Open Access Library Journal

Stillbirth in Nigeria: Rates and Risk Factors Based on 2013 Nigeria DHS

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Received 17 May 2016; accepted 7 August 2016; published 10 August 2016

Abstract

Introduction: Stillbirth remains a public health problem with an estimate of 2.6 million stillbirths in 2015 of which 98% occurred in low- and middle-income countries and over three-quarters of these occurring in Sub-Saharan Africa (SSA) and south Asia. Further, only ten countries carry the burden of over 65% of total stillbirths in the world including Nigeria in the second position. The objective of this analysis is to estimate stillbirth rates and identify the determinants of stillbirth in Nigeria using the 2013 Nigeria DHS data. Methods: The study utilized the nationally-representative sample of women of reproductive age interviewed during the 2013 Nigeria DHS. Analysis was restricted to 31,671 women aged 15 - 49 years who had a pregnancy reaching at least seven months of gestation in the five-year period prior to the survey. Descriptive statistics and regression analysis were performed using Stata v13 to determine significant factors related to stillbirth. Incidence Risk Ratio (IRR) was used to assess strength of association between independent and dependent variables. Results: Overall stillbirth rate is 12.5 per 1000 pregnancies, with rates as high as 22 per 1000 (among women aged 15 - 19 years) and as low as 6.4 per 1000 (among women who received skilled ANC). Age, household wealth, higher birth order, facility delivery, Caesarean delivery, rural residence and ever use of contraceptive are consistent determinants of stillbirth in both the bivariate and multivariate models. Women in rich households have lower IRR of stillbirth (0.60; 95% CI: 0.45 - 0.59) as well as women who had ever used modern contraception (IRR = 0.72; 95% CI: 0.63 - 0.81). However, health facility deliveries as well as deliveries through a C-section, rural residence and age older than 20 years all carry increased risk of stillbirth (IRR = 1.81; 95% CI: 1.05 - 1.33), (IRR = 2.46; 95% CI: 2.03 - 2.98), (IRR = 1.41; 95% CI: 1.24 - 1.59), and (IRR = 2.23; 95% CI: 1.75 - 2.59) respectively. Conclusions: The study revealed that there are several factors responsible for stillbirth in Nigeria. Age, household wealth, higher birth order, facility delivery, Caesarean delivery, rural residence and ever use of contraceptive are consistent determinants of stillbirth in both the bivariate and multivariate models. There is urgent need by the National government to improve quality of maternal health care services and interventions to improve utilization and quality of prenatal care.

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How to cite this paper: Dahiru, T. and Aliyu, A.A. (2016) Stillbirth in Nigeria: Rates and Risk Factors Based on 2013 Nigeria DHS. *Open Access Library Journal*, **3**: e2747. http://dx.doi.org/10.4236/oalib.1102747

Keywords

Stillbirth, Determinants, Rates, Nigeria

Subject Areas: **Public Health**

1. Introduction

Worldwide, it was estimated that in 2015 there were 2.6 million third trimester stillbirths (SB) of which 98% occurred in low- and middle-income countries and over three-quarters of these occurring in Sub-Saharan Africa (SSA) and south Asia [1]. It is also estimated that only ten countries carry the burden of over 65% of total stillbirths in the world; Nigeria being ranked in the second position with an estimated 313,700 stillbirths (SB) in 2015 [1].

While significant progress was made during the Millennium era in reducing child and maternal mortality, the progress made in reducing stillbirth is the slowest; an annual Average Rate of Reduction (ARR) of 2.0% in comparison to AAR of 3.0% for maternal death or 3.1% for neonatal death [2] [3]. This arose partly from overall neglect of the problem such as poor investment in terms of overseas development assistance that characterized child and maternal health agenda, invisibility of the health problem at both the global and national health agenda despite existence of cost-effective interventions to end preventable stillbirths [4]. However, following the Lancet Series of 2011 and Every Newborn Action Plan (ENAP) of 2014, the issue of stillbirth assumed international health agenda with increased visibility both at national and international health fora [4] [5]. Following these international commitments, a target was set to reduce global (as well as at country level) stillbirth rate of 12 or fewer stillbirths per 1000 births by 2030 from 25 stillbirths per 1000births in 2000. Of the 2.6 million stillbirths estimated to have occurred in 2015, about half, 1.3 million occurred during child birth underscoring the urgent need to provide skilled assistance during this critical period; about 60% of global stillbirths occurred in rural areas [1].

