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Factors Associated with Low Birth Weights in Kenya

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Abstract
Sustainable development goal number three aims at attaining healthy lives for all at all ages come 2030. This is at the backdrop of the continued experiences of adverse birth outcomes in most of the developing countries, births whose effects on life quality cannot be denied. This paper employed multinomial logistic regression analysis on 2008/09 Kenya demographic and health survey data to identify factors that contribute to low birth weights in Kenya. Of the assessed factors, only work status of the mother and maternal age were found not to be significantly associated with low birth weights. Births to women who had not attended any antenatal care visit had a more than double likelihood of being low birth weights than those births to women who had attended a minimum of four antenatal care visits. To reduce on cases of low birth weights is a call for promoting women education beyond elementary level, improving the living standards of women especially during pregnancy, checking on urban lifestyles, and encouraging women to attend optimum antenatal care visits.
Keywords: low birth weight; antenatal care visits; Kenya demographic and health survey

Introduction

Adverse birth outcomes include preterm birth, defined as less than 37 weeks' gestation; low birth weight, defined as less than 2500g; and small for gestational age, defined as birth weight less than 2 standard deviations below the mean for gestational age. They are far more frequent in the developing world because of the many unplanned pregnancies, pregnancy and birth complications whose repercussions are generally unfavourable both for the mother and the baby. They remain significant contributors to perinatal mortality and developmental disabilities globally. Abu-Saad and Fraser (2010) concluded that adverse birth outcomes carry lifelong consequences for development, life quality and health care costs.

In Kenya, there exists limited evidence on the determinants of low birth weights. Earlier in the millennium, while studying factors associated with unfavourable birth outcomes in Kenya, Magadi and colleagues (2001) found odds of unfavourable birth outcomes to be significantly higher for first births than for higher order births. Maternal nutrition was observed to be a predominant factor in the determination of the size of birth. Studies elsewhere have documented maternal age, education, marital status, occupation, antenatal care uptake, sex of the birth, ethnicity, maternal malaria and age at first sexual debut as some of the predictors of low birth weights (Olusanya & Ofovwe, 2010; Kurth et al., 2010; Luo et al., 2006; Guyatt & Snow, 2004; Guyatt & Snow, 2001). For example, adolescent motherhood was found to be associated with increased risks of low birth weight (Kurth et al., 2010).

Out of the 6,079 live births in the five- year period that preceded the 2008/09 Kenya Demographic and Health Survey, 17 percent (1,044) of them were reported to be either smaller than average or very small at birth putting them at higher risks of early childhood death and overall developmental disabilities. This study seeks to examine the determinants of low birth weights based on the 2008/09 KDHS data. Specifically, the study shall assess the influence of socioeconomic, obstetric and demographic factors on low birth weight in Kenya. Such information is necessary especially in areas dealing with increasing child survival and reduction of developmental disabilities among mankind besides availing literature for academic researchers. Low birth weight infants are at elevated risks of dying in their early months and years of life, and them that survive are liable to having an impaired immune system and may thus suffer higher incidences of such chronic illnesses as diabetes and heart disease in later life. Further, as put by Darmstadt et al. (2013), babies who are born with low birth weight and survive are more likely to continue to grow poorly after birth, remain underweight and stunted in early childhood, and face educational and neuro-developmental delays. Low birth weight girls, according to the trio, tend to grow into women with short stature and an underdeveloped pelvis, leading to obstetric complications during childbirth.

Literature Review

Low birth weight can be due to prematurity or intrauterine growth retardation (IUGR). It remains a risk factor for poor neurosensory, cognitive, and behavioural development, and for limited school performance and academic achievement (Taylor et al., 2000; Teplin et al., 1991). The most vulnerable group are prematurely-born infants who were found to be four times more likely to experience failure in school than infants of normal birth weight and they need special support or educational services (Hack et al., 1995). An analysis of cross-sectional data on birth weight and survival from five sites in sub-Saharan Africa showed that infant mortality is three times higher for low birth weight babies than for those of normal weight (Guyatt & Snow, 2001). The effects on neonatal mortality are even more marked, with a low birth weight baby being nine times more likely to die in the first month of life than a normal weight baby.

