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Prevalence of low birth weight and its association with maternal body weight status in selected countries in Africa: a cross-sectional study

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ABSTRACT

Objectives The present study aimed to estimate the prevalence of low birth weight (LBW), and to investigate the association between maternal body weight measured in terms of body mass index (BMI) and birth weight in selected countries in Africa.

Setting Urban and rural household in Burkina Faso, Ghana, Malawi, Senegal and Uganda.

Participants Mothers (n=11 418) aged between 15 and 49 years with a history of childbirth in the last 5 years.

Results The prevalence of LBW in Burkina Faso, Ghana, Malawi, Senegal and Uganda was, respectively, 13.4%, 10.2%, 12.1%, 15.7% and 10%. Compared with women who are of normal weight, underweight mothers had a higher likelihood of giving birth to LBW babies in all countries except Ghana. However, the association between maternal BMI and birth weight was found to be statistically significant for Senegal only (OR=1.961 (95% CI 1.259 to 3.055)).

Conclusion Underweight mothers in Senegal share a greater risk of having LBW babies compared with their normal-weight counterparts. Programmes targeting to address infant mortality should focus on promoting nutritional status among women of childbearing age. Longitudinal studies are required to better elucidate the causal nature of the relationship between maternal underweight and LBW.

Strengths and limitations of this study

- ► Based on nationally representative samples, this is the first study to explore the association between maternal body mass index (BMI) and low birth weight (LBW) across five different countries in Africa.
- ► The relatively large sample size provides a robust precision of the estimation.
- ► This study also provides an update on maternal BMI and LBW scenario, and reports the comparison of prevalence rates of these two important health indicators in five countries.
- ► Due to data constraints, some relevant sociocultural factors that could have affected the association were not included in the analysis.
- ► The cross-sectional nature of the data prevents making any causal relationships.

INTRODUCTION

The last few decades have experienced an appreciable reduction in the burden of infant mortality rates, thanks to the programmatic efforts within the framework of Millennium Development Goals (MDGs).[1] Between 1990 and 2013, the rate of under-5 mortality has declined by about half at the global level (90% in 1990 vs 46% in 2013 per 1000 live births).[1] Despite this progress in terms of total child mortality, the prevalence of neonatal mortality is still on the rise (38% in 2000 vs 45% in 2015), which poses significant barriers to the fulfilment of the MDGs.[2] Globally, preterm birth (28%), severe infections (26%) and asphyxia (23%) constitute the most important causes of neonatal death.[2 3] However low birth weight (LBW) (weighing <2500 g at birth) is also considered a crucial underlying determinant and contributor to neonatal and infant mortality.[3 4] LBW accounts for nearly half of all perinatal and one-third of all infant deaths.[5] Compared with normal birthweight (NBW) babies, LBW babies are 40 times more likely to die within the first 30 days of life.[5] In African countries, LBW is claimed to be the strongest predictor of infant morbidity and mortality.[6] Given its critical importance on child survival, LBW was adopted as one of a number of health indicators as part of the global strategy for health in the 34th Assembly of WHO in 2000.[7]

Regional statistics suggest that the global burden of neonatal mortality is heavily skewed towards low-income and middle-income countries (LMICs), which account for nearly all LBW cases.[5] According to WHO estimates, out of more than 20 million LBW babies (representing 15.5% of all live births), nearly 95.6% are in LMICs.[5] Evidence from South Asian countries, the highest LBW-prevalent global region, shows that majority of neonatal death occurred among those who weighed less than 2500 g at birth (54% in Pakistan and 79.5% in India).[4 8] Apart from the higher likelihood of neonatal mortality, LBW babies in later periods of life face greater risks of poor cognitive development, impaired immunity, and developing chronic medical conditions and neurodegenerative diseases.[9–11] Besides its direct consequences on physical and mental health, LBW has important socioeconomic bearings, for example, low workplace productivity and increased spending on healthcare, with adverse impacts on national development imperatives in the aggregate.[10–12] Besides being a significant determinant of the chances of survival and long-term health status of infants, LBW also serves as an indicator of health, nutritional and socioeconomic status of the mother.[13 14]