Risk factors for stillbirths (SB) can broadly be classified into three: maternal, fetal and contextual. Maternal factors include older and younger maternal age; short pregnancy interval, maternal infections (syphilis, malaria in pregnancy), maternal obesity and malnutrition, cigarette smoking, alcohol and drug abuse, maternal disease (pre-eclampsia and eclampsia), previous stillbirth, primiparity and multiparity; fetal factors include male sex, prematurity, extremes of birth weight; while contextual factors include lack of Access to Antenatal Care (ANC), lack of skilled care during child birth, rural residence, low socioeconomic status, type of marriage, ethnicity, poor maternal education and environmental pollution particularly indoor air pollution [1] [6] [7].

In the Nigerian context, stillbirth is a public health problem where an estimated 313,700 occurred in 2015 making Nigeria the second largest contributor of stillbirths worldwide (12% of the global burden of stillbirth) or 30% of total stillbirths in sub-Saharan Africa. This figure translates to a stillbirth rate of 42.9 per 1000 births. There was an estimated 278,000 stillbirths in 2000 equivalent to a stillbirth rate of 52.3 per 1000, implying an average annual rate of reduction of 1.3% [8]. However, from fragmentary and hospital-based studies, the stillbirth rates as high as 85 per 1000 births have been reported [9]. While Fawole (2011) reported a relatively lower figure of 71 per 1000 births [10]. Though, these studies provide insights into the levels, possible trends and associated factors, they are limited to the areas/hospitals where they have been conducted. Thus, there is a need to estimate a nationally-representative figure with large sample size and more recent data; this was accomplished in the 2013 Nigeria Demographic and Healthy Survey [11]. Still, the DHS final report only provided trends in stillbirth rates against some background socio-demographic characteristics; it is therefore pertinent that a further analysis of the determinants be carried for programming and policy formulation.

2. Methods

The study utilized the 2013 Nigeria DHS data sets. The survey was a three-stage stratified cluster sampling design. The clusters are adopted from the 2006 Nigeria census in which they are synonymous with Enumeration Areas (EAs). The EAs provided the primary sampling units for the both the census and the 2013 Nigeria DHS. During this survey, a total of 904 clusters were sampled of which 372 were in urban areas and 532 in rural areas.

A representative sample of 40,680 households was sampled for the survey allowing a minimum of 943 completed interviews in each state of the 36 states of the country and 45 households in each cluster. A de jure population of all women aged 15 - 49 years and a de jure population of men aged 15 - 49 years were eligible for the interview. The survey used basically three types of structured questionnaires on the respondents: the household questionnaire, woman's questionnaire and man's questionnaire. For this investigation, we are interested in the woman's questionnaire since we are interested in the pregnancy outcome associated with each that was pregnant five years before the survey. The questionnaire collected information on background characteristics, reproductive history and childhood mortality, family planning methods, fertility preferences, antenatal, delivery, pregnancy outcome and postnatal care and host of other health issues relating to specific diseases and disease-prevention programmes/interventions [NPC 2014]. Our analysis was restricted to all pregnancies of at least seven months or more duration not ending in live birth within the five-year period prior to the survey in 2013. The study used definition of stillbirths by World Health Organization (WHO) as late fetal deaths weighing at least 1000 grams or occurring at or beyond 28 weeks of gestation. However, because gestational age criterion is more feasible in an epidemiological survey like DHS since it is a better predictor of maturity and viability than birth weight which is equally adopted here [1] [8] [12].

