density of 14 people per Km<sup>2</sup>. The County has 98,590 Households. The County's rainfall varies from 1,000 to 1,500 mm in the highlands to 600 mm per annum in the lowlands with temperatures ranging from a minimum of 10 °C in the highlands to a maximum of 35 °C in the low-lying plains. The main economic activities in the County are Livestock rearing predominantly through pastoralism, bee-keeping, sand harvesting, irrigated farming and trading. The County is endowed with natural resources such as livestock, rivers, pasture, wildlife, vast tracts of flat land, solar and wind energy, mineral resources and medicinal plants. The study was conducted from December 2019 up to February 2020.

### Study design

The study adopted a descriptive cross-sectional study among postnatal women at Hagadara Main Hospital. The study population consisted of mothers who delivered on the way to the hospital and mothers who delivered in the hospital. The study included all postnatal mothers of reproductive age (15-49 years) all who gave written consent to participate. Further, exclude postnatal mothers of reproductive age of unsound mind and mothers who didn't give written consent.

### Sample size and sampling procedure

A multistage sampling technique, random sampling among the Kenyan counties was employed to select one county with Garissa County selected, then stratified sampling to select the respondents, stratified sampling is a probability sampling technique wherein the entire population is divided into strata or subgroups and then simple random sampling for postnatal women. The sample size was 122 respondents determined using Cochran (1977) formula. A pilot study was done at Madina Hospital to assess the reliability of the tools. Test-retest method was used to achieve validity. Data collection was done by trained research assistants under the supervision of the principal investigator in January 2020. Data was entered in SPSS 26.0 for analysis. Descriptive statistics, mainly percentages, were initially used after which inferences statistics were applied. Chi-square tests were the two statistical tests that were used to draw inferences (associations between the dependent and independent variables).

## Results

### Maternal socio-demographic factors associated with BBA

Table 1 shows the analysis of demographic charac-

**Table 1:** Maternal Socio-Demographic factors associated with BBA.

		BBA		Hospital delivery		Statistics
		n	%	n	%	
Age	15-19 years	11	78.6%	3	21.4%	$\chi^2 = 4.378$ $p = 0.009$
	20-24 years	10	27.0%	27	73.0%	
	25-29 years	9	37.5%	15	62.5%	
	30-34 years	8	38.1%	13	61.9%	
	35-39 years	6	37.5%	10	62.5%	
	≥ 40 years	6	60.0%	4	40.0%	
Marital status	Single	24	61.5%	15	38.5%	$\chi^2 = 4.967$ $p = 0.023$
	Married	26	31.3%	57	68.7%	
Education Level	No formal education	21	75.0%	7	25.0%	$\chi^2 = 7.345$ $p = 0.007$
	Primary	24	36.9%	41	63.1%	
	Secondary	4	18.2%	18	81.8%	
	Tertiary	1	14.3%	6	85.7%	
Employment Status	Self-employed	8	20.5%	31	79.5%	$\chi^2 = 2.013$ $p = 0.099$
	Unemployed	40	54.1%	34	45.9%	
	Employed	2	22.2%	7	77.8%	
Monthly income	Less than Ksh 10000	41	52.6%	37	47.4%	$\chi^2 = 7.454$ $p = 0.010$
	Ksh 10000 and above	9	20.5%	35	79.5%	

teristics. The study shows that more than three-quarter (78.6%) of mothers between 15-19 years were BBA mothers; similarly, 60.0% were mothers above 40 years, followed by 30-34 years (38.1%), by 25-29 years (37.5%) and 20-24 years (27.0%). The study also showed that 73.0% of mothers between 20-24 years had hospital delivery followed by mothers between 25-29 years (62.5%), 35-39 years (62.5%), mothers above 40 years (40.0%) and 21.4% were between 15-19 years. The study showed that slightly over half (61.5%) of BBA mothers were single compared with 38.5% of hospital delivered mothers who were single and 31.3% of BBA mothers were married compared with 68.7% of hospital delivered mothers who were married. Three-quarter 75.0% of BBA mothers had no formal education and 36.9% had attained primary education compared with over a half 63.1% of hospital delivered mothers who had attained primary education, about 18% of BBA mothers had attained secondary education compared with 81.8% of hospital delivered mothers who had attained secondary education and 14.3% of BBA mothers had attained tertiary education compared with 85.7% of hospital delivered mothers who had attained tertiary education. Slightly over a half 54.1% of BBA mothers were unemployed compared with 45.9% of hospital delivered mothers who were unemployed, 22.2% of BBA mothers were employed compared with 77.8% of hospital delivered mothers who were employed and 20.5% of BBA mothers were self-employed compared

with 79.5% of hospital delivered mothers who were self-employed. A majority 52.6% of BBA mothers had an average family monthly income of less than Ksh 10,000 compared with about a half 47.4% of hospital delivered mothers who had the same monthly income and 20.5% of BBA mothers had an average family monthly income of Ksh 10,000 or more compared with 79.5% of hospital delivered mothers who had the same monthly income.