There exist a number of studies that have attempted to identify the causes of LBW and have shown that the factors fall into a diversity of socioeconomic, biological, psychological and nutrition-related factors.[10–16] The themes that commonly emerge from the previous studies include maternal height and weight, level of education, socioeconomic status, adherence to adequate antenatal care services, and order and number of pregnancies.[15–18] Research evidence on the association between maternal body mass index (BMI) and LBW can be useful in informing policy making and health promotion programmes. Unfortunately, most of the countries lack a well-developed birth registry system, which poses challenges in conducting research on a nationally representative sample. However, only a handful of the studies are based on a country representative population, and the results remain mixed. To address this data and research gap, we used secondary data sets from the Demographic and Health Survey (DHS), which collects representative data on various anthropometric and socioeconomic indicators on individual women and their children. The goals were to measure the prevalence of LBW in selected countries in Africa, including Burkina Faso, Ghana, Malawi, Senegal and Uganda, as well as to investigate whether maternal body weight (measured in terms of BMI) has any influence on birth weight outcomes.

METHODS

Study setting, sampling and data collection

The study is based on cross-sectional data on individual women collected from the recent DHS in five Sub-Saharan countries: Burkina Faso, Ghana, Malawi, Senegal and Uganda. Details about the year, implementing body and response rates are listed in table 1. DHS surveys operate in LMICs with an aim to conduct quality studies on basic demographic and health indicators on under-5 children, men (aged 18–59) and women (aged 18–49). Among many, the dominant themes of the surveys include childhood mortality, family planning and fertility, maternal and child health, nutrition, health-related knowledge and behaviour.[19] The main objectives of the programme are to provide quality data on public health issues and increased dissemination and utilisation of the data to promote evidence-based health policy making.[19] DHS programmes work in collaboration with local and international development partners to implement the survey programmes, with financial support from the US Agency for International Development and with technical assistance from ICF International.

The surveys collect information by using standardised questionnaires on various themes on eligible samples and other members of the households. For sampling, DHS employs a two-stage cluster design of the population, which involves labelling the smallest administrative units as enumeration areas (EAs) or clusters. Selection of EAs is based on their size proportional to that of the units. In the second step, households are selected systematically from each EA to ensure effective sampling. DHS provides no exact information on the spatial dimension of EAs. However, it consists about a hundred to 30 000 households varying from country to country. Detailed versions of the sampling procedure are published in previous studies.[20 21]

Participants

The participants were mothers of at least one child ageing between 15 and 49 years and living in non-institutional residences in Burkina Faso, Ghana, Malawi, Senegal and Uganda.

Table 1 Description of the surveys for the countries included in the study

Country	Survey round	Implementing body	Year	Sample (response rate, %)
Burkina Faso	VI	Institut National de la Statistique et de la Démographie.	May 2010–January 2011.	17 087 (98.4)
Ghana	VII	Ghana Statistical Service, Ghana Health Service.	January–March 2014.	9396 (97.3)
Malawi	VI	National Statistical Office of Malawi.	June–November 2010.	23 020 (96.9)
Senegal	VI	Agence Nationale de la Statistique et de la Démographie.	2010–2011.	15 688 (92.7)
Uganda	VI	Uganda Bureau of Statistics.	June–December 2011.	8674 (93.8)

Variables

Dependent variable

The dependent variable in this study was birth weight for the most recent child. As per WHO classification, birth weight was categorised as LBW (<2500 g) and NBW (≥2500 g).

Explanatory variable

The main explanatory variable was prepregnancy body weight status of the respondents measured in terms of BMI. During the interviews, height and weight were measured by standard anthropometric procedures for those who were eligible and gave consent. As per WHO recommendation, BMI was categorised into the following: underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), and overweight and obese (≥25 kg/m^2).