2.1. Variables and Definitions in the Analysis

The variables of interest in this study are broadly divided into two: dependent (or outcome) and independent (or explanatory) variable. These variables with their operational definitions and coding are shown in **Table 1**. The dependent variable is the stillbirth which is defined as an infant born without any signs of life (*i.e.* without crying, breathing, or movement at the time of birth) at 28 weeks of gestation or later [13]. The independent or explanatory are listed above with their operational definitions. These variables were selected based on review of empirical research [6]-[8] [13].

2.2. Data Analysis

Descriptive statistics were generated across background socio-demographic. Numbers of pregnancies of at least seven months gestation or 28 weeks gestation and stillbirths were generated with subsequent estimation of stillbirth rates by background characteristics.

The statistical model for assessing the strengths of some selected risk factors in stillbirths is the Poisson regression since the assumption here is that the distribution of stillbirths in the general population follows a binomial distribution (each pregnancy has a binary outcome; live birth or a stillbirth) and that stillbirth in general population is a rare event. In the 2013 Nigeria DHS there were 396 stillbirths in 31,671 pregnancies of at least seven months (or 28 weeks). Furthermore, prevalence data in a cross-sectional study follows a binomial distribution [Barros and Hirakata, 2003].

2.3. Statistical Model

The Poisson regression model is represented by:

$$\log\left(\frac{n}{t}\right) = \beta_0 + \beta_1 \mathrm{X}_1 + \cdots + \beta_k \mathrm{X}_k$$

where n is the count of events for a given individual, t the time it was followed-up, and X the covariates. The model parameters (β_i) are log relative risks. Following the recommendation of Barros and Hirakata (2003), we adopted the Poisson regression adjusted by deviance. The analysis was carried using Stata v13.

Ethical statement: This study is a secondary analysis of the 2013 NDHS, so does not require ethical approval. We were 2015 DHS Fellows, we registered and requested for access to NDHS datasets from DHS on-line archive and received approval to access and download the de-identified DHS data files.

3. Results

In the 2013 Nigeria DHS there were 396 stillbirths in 31,671 pregnancies of at least seven months (or 28 weeks) to derive a stillbirth rate of 12.5 per 1000 pregnancies. The number of stillbirths, pregnancies of seven months duration and stillbirth rates against some selected socio-demographic characteristics is shown in **Table 2**. There

Table 1. List of variables, variable definition and variable coding.

S/No	Variable	Variable definition	Coding
		Main outcome variable	
1	Still birth	Death of fetus after 28 weeks gestation (or seven months and above)	Died (1); live birth (0)
		Main explanatory variables	
2	Maternal age	Maternal age at the time of interview	Numerical values in years
3	Maternal education	Highest level of formal education attained by mother	None (0); primary (1); secondary (2); tertiary (3)
4	Ethnicity	Ethnic affiliation of the respondent	Hausa (1); Yoruba (2); Igbo (3); Fulani (4); Others (5)
5	Place of residence	Place of residence either rural or urban	Urban (1); rural (2)
6	Household wealth index	Measure of household wealth in quintiles	Poor (1); middle (2): rich (3)
7	Religion	Religious affiliation of mother	Christianity (1); Islam (2) Traditional/Others (3)
8	Region of residence	Geopolitical zone of residence	South (1); North (2)
9	Birth weight	Birth in kilograms (for facility deliveries)	<2.5 Kg (1); 2.5 - 4.5 Kg (2); >4.5 (3)
10	Complications	Informed of pregnancy complications	None (0); Yes (1)
11	Birth order	Birth order of children born	First; second; third; fourth; fifth and sixth and more
12	Pregnancy desire	If the last pregnancy was desired	Wanted (1); Mistimed (2); Unwanted (3)
13	Place of delivery	Place where delivery took place	Home (0); Health facility (1)
14	Type of energy source	Source of energy for household use	Solid (1); Non-solid fuels (0)
15	Obesity	Measure of body fastness using body mass index (BMI)	Underweight (1); Normal (2); Obese (3)
16	Delivery mode	How fetus was delivered	Normal (0); Caesarean section (1)
17	Use of ANC	Number of ANC visits	No ANC use (0); At least one ANC (1)
18	Skilled ANC use	If person seen during ANC visit is skilled or not	Skilled ANC (1); None-skilled ANC (0)

are clear differentials in stillbirth rates by some background characteristics. Stillbirth rates are highest among the youngest and oldest women, 22 and 19 respectively compared to middle age groups of 20 - 39 years. Similarly, stillbirth rate is highest among women in poor households. It is also highest among the first births or first pregnancies so also with primiparity. Obese women have highest rates of SB than normal or underweight.

