Underweight and associated factors among lactating women in Uganda: evidence from the Uganda demographic health survey 2016.

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Abstract

Background

Lactating mothers are at increased risk of underweight due to physiological changes that lead to disproportionately higher energy and nutrient requirements than non-pregnant and non-lactating women. Maternal underweight has been shown to negatively affect the secretion of nutrients in breast milk leading to increased risk of child morbidity and mortality. We aimed to determine the prevalence and factors associated with underweight among lactating women in Uganda.

Methods

We used the Uganda Demographic and Health Survey (UDHS) 2016 data of 1,356 women aged 20 to 49 years. Multistage stratified sampling was used to select study participants and data were collected using validated questionnaires. We used multivariable logistic regression to determine factors associated with underweight among 20 to 49-year-old lactating women in Uganda.

Results

The prevalence of underweight was 8.2% (111/1356) (95% CI: 7.0–10.0). Women who were working were more likely to be underweight compared to those who were not working (AOR = 0.51; 95% CI: 0.28–0.96). Women in the Northern region were more likely to be underweight compared to women in the Western (AOR = 0.14; 95% CI: 0.06–0.29), Eastern (AOR = 0.34; 95% CI: 0.18–0.64) and Central (AOR = 0.24; 95% CI: 0.10–0.57) regions. Women who had no education (AOR = 9.27; 95% CI: 1.61–53.52) or, primary education (AOR = 6.00; 95% CI: 1.13–31.98) were more likely to be underweight compared to those who had higher (post-secondary) education level.

Conclusion

Our study established that the factors associated with underweight among Ugandan lactating women were level of education, working status and region. Based on the findings of this and other studies, it is important for the government to design targeted underweight reduction programs with special emphasis on working, women from the Northern region and those whose highest level of education is primary.

Introduction

Maternal and child nutritional status is a good indicator of the overall wellbeing of a society (1). Globally, 10% of women aged 20 to 49 are underweight (2) with the greatest burden in low-income countries (3). Underweight is an indicator of undernutrition, an adult is considered underweight when their body mass index is below 18.5 kg/m^2 (4). Lactation and pregnancy are particularly demanding periods for women because of the increased demand for calories and nutrients, often at the expense of the woman's health if the oral intake is not commensurate (1, 5).

The World Health Organization (WHO) recommends up to two years of breastfeeding with six months of exclusive breastfeeding (6), yet breast milk production largely depends on the nutritional status of the mother hence it is crucial to ensure adequate nutrition among lactating women (6). Additionally, the WHO recommends a birth to pregnancy interval of at least 24 months in order for the physiological changes of pregnancy to be reversed to allow full recovery from the preceding pregnancy (7).

With maternal underweight, the quality and quantity of nutrients in breast milk is negatively affected leading to increased risk of child morbidity, mortality and a long term impact on the child's health (8, 9). Under-nutrition in lactating women induces nutrition related metabolic disturbances in early infancy and irreversible physiologic alterations in infants (10). The nutritional demand is high for lactating women (11) yet women in low-income countries are at a high risk of not meeting their nutrient requirements (12) because of inadequate food supply due to financial constraints (13, 14).

Women in Uganda are economically disadvantaged as they have less control of resources like land, much involvement in unpaid care work, work longer hours than men and less access to credit services (15). The majority of the reported studies in Uganda have mainly focused on prenatal and under-five nutrition overlooking another high risk group of pregnant and lactating women despite studies in developing countries showing a high prevalence of underweight among lactating women. This knowledge gap impedes designing of national nutrition policies for pregnant and lactating women. Hence this study aimed to determine the prevalence and associated factors of underweight among lactating women in Uganda.