Covariates

Demographic and socioeconomic variables that could influence the associations between maternal BMI and LBW were included in multivariable analyses. Based on the insights from literature review and availability on the data sets, the following variables were included as potential confounders in this study: maternal age; area of residence: urban/rural; educational attainment: nil/primary/secondary and higher; household wealth status*: poorest, poorer, middle, richer and richest; parity: <3/≥3; ANC**: <4/≥4; and pregnancy wantedness (most recent pregnancy): yes/no.

*As DHS does not collect data on individual income, this study used household wealth index as a proxy for economic status. It is calculated based on factor scores generated by principal component analysis on ownership of household assets, for example, source of drinking water, type of toilet facility, type of cooking fuel, and ownership of television and refrigerator. Based on individual scores, households fall into five categories on the wealth index: poorest, poorer, middle, richer and richest.[22]

**WHO recommends at least four ANC visits during the course of normal pregnancies.

Data analysis

Data were analysed using SPSS V.22. Respondents for whom there was no information on height or weight were excluded from the analysis. The basic characteristics of the sample, including the prevalence rates, were presented as frequencies and percentages. Since the dependent variable was dichotomous in nature, a binary logistic regression technique was performed to examine the association between maternal BMI and LBW. Separate bivariate and multivariate models were run for each country included in the analysis. Each of the background variable that showed a significance level of 0.25 in the bivariate analysis (as proposed by Hosmer and Lemeshow) was retained for multivariable analysis.[23] To adjust for the clustered nature of the data, we used binary logistic technique from the generalised estimating equations.[24] The results of multivariate analysis were presented as ORs and 95% CIs. Before regression analysis, variance inflation factor was used to check for collinearity and to ensure that the assumptions of multicollinearity were not violated. All statistical tests were two-tailed, and a p<0.05 was considered statistically significant.

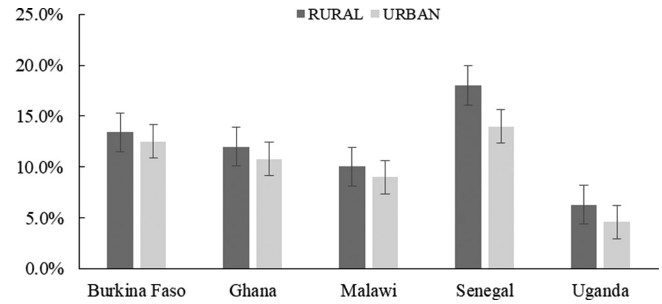

Figure 1 Percentage of LBW babies in individual countries stratified by region. The figure illustrates the per cent distribution of LBW babies between urban and rural regions in the individual countries. It shows that the prevalence of LBW was higher in rural areas in all countries. Regional difference in LBW prevalence was most noteworthy for Senegal. LBW, low birth weight.

Patient and public involvement

Not applicable for this study.

RESULTS

Sample characteristics

The basic sociodemographic characteristics of the sample population in individual countries are presented in figure 1, tables 2 and 3. The results indicate that the average age was lowest at 28.1 years for Malawi and highest at 30.34 years for Ghana (SD 6.63). Women from all countries were predominantly of rural origin, and the percentage ranged from 86.8% in Malawi to 57.1% in Ghana. On educational status, Malawi had the highest literacy rate (86.7%), followed by Uganda (83.7%) and Ghana (75.1%). The majority of women in all countries reported living in households with poorest to middle wealth status. The percentage of participants with the richest wealth status was highest for Burkina Faso (24.1%) and lowest for Senegal (13.5%). Women in Burkina Faso had the highest parity (62.2%), with the majority of women in Ghana, Malawi and Uganda having given birth to fewer than three children. The rate of the antenatal visit for the last pregnancy was low in all countries, ranging from over a quarter in Senegal (27.3%) to about three-fifths in Burkina Faso (59.9%). Well above half of the women in Ghana (71.4%) and Uganda (54.4%) reported their last pregnancy as unintended.