Table 3 show the result of Poisson regression adjusted by deviance model of stillbirth and some selected background characteristics. Incidence Rate Ratio (IRR) is the measure of the association between these background characteristics and occurrence of stillbirths. Two models were generated: univariate and multivariable. In the univariate model, maternal age, maternal level of education, household wealth index, birth order, facility-based delivery, indoor air pollution from solid fuels, Caesarean section, rural residence and ever use of contraception significantly predicts stillbirth. Unexpected results include increased risk of stillbirth with prenatal care, sex of baby and multiple gestations; though these relationships are not significant.

Generally, when the multivariable model was generated, most of these variables retained their significant relationships with SB. Virtually all the factors entered in the model are significantly associated with risk of stillbirth. Maternal age is significantly associated with risk of stillbirth; women in age bracket of 35 - 49 years have

Table 2. Number of stillbirths, pregnancies of seven months and stillbirth rates for the five-year period preceding the survey, by background characteristics, Nigeria 2013.

Background characteristics	Stillbirths	Pregnancy 7 months+	Stillbirth rate
Age			
15 - 19	36	1620	22.0
20 - 29	164	15,078	10.9
30 - 39	123	11,776	10.4
40 - 49	61	3196	19.1
Maternal education			
No formal education	190	15,611	12.2
Primary	88	6086	14.4
Secondary or higher	106	9974	10.6
Husband education			
No formal education	155	12,597	12.3
Primary	65	5829	11.2
Secondary or higher	158	12,743	12.4
Household wealth			
Poor	215	14,847	14.5
Middle	56	5941	9.4
Rich	112	10,882	10.3
Occupational status of mother			
Has occupation	270	9450	12.0
No occupation	113	22,221	12.2
Religion			
Christianity	130	11,548	11.3
Islam	250	19,638	12.8
Traditional	3	485	6.2
Birth order			
1st	66	3738	17.8
2nd & 3rd	102	10,762	9.4
4th & 5th	67	8061	8.4
6th & more	92	9051	10.1
ANC use			
1+ visit	78	12,369	6.3
None	133	19,118	6.9
Skilled ANC			
Yes	81	12,678	6.4
No	129	18,702	6.9
Focused ANC			
No ANC	70	10,957	6.4
1 - 3 visits	28	3977	6.9
4+ visits	109	15,731	7.0
Initiation of ANC			
Early	41	5326	7.7
Intermediate	84	12,640	6.6
Late	16	2564	6.3

Continued

Parity			
1	66	3738	17.8
2 - 4	140	15,233	9.2
5+	120	12,640	9.5
Energy source (IAP)			
Solid fuel	68	5787	11.8
Non-solid fuel	315	25,883	12.2
Ethnicity			
Hausa	153	11,205	13.6
Yoruba	43	3475	12.3
Igbo	28	3540	8.0
Fulani	36	2618	13.6
Others	124	10,833	11.5
BMI			
Underweight	26	2653	9.9
Normal	316	26,494	11.9
Obese	41	2524	16.3
Birth interval			
>24 months	325	25,031	13.0
<24 months	58	6640	8.8

Table 3. Number of stillbirths and pregnancies of seven months and stillbirth rate for the five-year period preceding the survey, by background characteristics, Nigeria 2013.