The study showed significant statistical association between the following socio-demographic risk factors and BBA; age ( $\chi^2 = 4.378$ ;  $p = 0.009$ ), marital status ( $\chi^2 = 4.967$ ;  $p = 0.023$ ), education level ( $\chi^2 = 7.345$ ;  $p = 0.007$ ) and average family monthly income ( $\chi^2 = 7.454$ ;  $p = 0.010$ ) and parity (OR = 3.387; 95% CI = 1.463-7.843;  $P = 0.003$ ). However, the study did not show any significant statistical association between employment status and BBA ( $\chi^2 = 2.013$ ;  $p = 0.099$ ).

### Obstetric factors associated with BBA

Slightly less than half (46.0%) of BBA mothers had more than 4 deliveries compared with 22.2% of hospital delivered mothers who had more than 4 deliveries and 54.0% of BBA mothers had 4 or less deliveries compared with 77.8% of hospital delivered mothers who had had 4 or less deliveries. More than half (66.0%) of BBA mothers had labor lasting less than 5 hours (precipitate labor) compared with none of hospital delivered mothers with precipitate labor and slightly less than half (46.0%) of BBA mothers had abnormal mode of previous delivery

**Table 2:** Obstetric factors associated with BBA.

		BBA		Hospital delivery		Statistics
		n	%	n	%	
Parity	Less than 3	13	26.0%	33	45.8%	$\chi^2 = 5.374$ $p = 0.006$
	3-4	14	28.0%	23	31.9%	
	More than 4	23	46.0%	16	22.2%	
Duration of labor pains	Less than 5 hours	33	66.0%	0	0.0%	$\chi^2 = 14.008$ $p = 0.0001$
	5 hours and more	17	34.0%	72	100.0%	
Previous delivery	Abnormal	23	46.0%	14	19.4%	$\chi^2 = 6.319$ $p = 0.028$
	Normal	27	54.0%	58	80.6%	
Labor pain recognition	Yes	32	64.0%	67	93.1%	$\chi^2 = 8.999$ $p = 0.001$
	No	18	36.0%	5	6.9%	
Gestation weeks	< 37 weeks	24	48.0%	17	23.6%	$\chi^2 = 2.107$ $p = 0.124$
	≥ 37 weeks	26	52.0%	55	76.4%	

compared with 19.4% of hospital delivered mothers. At least 36.0% of BBA mothers did not recognize labor pains compared with 6.9% of hospital delivered mothers and 64.0% of BBA mothers recognized labor pains compared with 93.1% of hospital delivered mothers who recognized labour pains. Slightly less than half (48.0%) of BBA mothers delivered before term compared with 23.6% of hospital delivered mothers who delivered before term and 52.0% of BBA mothers delivered at term compared with 76.4% of hospital delivered mothers who delivered at term.

The study showed significant statistical association between the following obstetric factors and BBA; parity ( $\chi^2 = 5.374$ ;  $p = 0.006$ ), duration of labor pain ( $\chi^2 = 14.008$ ;  $p = 0.0001$ ), mode of previous delivery ( $\chi^2 = 6.319$ ;  $p = 0.028$ ), and labor pains recognition ( $\chi^2 = 8.999$ ;  $p = 0.001$ ). However, the study did not show any significant statistical association between gestation age at birth and BBA ( $\chi^2 = 2.107$ ;  $p = 0.124$ ) (Table 2).

### Health system factors associated with BBA

The study showed that majority (82.0%) of BBA mothers resided 10 km or more compared with 79.2% of hospital delivered mothers who resided in the same distance and 18.0% of BBA mothers resided in less than 10 km compared with 20.8% of hospital delivered mothers who resided in the same distance. More than half (64.0%) of BBA mothers resided in areas without means of transport compared with 33.3% of hospital delivered mothers who resided in areas without means of transport and 36.0% of BBA mothers resided in areas with means of transport compared with 66.7% of hospital delivered mothers who resided in areas with means of transport. A majority 78.0% of BBA mothers used roads in poor status compared with 84.7% of hospital delivered mothers who used roads of the same status.