Prevalence data

The prevalence of underweight among women was highest for Senegal (16.1%) and lowest for Malawi (5.9%), and that of overweight was lowest for Ghana (41.9%) and lowest for Burkina Faso (11.3%). The prevalence of underweight was highest in Senegal (16.1%), followed

Table 2 Basic sociodemographic characteristics of the study sample by country

Variables	Burkina Faso (n=3743)	Ghana (n=1338)	Malawi (n=3113)	Senegal (n=1665)	Uganda (n=1559)
Age, mean (SD)	29.09 (7.1)	30.34 (6.63)	28.1 (6.86)	28.93 (9.21)	28.78 (7.08)
Region					
Urban	30.9	46.4	13.2	42.9	18.8
Rural	69.1	53.6	86.8	57.1	81.2
Education					
Nil	75.7	24.9	12.3	62.2	16.3
Primary	15.4	18.5	67.9	25.8	58.9
Secondary/Higher	8.8	56.6	19.8	12.1	24.8
Wealth index					
Poorest	13.7	23.2	17.3	23.5	23.9
Poorer	17.1	16.6	19.7	24.6	18.9
Middle	20.8	21.4	22.3	20.2	16.5
Richer	24.4	19.7	21.7	18.2	17.0
Richest	24.1	19.1	19.0	13.5	23.7
Parity					
<3	37.8	52.7	61.0	45.2	53.7
≥3	62.2	47.3	39.0	54.8	46.3
Antenatal care					
<4	59.9	6.7	52.8	27.6	47.7
≥4	40.1	93.3	47.2	72.4	52.3
Last pregnancy intended					
Yes	89.3	28.6	46.0	61.0	45.2
No	10.7	71.4	54.0	39.0	54.8
Body mass index					
Underweight	11.0	4.5	5.9	16.1	10.2
Overweight/Obese	11.3	41.9	17.6	21.5	19.4
Normal weight	77.7	53.7	76.5	62.4	70.4

Except for age, the numbers represent percentages.

by Ghana (10.4%) and Malawi (10.1%), and was lowest in Uganda (5.3%). The mean birth weight in Burkina Faso, Ghana, Malawi, Senegal and Uganda was, respectively, 2.97 (0.52), 3.25 (0.7), 3 (0.7), 3.35 (0.48) and 3.19 (0.52), and that of LBW was 13.4%, 10.2%, 12.1%, 15.7% and 10% in the same order (table 3).

The results of the χ^2 tests are shown in table 3. It shows that mothers aged more than 35 years, being of rural origin, having no formal education and living in households with the poorer to poorest wealth status were more likely to give birth to LBW babies. The likelihood of having LBW babies was also higher among those with lower parity, attending less than four ANC visits and who reported the last pregnancy as unintended. Underweight mothers had a higher likelihood of having LBW babies compared with overweight/obese mothers in all countries but Uganda (p>0.05).

Association between maternal BMI and LBW

The results of multivariable logistic regression are presented in table 4 and table 5. Among underweight mothers, compared with normal weight, the odds of having LBW babies were, respectively, 1.29, 1.45, 1.90 and 1.50 times higher in Burkina Faso, Malawi, Senegal and Uganda. The odds of having LBW babies were statistically significant among underweight mothers in Senegal only.

As shown in table 5, the nature of the association between maternal BMI and LBW remained nearly the same for all countries after adjusting for other variables in the models. Compared with normal-weight mothers, underweight mothers in all five countries had higher odds of having LBW babies; however, the association was statistically significant for Senegal only.

For sensitivity analysis, we performed regression analysis with different combinations of explanatory variables (not shown) and calculated crude ORs. The results did not show any significant deviation from the final analysis.