Although education is expected to improve birth outcomes by improving the status of women and their access to information and services (Eboyi et al., 1991), some research findings have suggested that more educated women are more likely to experience poor birth outcomes. As a possible explanation for education being a risk factor for prematurity in Burkina Faso, Prazuck (1993) suggested that educated mothers were more likely to use motorized transport on bumpy roads which caused intrauterine vibrations, resulting in premature delivery. Yet still other studies have failed to detect any association between maternal education and birth outcomes (Xu et al., 1995; Magadi et al., 2001). Magadi et al. (2001) attributes this to the fact that the studies which have shown significant association between maternal education and birth outcomes use hospital-based data. Such data, especially from developing countries, are likely to be selective since some population subgroups are likely to visit health facilities only when they develop complications. Naturally, they conclude, such subgroups have higher than average risks of unfavourable birth outcomes.

Kenya has observed an increase in women participation in the labour force with women being involved in a broad range of occupations than before. There exists evidence that the type of work and environmental exposures in the working environments may have adverse effects of foetal development (Figa-Talamanca, 2006). Occupational stress is also said to cause harm to foetal development. Occupations such as chemical, hair dressing, dry cleaners and agricultural workers have been found to yield elevated risks of adverse pregnancy outcomes somewhere else (Ha et al., 2002; Kersemaekers et al., 1997; Doyle et al., 1997; Nurminen, 1995). A study by Ahmed and Jaakkola (2007) found the risk of low birth weight among newborns of women working in factories, mining and construction to be higher compared to that of newborns to housewives. Farmers and forestry workers had their births with elevated risks of low birth weight and preterm deliveries while the estimates were lower among births to non-manual and service workers. The high risk among farmers and forestry workers could be related to the heavy physical load, such as lifting heavy weights, and awkward physical postures shown to be related to the risk of low birth weight (Figa-Talamanca, 2006). There is also epidemiological evidence that exposure to pesticides typical for some agricultural jobs increase the risk of spontaneous abortions and preterm deliveries (Nurminen, 1995). High proportion of small baby-size at birth has also been reported among unemployed women compared to those in employment (Magadi et al., 2001) probably due to the fact that they are economically unfortunate to accord pregnancy its due care.

The ability of a mother to take care of her diet and health at large depends on the household income levels save for households in which a woman has no say on income expenditure. A study by Luo et al. (2006) found women in the lowest wealth quintile to be significantly more likely to have a preterm birth with an adjusted odds ratio of 1.14 at 95 percent confidence interval. A recent study by Azimi and Lotfi (2012) demonstrate that higher social classes give birth to heavier babies with heavier placenta and have lower perinatal mortality. Mothers in the highest wealth quintile were significantly more likely to use modern trained personnel for antenatal care, birth attendance and child health care than those in the households with poorer wealth quintiles.

Rural populace is subject to higher risks of adverse birth outcomes not because of residence in rural areas per se but due to factors associated with such residence. Such factors are low educational qualifications, long distances to health facilities, home deliveries with minimal, if any, assistance by qualified medical personnel, early marriages and high parities. Luo et al. (2006) found infants to mothers with low level of education in rural areas to be more vulnerable to neonatal deaths, particularly for deaths due to immaturity-related conditions. They speculated that access to high- quality neonatal intensive care may be more limited to rural mothers with low educational levels. Counter-intuitively, a study by Magadi and colleagues (2001) found the proportion of premature deliveries (most of which are of low birth weight) to be higher among urban women than their counterparts in rural Kenya, a feature that disappeared in multivariate analysis. The lack of significant association in the full model may imply that unfavourable birth outcomes are not necessarily due to type of place of residence per se but probably as a result of other confounding factors such as poor maternal health care utilisation and, or, poor nutritional status of such women.