Almost three-quarter (74.0%) of BBA mothers delivered at night compared with slightly more than half 59.7% of hospital delivered mothers who delivered at night and at least 64.0% of BBA mothers could not af-

ford cost of hospital delivery compared with 58.3% of hospital delivered mothers and 36.0% of BBA mothers could afford cost of hospital delivery compared with 41.7% of hospital delivered mothers who could afford cost of hospital delivery. The study showed that 78.0% of BBA mothers did not attend antenatal clinic (ANC) compared with 40.3% of hospital delivered mothers and 22.0% of BBA mothers attended ANC compared with 59.7% of hospital delivered mothers who attended ANC. About a quarter 45.5% of BBA mothers started attending ANC after 6 months compared with 48.8% of hospital delivered mothers and 54.5% of BBA mothers started attending ANC before or at 6 months compared with 51.2% of hospital delivered mothers who started attending before or at 6 months.

Majority (81.8%) of BBA mothers made less than 4 ANC visits compared with 46.5% of hospital delivered mothers and 18.2% of BBA mothers made 4 or more ANC visits compared with 53.5% of hospital delivered mothers who made 4 or more ANC visits. Most (64.0%) of BBA mothers did not know signs and symptoms of labor compared with 55.6% of hospital delivered mothers and 36.0% of BBA mothers knew signs and symptoms of labor. More than half (56.0%) of BBA mothers did not know their expected date of delivery (EDD) compared with 69.4% of hospital delivered mothers and 44.0% of BBA mothers knew their EDD compared with 30.6% of hospital delivered mothers who knew their EDD. More than half 68.0% of BBA mothers did not identify health facility for delivery compared with 48.6% of hospital delivered mothers. Almost three-quarter (74.0%) of BBA mothers did not identify means of transport compared with 73.6% of hospital delivered mothers, also, 82.0% of BBA mothers were not financially prepared for hospital delivery compared with 23.6% of hospital delivered mothers. In addition, 80.0% of BBA mothers did not have basic supplies for birth compared with 48.6% of hospital delivered mothers.

The study showed significant statistical association between the following health system factors and BBA;

**Table 3:** Health system factors associated with BBA.

Variables		BBA		Hospital delivery		Statistics
		n	%	n	%	
Distance to health facility	≥ 10 km	41	82.0%	57	79.2%	$\chi^2 = 7.008$ p = 0.006
	< 10 km	9	18.0%	15	20.8%	
Availability of transport	Yes	18	36.0%	48	66.7%	$\chi^2 = 3.941$ p = 0.019
	No	32	64.0%	24	33.3%	
Status of road	Poor	39	78.0%	61	84.7%	$\chi^2 = 4.777$ p = 0.007
	Good	11	22.0%	11	15.3%	
Time of delivery	Night	37	74.0%	43	59.7%	$\chi^2 = 1.647$ p = 0.012
	Day	13	26.0%	29	40.3%	
Cost of delivery	Affordable	18	36.0%	30	41.7%	$\chi^2 = 4.600$ p = 0.043
	Costly	32	64.0%	42	58.3%	
Antenatal clinic attendance	Yes	11	22.0%	43	59.7%	$\chi^2 = 4.217$ p = 0.011
	No	39	78.0%	29	40.3%	
Timing of Antenatal clinic attendance	> 6 months	5	45.5%	21	48.8%	$\chi^2 = 8.080$ p = 0.003
	≤ 6 months	6	54.5%	22	51.2%	
Number of Antenatal clinic visits	< 4 times	9	81.8%	20	46.5%	$\chi^2 = 6.222$ p = 0.009
	≥ 4 times	2	18.2%	23	53.5%	
Knowledge of signs and symptoms of labor	Yes	18	36.0%	32	44.4%	$\chi^2 = 8.600$ p = 0.021
	No	32	64.0%	40	55.6%	
Knowledge of expected date of delivery	Yes	22	44.0%	22	30.6%	$\chi^2 = 6.399$ p = 0.028
	No	28	56.0%	50	69.4%	
Identify health facility for delivery	Yes	16	32.0%	37	51.4%	$\chi^2 = 3.468$ p = 0.016
	No	34	68.0%	35	48.6%	
Identification of means transport	Yes	13	26.0%	19	26.4%	$\chi^2 = 3.067$ p = 0.028
	No	37	74.0%	53	73.6%	
Financially prepared for hospital delivery	Yes	9	18.0%	55	76.4%	$\chi^2 = 9.241$ p = 0.014
	No	41	82.0%	17	23.6%	
Basic supplies for birth	Yes	10	20.0%	37	51.4%	$\chi^2 = 10.029$ p = 0.010
	No	40	80.0%	35	48.6%	