Background characteristics	Univariate	Multivariate
	IRR (95% CI)	IRR (95% CI)
Age		
15 - 19	1.00	1.00
20 - 34	1.49 (1.06 - 1.57)***	2.23 (1.75 - 2.59)***
35 - 49	1.29 (1.06 - 1.57)**	2.35 (1.87 - 2.96)***
Maternal education		
Noformal education	1.00	1.00
Primary	1.13 (1.03 - 1.22)**	1.58 (1.41 - 1.78)***
Secondary or higher	0.73 (0.67 - 0.80)***	0.98 (0.84 - 1.14)
Household wealth		
Poor	1.00	1.00
Middle	0.64 (0.57 - 0.70)***	0.52 (0.45 - 0.59)***
Rich	0.63 (0.59 - 0.69)***	0.60 (0.51 - 0.70)***
Ethnicity		
Hausa	1.00	1.00
Yoruba	0.74 (0.66 - 0.83)***	0.78 (0.65 - 0.94)*
Igbo	0.52 (0.45 - 0.60)***	0.74 (0.62 - 0.89)**
Fulani	1.00 (0.88 - 1.14)	1.05 (0.91 - 1.22)
Others	0.76 (0.70 - 0.83)***	0.81 (0.72 - 0.90)***

Continued

Birth order		
1st	1.00	1.00
2nd & 3rd	0.84 (0.76 - 0.93)**	0.63 (0.54 - 0.68)***
4th & 5th	0.65 (0.58 - 0.73)***	0.42 (0.36 - 0.48)***
6th & more	0.74 (0.67 - 0.82)***	0.50 (0.43 - 0.58)***
ANC visits		
None	1.00	1.00
1 - 3 visits	1.12 (0.98 - 1.28)	1.33 (1.16 - 1.53)***
4+ visits	1.05 (0.96 - 1.15)	1.44 (1.28 - 1.61)***
Place of delivery		
Home	1.00	1.00
Facility (public & private)	1.27 (1.18 - 1.37)***	1.81 (1.05 - 1.33)**
Pregnancy desire		
Wanted	1.00	1.00
Mistimed	0.57 (0.67 - 0.70)***	0.62 (0.50 - 0.75)***
Unwanted	0.94 (0.71 - 1.26)	1.16 (0.86 - 1.56)
Energy source (IAP)		
Non-solid fuel	1.00	1.00
Solid fuel	1.21 (1.10 - 1.32)***	0.84 (0.71 - 0.98)**
BMI		
Normal	1.00	1.00
Underweight	0.71 (0.62 - 0.83)***	0.64 (0.54 - 0.76)***
Overweight	0.78 (0.71 - 0.86)***	0.79 (0.69 - 0.90)***
Obese	0.99 (0.89 - 1.11)	1.42 (1.23 - 1.63)***
Mode of delivery		
Normal (vaginal)	100	1.00
CS	2.44 (2.03 - 2.92)***	2.46 (2.03 - 2.98)***
Place of residence		
Urban	1.00	1.00
Rural	1.38 (1.28 - 1.49)***	1.41 (1.24 - 1.59)***
Ever use contraception		
No	1.00	1.00
Yes	0.69 (0.63 - 0.75)***	0.72 (0.63 - 0.81)***
Sex of baby		
Female	1.00	1.00
Male	1.05 (0.98 - 1.13)	0.92 (0.84 - 0.99)**
Pregnancy type		
Singleton	1.00	1.00
Multiple	0.99 (0.77 - 1.26)	0.59 (0.40 - 0.88)*

*p < 0.05; **p < 0.001; ***p < 0.0001.

the highest risk of experiencing stillbirth compared to 20 - 34 age group. Women in rich households are at reduced risk of stillbirth than those from poor households (IRR = 0.60; 95% CI: 0.51 - 0.70). The first child carries a significant risk of being born dead compared to subsequent children; the fourth and the fifth children have the lowest risk (IRR = 0.42; 95% CI: 0.6 - 0.48). Women from the ethnic groups of Yoruba, Igbo and those belonging to other ethnicity have reduced risk compared to women from Hausa ethnic extraction; in comparison, the Fulanis have increased risk but not significant. Outcome of pregnancy seemed to be not uniform with regards to desirability of the pregnancy; mistimed pregnancies have significantly reduced risk of stillbirths (IRR = 0.62; 95% CI: 0.50 - 0.75); while unwanted pregnancies have increased risk even though this is not significant (IRR = 1.16; 95% CI: 0.86 - 1.56). Women that delivered in a health facility (either public or private) unexpectedly have increased incidence of stillbirth (IRR = 1.81; 95% CI: 1.05 - 1.33) as well as those that were delivered via a Caesarean section (IRR = 2.46; 95% CI: 2.03 - 2.98). Expectedly, obese women are at increased risk of stillbirth (IRR = 1.42; 95% CI: 1.23 - 1.63), but underweight and overweight both have reduced risks of stillbirths. Rural residence increases the incidence of stillbirth while ever use of contraception decreases the incidence. Other unexpected results in this analysis include the increased incidence of stillbirths among those that had prenatal care, female babies; and reduced risks of SBs among babies whose source of energy is solid fuels as well as multiple pregnancies (twins and triplets) (IRR = 0.59; 95% CI: 0.40 - 0.88).