Early motherhood is associated with increased risks of neonatal mortality through higher rates of preterm delivery and low birth weights. Chen and others (2007) found the effect of teenage pregnancy on neonatal mortality to disappear after adjusting for birth weight and gestational age, implying that the risk of neonatal mortality in teenage pregnancy could largely be explained by the higher rates of preterm delivery and low birth weight in teenage mothers. The socio-demographic risk factors known to be more prevalent in teenage gravidas are poverty, low level of maternal education, inadequate antenatal care and unmarried status (Omedi, 2014; 2011; Kurth et al., 2010; Bukulmez & Deren, 2000). Bukulmez and Deren (2000) believe that the adverse outcomes observed in teenage pregnancies might have been attributed to these socio-demographic factors. Kurth et al. (2010) found young maternal age to be significantly associated with the risk of low birth weight at an odds ratio of 2.7 and 95 percent confidence interval. Immaturity of the uterine or cervical blood supply in teenage pregnancy could increase the risk of subclinical infections and prostaglandin production leading to increased risk of preterm delivery. Teenage mothers who themselves continue to grow during pregnancy could compete with the developing foetus for nutrients ending up with a low birth weight.

Optimizing antenatal care visits can work towards preventing the excess risk of low birth weight, premature delivery and perinatal mortality. The reduction of premature deliveries here is through early detection, treatment and effective management of conditions that may cause premature deliveries. In a study by Kurth et al. (2010), the number of antenatal care visits showed a statistically significant influence on the probability of delivering a low birth weight infant. In a different study, the average odds of premature deliveries for those who had received only one or two antenatal care visits exceeded the odds for those who received at least seven visits by a factor of five (Magadi et al., 2001). Further, babies to mothers who had received at least one tetanus toxoid injection had about half the odds of being small at birth compared to those whose mothers had received no tetanus injection.

Magadi and colleagues (2001) found female babies to have a higher likelihood of being small than male babies with an average odds ratio of 1.8. In a study that involved 51 percent male infants and 49 percent female infants, male births were found to have higher birth weights than their female correspondents (Bell et al., 2008). In a study in which 41 percent of newborn babies weighed less than 2,500 grams at birth, 52 percent of them were female (Huque & Hussain, 1991). Yet in another study on the influence of birth order on birth weight, Cote and others (2003) found male newborns with older brothers to weigh less than male newborns with older sisters. The weight of female newborns with older sisters did not differ from the weight of female newborns with older brothers. The trio explained that maternal immunoreactivity to some male-specific features of the foetus affects prenatal development and consequently reduces birth weight in females.

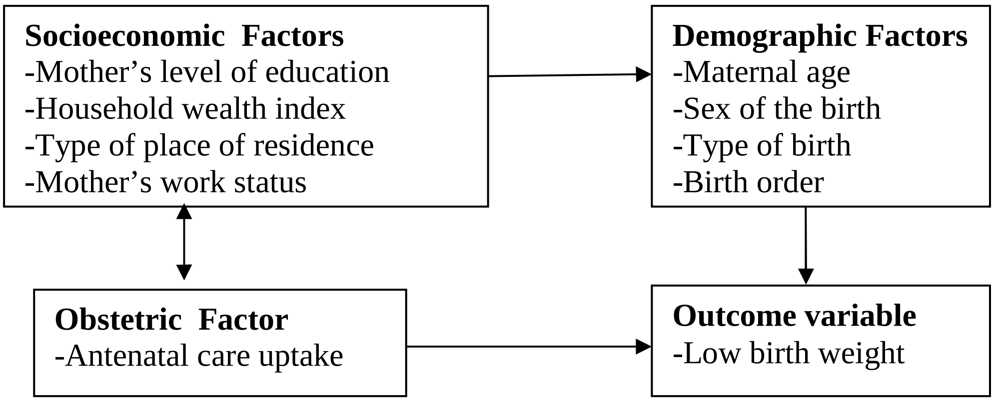
Type of birth is a measure of whether births are either singletons or multiple births. Multiple births are thought to be at heightened risks of low birth weight, preterm births and reduced survival during childhood stages. A study by Magadi et al. (2001) found the average odds of a premature delivery for multiple births to be about seven times the odds for single births. Infant mortality rates are 5.3-fold higher for multiple births, compared with singletons (Russell et al., 2003). The National Center for Health Statistics (2001) reported that preterm birth rates in the United States were 10.4 percent for singleton births, 57.4 percent for twins, and 92.7 percent for triplets and higher-order births. The high rate of preterm delivery among twins is partially due to medical interventions to end pregnancy, or decisions not to prevent preterm delivery where this is thought to benefit the newborns (Blondel et al., 2002). This practice is influenced by the belief that multiple births have advanced maturity compared with singletons. 6.0 percent of singleton births were low birth weight, contrasting with 54.9 percent of twins and 94.0 percent of triplets (National Center for Health Statistics, 2001). On the other hand, singleton births resulting from assisted reproductive technology are associated with an increased risk of low birth weight. Schieve et al. (2002) estimate that the rate of low birth weight in terms of singletons conceived with assisted reproductive technology is 2.6 times that in the general population, and a 606 grams lower mean birth weight was reported in intracytoplasmic sperm injection-conceived singleton births, compared with controls (Sutcliffe et al., 2001). These outcomes may be at least partly attributed to a variety of parental factors that contribute to the underlying reasons for assisted reproductive technology, as well as possible effects of the fertility treatments.