DISCUSSION AND POLICY RECOMMENDATION

Our findings showed considerable variations in the prevalence of BMI and birth weight among the five countries. The percentage of women who were underweight was highest in Senegal and lowest in Ghana, whereas that

Table 3 Distribution of low birthweight babies across maternal socioeconomic and BMI status

Variables	Burkina Faso (13.4%)	Ghana (10.2%)	Malawi (12.1%)	Senegal (15.7%)	Uganda (10%)
Age					
<35	399 (79.6)	108 (79.4)	296 (78.7)	60 (22.9)	24 (15.4)
35+	102 (20.4)	28 (20.6)	80 (21.3)	201 (77.1)	132 (84.6)
P values	0.025	0.016	0.124	0.030	0.001
Region					
Urban	156 (31.1)	66 (48.5)	53 (14.1)	121 (46.4)	70 (44.9)
Rural	345 (68.9)	70 (51.5)	323 (85.9)	140 (53.6)	86 (55.1)
P values	0.479	0.360	0.356	0.000	0.003
Education					
Nil	391 (78.0)	30 (22.1)	59 (15.7)	178 (68.2)	21 (13.5)
Primary	72 (14.4)	27 (19.8)	261 (69.4)	58 (22.2)	75 (48.1)
Secondary/Higher	38 (7.6)	79 (58.1)	56 (14.9)	25 (9.6)	60 (38.5)
P values	0.179	0.158	0.024	0.000	0.013
Wealth index					
Richest	66 (13.2)	20 (14.7)	55 (14.6)	37 (14.2)	34 (21.8)
Richer	81 (16.2)	18 (13.2)	81 (21.5)	54 (20.7)	15 (9.6)
Middle	119 (23.8)	24 (17.6)	82 (21.8)	59 (22.6)	19 (12.2)
Poorer	127 (25.3)	34 (25.0)	83 (22.1)	48 (18.4)	34 (21.8)
Poorest	108 (21.6)	40 (29.4)	75 (19.9)	63 (24.1)	54 (34.6)
P values	0.168	0.041	0.149	0.209	0.027
Parity					
<3	233 (46.5)	62 (45.6)	167 (44.4)	113 (43.3)	62 (39.8)
≥3	268 (53.5)	74 (54.4)	209 (55.6)	148 (56.7)	94 (60.2)
P values	0.001	0.04	0.021	0.253	0.385
Antenatal care					
<4	300 (59.9)	13 (9.6)	221 (58.8)	69 (26.4)	71 (45.5)
≥4	201 (40.1)	123 (90.4)	155 (41.2)	192 (73.6)	85 (54.5)
P values	0.136	0.123	0.015	0.113	0.000
Last pregnancy intended					
Yes	54 (10.8)	35 (25.7)	177 (47.1)	159 (61.9)	77 (49.4)
No	447 (89.2)	101 (74.3)	199 (52.9)	102 (39.1)	79 (50.6)
P values	0.251	0.139	0.173		0.000
BMI					
Underweight	68 (13.6)	49 (36.0)	56 (14.9)	56 (21.5)	30 (19.2)
Overweight/Obese	49 (9.8)	7 (5.1)	31 (8.2)	24 (9.2)	11 (7.1)
Normal weight	384 (76.6)	80 (58.9)	289 (76.9)	181 (69.3)	115 (73.7)
P values	0.018	0.04	0.000	0.019	0.116

P value from χ^2 test.
All percentages are in brackets.
BMI, body mass index.

of overweight women was highest in Ghana and lowest in Burkina Faso. The mean birth weight was highest in Uganda and lowest in Burkina Faso. The prevalence of LBW ranged from 10% in Uganda to 15.7% in Senegal. Besides the intercountry differences, the prevalence of LBW varied within countries as well, with the prevalence being higher in rural women compared with urban women. The likelihood of having LBW babies was higher among women with lower parity, attending less than four ANC visits and who reported the last pregnancy as

Table 4 Association (crude) between maternal body mass index and low birth weight, in selected countries in Africa