distance to the health facility ( $\chi^2 = 7.008$ ; p = 0.006), availability of means of transport ( $\chi^2 = 3.941$ ; p = 0.019), status of the roads ( $\chi^2 = 4.777$ ; p = 0.007), time of delivery ( $\chi^2 = 1.647$ ; p = 0.012), ANC attendance ( $\chi^2 = 4.217$ ; p = 0.011), timing of ANC attendance ( $\chi^2 = 8.080$ ; p = 0.003), number of ANC visits ( $\chi^2 = 6.222$ ; p = 0.009), knowledge of signs and symptoms of labor ( $\chi^2 = 8.600$ ; p = 0.021), knowledge of EDD ( $\chi^2 = 6.399$ ; p = 0.028), identification of health facility for delivery ( $\chi^2 = 3.468$ ; p = 0.016), identification of means of transport ( $\chi^2 = 3.067$ ; p = 0.028), financially prepared for hospital delivery ( $\chi^2 = 9.241$ ; p = 0.014) and basic supplies for birth ( $\chi^2 = 10.029$ ; p = 0.010) (Table 3).

### BBA and Hospital birth outcome

The study showed that slightly over a half 56.0% of BBA babies had advance neonatal outcome compared with 16.7% of hospital delivered babies. Almost a third (24.0%) of BBA babies died during perinatal period (still birth and neonatal death) compared with 6.9% of the hospital delivered babies. Almost three-quarter (71.1%)

of BBA babies were admitted compared with 47.8% of hospital delivered babies.

The study showed significant statistical difference between hospital delivery and BBA on birth outcome ( $\chi^2 = 5.430$ ; p = 0.017), perinatal outcome ( $\chi^2 = 4.947$ ; p = 0.040) and babies admitted ( $\chi^2 = 7.514$ ; p = 0.001) (Table 4).

### Discussion

The aim of the study was to determine which variables, socio-demographic characteristics, obstetric factors and health system factors (distance to health facility, transport, cost of services, ANC attendance, timing of ANC, birth preparedness etc.) that were associated with a higher risk of BBA.

Slightly over a half 60.0% of BBA mothers were single compared with 40.0% of hospital delivered mothers among post-natal women. This is because single mothers delay going to the hospital when labor start, looking for someone to leave behind taking care of other

**Table 4:** BBA and Hospital birth outcome.

Variable		BBA		Hospital delivery		Statistics
		n	%	n	%	
Birth outcome	Advanced neonatal outcome	28	56.0%	12	16.7%	$\chi^2 = 5.430$ $p = 0.017$
	Good neonatal outcome	22	44.0%	60	83.3%	
Perinatal outcome	Perinatal death	12	24.0%	5	6.9%	$\chi^2 = 4.947$ $p = 0.040$
	Alive	38	76.0%	67	93.1%	
Babies admitted to NBU/Ward	Yes	27	71.1%	32	47.8%	$\chi^2 = 7.514$ $p = 0.001$
	No	11	28.9%	35	52.2%	

children, they have no one to accompany them to the hospital especially if labor pains start at night and have to wait up to the following morning due to insecurity. Youth and teenagers who are still under care of their parents tend to hide pregnancy and when labor pains start, they do not reveal until when it is at advanced stage. The findings were consistent with other studies done in Malawi, South Africa and Slovenia respectively by Mazalale, et al. [12], Alabi, et al. [10] and Zlatko, et al. [11], who found being single to be a risk factor for BBA. The findings were inconsistent with another study done in Kenya (Coast General Hospital) by Tanwira [13], which did not find marital status associated occurrence of BBA. The study established significant statistical association between education and BBA. At least a three-quarter 75.0% of BBA mothers had no formal education compared with a quarter 25.0% of hospital delivered mothers. Women who underwent some level of formal education have high likelihood of seeking maternity services. The findings were consistent with other studies done in Kenya, Malawi, and Slovenia by Kitui, et al. [14]; Mazalale, et al. [12], and Zlatko, et al. [11], whose studies found low education to be a risk factor for BBA. The study did not find any significant statistical association between employment status and BBA. Slightly more than half (54.1%) of BBA mothers were unemployed compared with 45.9% of hospital delivered mothers. The findings are consistent with study conducted in South Africa which found occupation not a risk factor for BBA [3]. The findings are inconsistent with study conducted in Coast general hospital which found occupation (being house wife) to be a risk factor for BBA [13].