4. Discussion

We analyzed the most recent DHS data for Nigeria (the 2013 NDHS) and came with a list of risk factors that determine the occurrence of stillbirth as well as rates of SB by socio-demographic characteristics. Until recently, stillbirth has largely remained outside the international health agenda; it is now included in the ENAP (The Every Newborn Action Plan) and part of the Sustainable Development Goals (SDG 3) [8]. The ENAP has set a national target of SB rates of 12 or less per 1000 births by 2030 [14]. Currently, as at end of 2015, Nigeria contributes around 12% (or 314,000 stillbirths) of global burden of stillbirth second only to India and in terms of stillbirth rates, Nigeria is second to Pakistan with an estimated stillbirth rate of 42.9 per 1000 births [15]. Our figure obtained herein, is at variance with that generated by *The Lancet* Stillbirth Epidemiology Investigator Group [8] probably due to the fact that the figure generated by the Group is based on modeling using data mostly derived from hospital-based studies that are plagued by selection bias. Estimates from hospital-based studies are very likely to be inflated because majority of these pregnancies are usually difficult ones referred for further management in those referral centers; since four of the seven studies whose estimates were used for modeling stillbirths in Nigeria are in the teaching hospitals which are the highest referral centers in Nigeria. In fact, Adimora reported an estimate of stillbirth rate of 68per 1000 births [16]. Secondly, the stillbirth rate in these hospital-based studies was based on total deliveries and not based on total pregnancies of at least 7 months of gestation (or 28 weeks). This led to contraction in the denominator thereby proportionally inflating the stillbirth rate.

Generally, our regression analysis revealed some risk factors to be strongly associated with SBs as has been reported in the literature: advanced maternal age (greater than 35 years); low or lack of maternal education; socio-economic disadvantage; antenatal care utilization; ethnic minority; pregnancy desire; place of delivery; type of delivery; indoor air pollution from solid fuels; rural residence; maternal obesity; use of contraception; sex of baby and type of pregnancy [6]. According to Aminu *et al*., these risk factors could broadly be classified into four: maternal; fetal; health system and socioeconomic [6].

Increasing maternal age has been associated with increased risk of stillbirth which is consistent our analysis. An estimated 6.7% of stillbirths are attributed to older maternal age of more than 35 years [1]. Though, we did not estimate the amount of stillbirths attributed to advanced maternal age, up to 32% of stillbirths in this study was among women aged 35 years or more. We are unable to demonstrate the dose-response relationship between maternal death and increasing risk of stillbirth that has been demonstrated by previous researchers [17]. A set of factors related to health system and socioeconomic situations are interrelated to increase risk of stillbirths. These factors include maternal education, household wealth level, utilization of prenatal care, place of delivery and place of residence. These factors interact in a complex and synergistic pathways to influence risk of SBs. For instance, socioeconomic disadvantage is associated with deprivation of maternal education which in turn is associated with lack of utilization of antenatal care either because of financial barrier or geographical access due to rural location of the woman. Maternal education, household wealth level and place of residence (urban/rural) are well-documented determinants of prenatal care and facility delivery (Simkhada 2009; Fatusi 2009) [18] [19].