The proportion of premature and low birth weight babies tend to be highest among first births and high order births with maximum effect expected among births of high orders. Besides having the highest proportion of unfavourable birth outcomes in Kenya, first order births were found to be significantly associated with higher odds for premature deliveries (Magadi et al., 2001). Compared to higher order births, first births were found to have more than double the odds of a premature birth. This can be attributed to inexperience in mothering by the first-time mothers and the act of hiding pregnancy in case it was unwanted.

Operational Framework

The operational framework of study is a modification of the conceptual framework developed by Magadi (1999: 20). The framework is illustrated as seen in Figure 1. Socio-economic factors operate through obstetric and demographic factors to determine the kind of birth weight outcome, whether normal or adverse. Numerous studies have provided evidence of low birth weight being influenced by factors such as level of education of the mother, maternal occupation, type of place of residence, maternal age, wealth index, sex of the birth, type of birth, antenatal care uptake and birth order (Olusanya & Ofovwe, 2010; Kurth et al., 2010; Luo et al., 2006; Guyatt & Snow, 2004; Guyatt & Snow, 2001; Magadi et al., 2001).

Figure 1: An illustration of the operational framework of study



Since the demographic and health survey whose data was used in the analyses collected information on the above variables, the study did the analysis of the influence of these variables on low birth weights in Kenya. A low birth weight is a birth weight less than 2,500 grammes, and is strongly associated with perinatal morbidity and increased risk of long term disability. Since information on birth weight is not available for majority of births in Kenya, the size of the birth was used instead as a proxy for birth weight. This has been used in other studies and proved to yield reliable results (Magadi et al., 2001).

Methodology

Data Source

The data used in these analyses was obtained from the individual women's questionnaires of the 2008/09 Kenya Demographic and Health Survey. Besides capturing information on the individual's birth history, entailing sex of birth, date of birth, whether the birth was a singleton, twin or multiple, survival status of the birth, and its current age, the survey also collected information on pregnancy and postnatal care- antenatal care uptake, whether one took any antimalarial drugs during pregnancy, size at birth, weight at birth, place and assistance during delivery, among others.

The survey was a nationally representative probability sample survey of 10,000 households in which a total of 8,444 eligible women were successfully interviewed. The Kenya demographic and health survey adopted the National Sample Survey and Evaluation Programme (NASSEP IV) design which was developed in 2002 from a list of enumeration areas covered in the 1999 Population and Housing Census on a platform of a two-stage sample design. First, 400 data collection points/clusters (133 urban; 267 rural) were selected from the national master sample frame. North Eastern province produced fewer clusters due to its sparse population while urban areas were oversampled to get enough cases for analysis. This was followed by systematic sampling of households from an updated list of households in the clusters. Such respondents were either permanent residents of the households in the sample or visitors present in the household on the night before the survey (KNBS and ICF Macro 2010). Due to the reported under-sampling of North Eastern province and oversampling of Kenya's urban areas, the surveys data are not self-weighting at national level. Thus, sample weights were used in the analyses to derive nationally representative estimates. Of the 8,444 women of reproductive ages interviewed, a total of 6,079 births were reported, of which 1,044 were considered as low birth weights.

Statistical Analyses

Logistic regression analysis was done. The logistic regression model allows the estimation of the occurrence of an outcome due to the effect of several explanatory variables by fitting data to a logit function logistic curve. It allows for the adjustment of many explanatory variables and controlling for many confounders at the same time as it enables easy detection of the interaction between explanatory factors. The predictor variable may be quantitative, categorical or both while the response variable is dichotomous.