	Burkina Faso	Ghana	Malawi	Senegal	Uganda
Birth weight, normal	1	1	1	1	1
Underweight	1.298 (0.977 to 1.724)	1.026 (0.460 to 2.286)	1.454 (0.948 to 2.230)	1.909 (1.242 to 2.933)	1.501 (0.652 to 3.457)
Overweight	0.870 (0.629 to 1.203)	0.763 (0.522 to 1.116)	0.972 (0.593 to 1.154)	1.048 (0.753 to 1.457)	1.156 (0.602 to 1.854)

Reference category is normal birth weight. 95% CI shown in parentheses.

unintended. Underweight mothers had a higher likelihood of having LBW babies compared with overweight/obese mothers; however, the association was significant for Senegal only.

The rate of LBW for the countries included in this study was found to be similar to the regional estimate of 13%, lower than in South Asia (28%) and the global average for LMICs (16.5%).[25 26] However, the level is still twice as high compared with developed country average, which is at 7%.[26] Countries in Sub-Saharan Africa rank second in terms of prevalence of LBW, after South Asia. As seen at the global level, the rate of progress towards MDGs has been uneven across the countries included in this study. Among the five countries we studied, only Burkina Faso experienced some reduction in the prevalence of LBW during the last decade (18% in 2003 vs 13.4% in 2010–2011).[27] For Ghana and Malawi, the situation has worsened considerably since their previous estimates (2% in 2003 vs 10.2% in 2014 for Ghana, and 5% in 2000 vs 10% in 2010 in Malawi).[28 29]

The rise in the burden of LBW in these countries serves as an indication of poor/inadequate implementation of national health policies to realise the MDGs targeted at improving child health outcomes (MDG 4 and 5). This deserves special research attention, delving into the underlying causes of the rise in LBW prevalence, and calls for employing more robust policy agenda to reverse the situation. A commonly proposed strategy to prevent maternal and childbirth-related complications is to take early precaution by providing necessary care for pregnant mothers through antenatal care services. Our results show that the rate of ANC attendance was very low in all countries. National LBW prevention policies should also focus on strategies to improve ANC visits among mothers, particularly in the rural areas. Besides, ANC visits have been found to be effective in encouraging institutional delivery, which itself reduces the risk of birth-related complications and increases the rate of weighing at birth, and thus helps in better monitoring LBW rates. In Uganda, for instance, the majority of births (about 70%) during the 5 years preceding the survey were not weighed.[30] This is understandable given the fact that only 37% of the total childbirths have taken place in a health facility.

In line with past findings, our results showed that mothers who were underweight were at higher risk of having LBW babies compared with normal-weight mothers. Previously, a systematic review including 42 studies found that both in developed countries and LMICs children born to underweight mothers were at higher risk of having LBW compared with those born to women with normal weight.[31] This finding was supported by a recent meta-analysis in the context of LMICs: LBW was significantly associated with maternal underweight, but not maternal overweight/obesity.[32] These findings warrant for strong policy attention to address undernutrition among mothers, especially because of its intergenerational effects. Although the situation has seen some progress during the last 8–10 years, about 5%–20% women in Africa still suffer from maternal malnutrition due to chronic hunger with adverse consequences on birth weight and infant and maternal mortality.[33] The rate of underweight has declined in Burkina Faso from 20.9% in 2003 to 11% in 2010–2011, in Ghana from 9% in 2003 to 4.5% in 2014, in Malawi from 9% in 2000 to 5.9% in 2010, and in Senegal from 21% in 2005 to 16.1% in 2010–2011.[27–29] In Uganda, however, no visible progress has been achieved since 2010 (10.4% in 2000–2001 to 10.2% in 2011).[30] As undernutrition itself is a multifactorial problem, the solution will require developing cross-cutting policies and placing the issue on broad national health and development agenda.