Lack or poor maternal education, rural location and poor household wealth level are underlying factors of general well-being of the woman and their effects with regard to stillbirth is through the pathway of restricting utilization of maternal health care including antenatal care, family planning services and emergency obstetric care including caesarean section resulting in high rates (of stillbirth rates) [20]. It is noted that stillbirth rates can be very high even in developed nations [21]; and the three delays model developed for maternal death is also relevant in this context [22]. These delays include: delay in recognizing danger sign; seeking care due to social or economic barriers, or distance and lack of transport; and receiving high quality health care [23].

In the context of our results, we observed that health system factors (utilization of antenatal care and facility delivery) have generated results that are at variance to what has been reported in literature. The literature is replete with reports establishing the relationship between lack of antenatal care, facility delivery and increasing risk of stillbirth [24]-[28]. In this study, use of antenatal care is associated with increased risk of stillbirth displaying a dose-response relationship meaning that with increasing number of ANC visits the IRR increases (**Table 3**). Similar association is observed with regard to facility delivery; about half (51%) of women had at least four ANC visits in Nigeria according to 2013 NDHS while one-third (36%) delivered in a health facility. The association between ANC and increased risk of stillbirth could be that women who attended ANC did so simply because they suspected the pregnancy was not normal, difficult or that they were experiencing some challenges with it and therefore to avoid adverse outcome had to attend antenatal care many times. And if in such situations the challenge or difficulty was not counteracted then the relationship between intervention and outcome may be misinterpreted. This same argument can be made for facility delivery; where women used the facility for delivery as last option in order to save the pregnancy from difficult labour or problem about the fetus. This is purely the case of selection bias among the women; they utilized ANC and facility delivery because their pregnancies had problems *ab initio*. The second reason likely to explain this reversed association between ANC, FBD and risk of SB has to do with measurement error. The instrument (that is, the questionnaire)used to collect the relevant information might not have captured the variable precisely or it may be due to the inability of the data collectors to accurately and precisely measure the quantity and quality of intervention received [28].

Other factors strongly associated with stillbirth are body mass index of the woman, CS delivery, indoor air pollution, ever use of modern contraception, sex of baby and type of pregnancy. Maternal obesity has been shown to increase the risk of stillbirth; the higher the body mass index the greater the chance of SB. In a meta-analysis conducted by Metwally *et al.* [29], women with BMI $\geq$ 30 were at increased risk of miscarriage (SB) compared to women with normal BMI [OR = 1.89; 95% CI: 1.14 - 3.13]. It is postulated that an unfavorable hormonal characteristic of maternal obesity as well as chronic inflammation from excess adipose tissue might be the underlying mechanism of action [30]. Furthermore, it has been demonstrated from observational data, that weight reduction is associated with reduced stillbirth rate in general population [31]. In our analysis, the relationship between maternal obesity and stillbirth hold true only with respect to those who are obese (BMI $\geq$ 30); for underweight women, the risk is less compared to normal-weight women.

5. Conclusion

We conclude discussion by making some notes on the negative findings from our model. Previous literatures have reported the increased risk of SB associated with male babies [32] [33] and multiple pregnancies (twins, triplets or more) [34]. Generally, male babies have 10% additional risk of stillbirth which could probably be attributed to X-linked congenital conditions, increased risk of preterm labour, and poor fetal growth for male babies [35]. However, in both situations, our model did not show an increased risk of SB with male babies or multiple pregnancies; in fact, in both cases we see a reversed statistically significant association between these factors and stillbirth; male babies and multiple pregnancies have lower risk of ending in stillbirths compared to female babies and singleton babies. Our result speaks to that of Feresu where the risk of SB is not statistically different between male and female babies [36].

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List of Abbreviations

SSA: Sub Saharan Africa
SB: Stillbirth
ARR: Average Rate of Reduction
IRR: Incidence Risk Ratio
ENAP: Every Newborn Action Plan
ANC: Antenatal Care
EAs: Enumeration Areas
DHS: Demographic and Health Survey
SDGs: Sustainable Development Goals
FBD: Facility-Based Delivery
CS: Caesarean Section
BMI: Body Mass Index