There was a significant statistical association between precipitate labor and BBA. At least 66% of BBA mothers had precipitate labor compared with none of hospital delivered mothers. The findings are consistent with other studies, which found precipitate labor to be a risk factor for BBA [13,15]. The study found significant statistical association between mode of previous delivery and BBA. 46.0% of BBA mothers had abnormal mode of previous delivery compared with 19.4% of hospital delivered mothers. The findings are consistent with studies which found previous history of precipitate delivery, BBA and preterm birth puts a woman at risk of BBA [3,8]. The study established significant statistical

association between failure to recognize labor and BBA. At least 36.0% of BBA mothers did not recognize labor pains compared with 6.9% of hospital delivered mothers. The failure to recognize labor hinders the mother in labor from going to the hospital. The findings of this study are consistent with studies, which found unawareness of symptoms of true labor to be a risk factor for BBA [16,17].

The study established significant statistical association between distance to the health facility and BBA. Majority (82.0%) of BBA mothers resided 10 km or more compared with slightly over a third 79.2% of hospital delivered mothers. Long distance delays the mother in labor from reaching the hospital in time. The findings are consistent with studies conducted in Kenya, Nepal and Zambia respectively, which found long distance to be a risk factor for BBA [1,14,18,19]. However, the findings of this study are inconsistent with studies conducted in Malawi and South Africa which found distance not a risk factor for BBA [15,20]. This is because these studies were conducted in urban areas where the roads were in good conditions and transport available all the time. The study established significant statistical association between means of transport and BBA. More than half (64.0%) of BBA mothers resided in areas without means of transport compared with 33.3% of hospital delivered mothers. This is due to lack of means of transport makes the mother who is in labor to walk or use other means like ox-cart, wheel barrow or bicycle and this delays the mother from reaching the hospital in time. The findings are consistent with studies done in South Africa and Kenya which established lack of transport to be a risk factor for BBA [10,14]. The study established significant statistical association between knowledge of signs and symptoms of labor and BBA. More than half (64.0%) of BBA mothers did not have knowledge of signs and symptoms of labor. This is due to lack of knowledge of labor makes the mother in true labor not go to the hospital at the right time and only goes to the hospital in second stage of labor. The findings were consistent with studies done by Alabi, et al. [10], failure to recognize the onset of labor by parturient and their attendants is most important factor in occurrence of BBA.

The study showed significant statistical difference between BBA and hospital delivered babies on neona-

tal birth outcome. Slightly over a half (56.0%) of BBA neonates had advanced birth outcome. BBA deliveries occur in unhygienic places without skilled attendants and resuscitation equipment and this makes BBA babies prone to infection and hypothermia. The findings were consistent with studies done by Tanwira [13] and Bassingthwaighe, et al. [2], whose studies found significant association between BBA and the risk of having advanced neonatal birth outcome. The study established significant statistical difference between BBA and hospital delivered on perinatal outcome. Slightly less than quarter (24.0%) of BBA perinatal outcome were perinatal deaths. During the study period there were one stillbirth and two neonatal deaths amongst the BBA neonates. Mothers had prolonged labor leading to stillbirth or birth asphyxia and no skilled attendant present to resuscitate the neonates. The findings were consistent with a study done by Bassingthwaighe, et al. [2], whose study demonstrated higher mortality in the immediate postnatal period in BBA neonates compared with hospital delivered neonates. The study showed significant statistical difference between BBA and hospital delivered on babies admitted in hospital. About three-quarter (71.1%) of BBA babies were admitted. The BBA babies were delivered in unhygienic places and those needing resuscitation were not resuscitated. The findings were consistent with a study conducted by Zlatko, et al. [11], whose study found high rate of perinatal morbidity for BBA deliveries compared to hospital deliveries.

## Conclusion

The study found socio-demographic factors associated with BBA among postnatal women to be; marital status, low level of education, low monthly income and high parity, while Occupation is not associated with BBA. The Obstetric factors associated with BBA among postnatal women are precipitate labor, abnormal mode of previous delivery, and failure to recognize onset of labor. Gestation age at delivery is not associated with BBA. The health system factors associated with BBA among postnatal women are; long distance to the health facility, unavailability of means transport, poor status of the road and night delivery. Cost of hospital delivery is not associated with BBA. The ANC compliance and birth preparedness factors associated with BBA among postnatal women are; non-ANC attendance, starting attending ANC late, few number of ANC visits, lack of knowledge of signs and symptoms of labor, lack of knowledge of EDD, failure to identify health facility for delivery, failure to identify means of transport, failure to financially prepare for hospital delivery and lack of basic supplies for birth.

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## Declarations

### Funding

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### Conflict of interest

None declared.

### Ethical approval

The study was approved by the Kenya University-Ethical Review Committee and permission by National Commission for Science, Technology and Innovation, Kenya. Written consent was obtained from the participants.

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