The regression model is represented as follows:

$P = 1/(1+e^{-z})$, where;

P is the estimated probability,

Z is the predictor variable, and

e is the base of the natural logarithm.

The coefficients in the models were interpreted as the effects of a given variable on the odds of a birth outcome being described as a low birth weight. In this scenario, when z becomes infinitely negative, e^{-z} becomes infinitely larger so that P approaches zero. On the other hand, when z becomes infinitely positive, e^{-z} becomes infinitely small so that P approaches unity (one). Thus, a negative z implies that the independent variable is less likely to influence the dependent variable while a positive z implies that the independent variable is more likely to influence the dependent variable.

Analyses were done at two levels: bivariate and multivariate levels. Bivariate analysis was done by cross tabulation to provide associations between low birth weights and the selected explanatory variables for study. Multivariate analysis entailed the computation of odds ratios using the multinomial logistic regression model. This was done at three levels: level 1 looked at the association of low birth weights with socioeconomic factors; level 2 looked at the association of low birth weights with both obstetric and demographic factors whereas level 3 looked at the association of low birth weights with socioeconomic, obstetric and demographic factors.

Findings of the Study

Table 1 shows the proportions of low birth weights based on the selected explanatory variables of study. Socioeconomically, low birth weights tend to be more among births to

Table 1: Percentage distribution of low birth weights and selected explanatory variables in Kenya

Variable name	Low Birth Weights (n = 1,044)	Percent
Level of education of the mother		
Secondary and higher	185	17.7
Primary	538	51.5
None	321	30.7
Type of place of residence		
Urban	233	22.3
Rural	811	77.7
Work status of the mother		
Working	554	53.1
Not working	489	46.9
Household wealth quintile		
High	310	29.7
Medium	164	15.7
Low	570	54.6
Maternal age		
35 and above	122	11.7
20- 34	724	69.3
Under 20	198	19.0
Sex of birth		
Female	553	53.0
Male	491	47.0
Type of birth		
Singleton	971	93.0
Not singleton	73	7.0
Birth order		
6 and above	193	18.5
4- 5	207	19.8
2- 3	399	38.2
First birth	245	23.5
Number of antenatal care visits		
4 and above	254	39.0
2- 3	253	38.9
1	36	5.5
None	108	16.6

mothers with primary educational qualifications, of rural residence, those who are working somewhere and those in low household wealth quintiles. The proportions of low birth weights based on the educational qualifications of the mother are unexpected. One would anticipate a scenario in which the proportions increases with decrease in educational attainment, that is, low among mothers with some secondary education and high among mothers with no any educational qualifications. The high proportion of low birth weight in rural Kenya may generally be attributed to the high proportion of Kenyans residing in rural than urban Kenya. Demographically, majority of the low birth weights were to mothers in the 20-34 years old age category, to female births, singleton births, and births or order 2-3. Surprisingly, births to mothers who attended only one antenatal care visit recorded the least low birth weight cases (5.5 percent) compared to births to mothers who attended at least four antenatal care visits (39 percent). This is at the backdrop of the notion that pregnant women only initiate antenatal care visits in order to obtain a clinical card that will enable them be attended to during postnatal care visits, and this is evident in the existing discontinuity in antenatal care uptake from the first visit to the recommended fourth visit. Modest differentials in terms of low birth weights existed for births to mothers who had two and more antenatal care visits.

Results of regression analyses in Table 2 indicate that only the work status of the mother and maternal age in the selected explanatory variables are not significantly related to low birth weights in Kenya. Socioeconomically, women with no any educational qualifications are more likely to have low birth weight babies across the analyses when compared to those with some secondary educational qualifications. However, the strength of the relationship decreases slightly from when only socioeconomic factors are analysed (Odds ratio 1.809) to when all factors are analysed (1.793). A similar trend is observed for the household wealth quintile factor in which births in the medium and low wealth quintile households are more likely to be low birth weights than those in the high wealth quintile households. However, type of place of residence proves contrary whereby, unlike urbanite births, rural births are less likely to be of low birth weights, with the strength of the relationship increasing slightly from Model I to Model III.