Regarding the impact of overweight/obesity on birth weight outcomes, current research evidence is still not sufficiently clear and varies across and within countries. Notably, the findings of the present study suggest a protective effect of overweight/obesity on LBW among Ghana and Malawian women. This finding is consistent with an Indian study based on National Family Health Survey 2, 1998–1999.[34] This finding was supported by

Table 5 Association (adjusted) between maternal body mass index and low birth weight in selected countries in Africa

	Burkina Faso	Ghana	Malawi	Senegal	Uganda
Birth weight, normal	1	1	1	1	1
Underweight	1.304 (0.974 to 1.745)	1.030 (0.453 to 2.342)	1.449 (0.936 to 2.242)	1.961 (1.259 to 3.055)	1.363 (0.587 to 3.169)
Overweight	0.933 (0.676 to 1.343)	0.780 (0.533 to 1.141)	0.998 (0.638 to 1.265)	1.088 (0.774 to 1.530)	1.065 (0.526 to 1.129)

Regression model adjusted for all the sociodemographic variables, which showed significant association, p<0.25 in cross-tabs.

another study conducted in a different Asian setting reporting that the odds of having LBW babies were more than double in underweight women compared with non-obese women.[34] However, these findings conflict with one meta-analysis study which reported that maternal overweight/obesity was associated with lower risk of LBW in LMICs, but the effect did not remain effective after controlling for publication bias.[20] The protective effect of maternal overweight/obesity, however, should not be regarded as a recommendation since it is involved with a range of fetal growth and obstetric complications.[35 36] Overweight/obese women should, therefore, be given proper counselling on the negative impacts of overweight and underweight, so that they can be aware and try to control their weight before and/or throughout the period of pregnancy.

Based on nationally representative data sets, the present study provides valuable insights into the current situation of LBW in selected African countries. To our knowledge, this is the most comprehensive study to focus on the association between maternal body weight status and birth weight outcomes among African women. The surveys were country representative, and hence the findings are generalisable to women aged 15–49 years. Findings from this study are expected to assist future research in this line and policy makers to devise strategies or intervention programmes to address the rising prevalence of LBW. Besides its scientific contributions, few important limitations need to be noted. A major barrier to measuring the rates of LBW in LMICs is the low prevalence of non-institutional delivery, which increases the likelihood of not being weighed at birth. An estimated 75% of newborns are not weighed in Sub-Saharan Africa, and therefore data on LBW may not be representative of the general population. Another limitation is that as prepregnancy BMI was not available, we used the BMI values taken during the interview as a proxy and assumed the change as minimal or insignificant, which could have impacted the outcome to some degree. However previous studies have adopted postgestational BMI as a predictor of LBW. In future studies, it is recommended to focus on pregestational BMI and investigate if low BMI is the result of any other illness conditions. Also, because this is a cross-sectional study, no causal relationship can be established between the explanatory and response variables.

CONCLUSION

This study concludes that the rate of LBW remains high and the prevalence has been on the rise for some countries during the last decade. Women who are underweight had increased odds of having LBW babies; however, the odds were statistically significant only for Senegal. In light of the findings, it is recommended to take special policy measures to promote universal access to antenatal care attendance among pregnant mothers and provide nutrition counselling at the same time to reduce the burden of being underweight. Integrating the provision of supplements/nutritious food programmes during pregnancy could benefit child nutrition and LBW-related programmes.

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Contributors ZH, GB and YZ conceptualised the study and data collection. ZH, GB, SY and YZ were responsible for data management and analysis. ZH and GB contributed to initial drafting and interpretation of the results. DZ and ZC were responsible for the language. All authors read the final manuscript and gave approval for publication.

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Competing interests None declared.

Patient consent Not required.

Ethics approval The protocol of the DHS surveys was approved by the Ethics Committee of ORC Macro. The study was based on analysis of anonymised secondary data available in the public domain of DHS; therefore, no additional approval was necessary. However, approval for the reuse of data was obtained by the authors from DHS.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Access to demographic and health survey data is managed and provided by MEASURE DHS following an online registration (http://www.dhsprogram.com).

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