Demographically, sex of birth and type of birth shows a significant relationship with low birth weights both in Model II and Model III. Compared to female births, male births are 0.23 times less likely to be of low birth weight. Second and third birth orders are 33 percent more likely to be of low birth weights than six and above birth orders, a relationship that disappears in the full model. As expected, non-singleton births (twins, triplets, et cetera) are more likely to be of low birth weights than singleton births.

Number of antenatal care visits done by a pregnant woman is significantly associated with the weight of the outcome birth. A woman who has attended less than four antenatal care visits is more likely to give birth to a low birth weight child compared to that woman who has attended at least four antenatal care visits. The strength of the relationship however decreases as the number of antenatal care visits increases.

Discussions

The subject of adverse birth outcomes, basically preterm births, low birth weights and small for gestational age, remain a global indaba especially as the world envisions to ensure healthy lives and promote well being for all at all ages come 2030. Especially for low birth weights, the United Nations estimate that more than 20 million infants are born each year weighing less than 2,500 grammes, and this accounts for 17 percent of all births in developing countries and only 7 percent in the industrialised countries. Based on 2008/09 Kenya demographic and health survey, 17 percent of infants in Kenya were born as low birth weights coinciding with the average percentage for the developing world. Such infants are at elevated risks of depicting early childhood mortalities, and still those who manage to survive to adulthood end up suffering higher incidences of health problems including high blood pressure, heart diseases and other metabolic problems. The analytical results indicate that level of education of the mother, type of place of residence, household wealth quintile, sex of birth, type of birth, birth order and number of antenatal care visits done by a pregnant woman are statistically associated with low birth weight cases in Kenya.

Women with some educational attainment are able to source the necessary information on how to take care of their pregnancies, are more likely to be better placed in terms of social status in the family and so have a say on making choices. Non-educated women are at the mercies of their husbands who might be ignorant on better healthcare for pregnant women. Such women might be engaged in hard labour that wear them off and thus interfering with proper foetal development. The study found babies to women with no any educational qualifications to be 80 percent more likely to be low birth weights ($\rho<0.000$) than those born to women with some secondary educational qualifications. The findings that babies born to rural dwellers are 30 percent less likely to be of low birth weight compared to those born to urban dwellers is a pointer to the kind of lifestyles our urban women practice. An expectant urban woman is more likely to go for caesarean section before due date than her colleague in a rural area. Some of those pregnant women in urban areas are in informal dwellings and suffer serious diet issues and stress than their colleagues in rural dwellings.

Table 2: Results of multinomial logistic regression analyses for the association between low birth weights and selected explanatory variables in Kenya

	Model I		Model II		Model III	
Variable name	B	Exp(β)	B	Exp(β)	B	Exp(β)
Level of education of the mother						
Secondary and higher	-	1.000			-	1.000
Primary	0.114	1.121			0.112	1.118
None	0.593	1.809*			0.584	1.793*
Type of place of residence						
Urban	-	1.000			-	1.000
Rural	-0.331	0.719***			-0.327	0.721***
Work status of the mother						
Working	-	1.000			-	1.000
Not working	-0.051	0.951			-0.053	0.948
Household wealth quintile						
High	-	1.000			-	1.000
Medium	0.348	1.417***			0.345	1.411***
Low	0.389	1.475**			0.388	1.471**
Maternal age						
35 and above			-	1.000	-	1.000
20- 34			-0.134	0.875	-0.112	0.894
Under 20			-0.196	0.822	-0.137	0.872
Sex of birth						
Female			-	1.000	-	1.000
Male			-0.261	0.770*	-0.265	0.767*
Type of birth						
Singleton			-	1.000	-	1.000
Not singleton			1.523	4.587*	1.528	4.611*
Birth order						
6 and above			-	1.000	-	1.000
4- 5			-0.042	0.959	-0.042	0.959
2- 3			0.285	1.330***	0.276	1.318
First birth			0.343	1.410	0.319	1.376
Number of antenatal care visits						
4 and above			-	1.000	-	1.000
2- 3			0.208	1.231***	0.225	1.252***
1			0.480	1.616***	0.498	1.646**
None			0.772	2.163*	0.741	2.098*
χ – test		*125.194*		*123.255*		*128.179*
- 2 Log likelihood ratio		*1592.553*		*1594.492*		*1589.568*

*ρ<0.001; **ρ<0.01; ***ρ<0.05; β- log of odds; Exp(β)-odds ratio

Household wealth quintile is a reflection of the socioeconomic conditions of the household dwellers. A high household wealth quintile indicates a household that is able to accord a pregnant woman better healthcare and see to it that she attends antenatal care visits oblivious of the distance of the service providers from the household's residence. Such a household has access to information on health care on various media stations than a household in a low wealth quintile because of affordability issue. The study found babies born in low and medium household wealth quintiles to be more likely to be low birth weights than those births in high household wealth quintiles, pointing to higher likelihood of these babies being born in poor socioeconomic conditions where their mothers are more susceptible to poor diet and infection, and more likely to undertake physically demanding work during pregnancy. It might also reflect a generational cycle of under-nutrition underpinned to poverty whose repercussions are passed along to children by mothers who are themselves in poor health or undernourished.

Results in Table 2 indicate that male births are 23 percent less likely to be of low birth weight ($\rho<0.000$) than female births. There might be biological reasons for this that are beyond the scope of this study. However, the observed higher risk of low birth weights among female births is consistent with the findings in other studies (such as Magadi et al. 2001; Bell et al. 2008) that found males to have higher birth weights than females. Also, while studying "Incidence and correlates of low birth weight at a referral hospital in Northwest Ethiopia", Zeleke and colleagues (2012) found female newborns to have smaller birth weight than males (COR=1.95, p-value=0.03) at bivariate level. Obviously, singletons are likely to be of the rightful birth weights compared to non-singletons due to foetal competition for nourishment, space, among others. Also, non-singletons are more likely to be delivered preterm than singletons, yet preterm delivery is a contributor to low birth weight. The study further found babies of the 2-3 birth orders to be 33 percent more likely to be low birth weights ($\rho<0.05$) than babies of 6 and higher birth orders in Model II, a significance that disappeared in the full model possibly to indicate that low birth weight is not necessarily a result of birth order per se but a result of other confounders, especially socioeconomic factors that are excluded in the second model.

Antenatal care during pregnancy aims at identifying and treating problems such as anaemia and infections (KNBS & ICF Macro, 2010). It is during an antenatal care visit that screening for complications is done and advice given on a range of issues, including place of delivery and referral of mothers. Worth noting is that antenatal care is more beneficial in preventing adverse birth outcomes when sought early in the pregnancy and continued through delivery. Antenatal care follow up ensures routine provisions of nutritional and medical advice and supplementations. Health professionals recommend that the first antenatal visit occur within the first three months of pregnancy, that subsequent visits continue on a monthly basis through the 28^{th} week of pregnancy, and that visits thereafter take place every two weeks until birth. World Health Organisation recommends that a woman without complications should have a minimum of four antenatal care visits with the first one coming in the first trimester. Results in Table 2 indicate that, unlike babies born to women who had at least four antenatal care visits, those born to women who had none or less than four antenatal care visits are more likely to be of low birth weights. The strengthening of the significance in the full model only points to the seriousness of antenatal care uptake.

Conclusions

Low birth weight cannot be done away with, but can be reduced. The study findings that the educational attainment of the mother, type of place of residence, household wealth quintile, birth order and number of antenatal care visits done by an expectant women are statistically related to low birth weight is a call for the relevant stakeholders to reconsider their positions in their respective categories. Example, there is need to promote maternal education for an educated woman is able to read, get information and practice what is right to ensure an avoided low birth weight. With a dearth of health facilities for antenatal care service provision, there is need to promote optimum antenatal care visits especially in the developing world where low birth weight cases are more than double those in the developed world. It is during such antenatal acre visits that an expectant woman is taught how to take care of herself and her pregnancy, the kind of exercises to do and diet to consider. She is also immunized, given nutritional supplements and administered malaria prophylaxis, all geared towards reducing the incidences of low birth weights. Pregnant women need to be screened for the important risk factors of low birth weight that have not been assessed in this study, such as maternal HIV and AIDS and other obstetric problems to provide them with the essential antenatal health care services.

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