Methods

Study Data

We used secondary data of the 2016 Uganda demographic health survey collected from 20th June 2016 to 16th December 2016 (16). It was a nationally representative survey carried out by the Uganda Bureau of Statistics as part of the international MEASURE Demographic Health Surveys (DHS) with the support of ICF International and United States Agency for International Development (USAID) (16). UDHS is a periodical survey conducted every five years. UDHS 2016 had four different questionnaires (16). Household questionnaire collected data on household environment, assets and members while women's questionnaire collected data about women's background characteristics, reproductive health, domestic violence and nutrition (16). The men's questionnaire collected men's health indicators' data while the biomarker questionnaire collected data on anthropometry and blood tests (16). Regarding anthropometry, weight was recorded in kilograms to the nearest one decimal point and was measured using an electronic scale (SECA 878) while height was recorded in centimeters to one decimal point (16).

Study Setting

As of July 2018, Uganda had a population of 40,853,749 million people with 23.8% of the population residing in urban areas and the country has a total area of 241,551 square kilometres (17, 18). Uganda's health system has six levels ranging from the highest level of national referral hospitals to the lowest level at the community level (19). Agriculture contributes about 24% of gross domestic product (GDP), providing half of the export earnings and is the primary source of income for the majority of Ugandans (18).

Study Sampling And Participants

Samples were collected using stratified two-stage cluster sampling design with census enumeration areas as the primary sampling units (16). The first stage of sampling involved selecting 697 enumeration areas (EAs), including 162 urban and 535 rural enumeration areas selected from the list of the 2014 population and housing census sample frame (16). One enumeration area in Acholi region was excluded due to land disputes hence ending up with 696 EAs. Enumeration areas with over 300 households were segmented and only one segment selected with probability proportional to the segment size as this helped minimize the burden of the household listing (16). The enumeration areas that were involved in the survey were chosen independently from each stratum with probability proportional to size. The second stage of sampling involved the selection of households through equal probability systematic sampling. A list containing all households and maps in the selected enumeration area was made available, and households that were in institutional living arrangements were excluded (16). Women aged 15 to 49 years who were either the permanent residents or slept in the selected household the night before were eligible for inclusion in Uganda's demographic health survey 2016 (16). During the survey, anthropometric measurements were done for women who were not pregnant or had no birth two months before the survey (16). Our secondary analysis only considered 20 to 49-year-old lactating women and excluded 15 to 19-year-old women (adolescents) because the recommended anthropometric indicators for assessing underweight for those above 20 are different from those of adolescents. Of the 18,506 women who consented and filled in the questionnaires, 14,242 were aged 20 to 49 years and of these, 4731 were eligible for anthropometry, 4640 had their anthropometry done and 1356 were breastfeeding (16). To maintain the representativeness of the sample and possible differences in response rates across regions, sampling weights were used.

Outcome Variables

In this study, underweight was the outcome variable and was defined as body mass index (BMI) less than ($<$) 18.5 kg/m² (4).

Explanatory Variables

This study included determinants of underweight based on evidence from available literature and data. These factors were divided into the individual level (age, marital status, working status and education level), household level (wealth index, household size and sex of household head) and community level (region and residence) characteristics. The “Wealth index” is a measure of relative household economic status and was calculated by DHS from information on household asset ownership using Principal Component Analysis (16, 20). Different household assets were used to calculate separate wealth indices for rural and urban areas, combined into a national wealth index and these quintiles are; the poorest, the poorer, the middle, the richer and the richest quintiles (16, 20). Place of Residence was aggregated as urban and rural. The “region” was categorized into four; Northern (Teso, Karamoja, Lango, Acholi, West Nile), Central (Kampala, Central 1 and Central 2), Eastern (Busoga, Bugishu and Bukedi) and Western (Tooro, Ankole, Bunyoro and Kigezi) (21). Level of Education was categorized into: no education, primary education, secondary and higher education. Age was categorized into 20–29, 30–39 and 40–49. Household Size was categorized as less than six members and six and above members. Sex of Household Head was categorized as male or female. Working status was categorized as: not working and working. Marital Status was categorized into married, and this included those in formal and informal unions and not married. Antenatal care (ANC) utilisation frequency was divided into less than four visits and four and above visits.

Statistical Analysis

We used the SPSS analytic software version 25.0 Complex Samples package for this analysis. Use of the complex samples package accounted for the complex survey sampling while the use of sample weighted data accounted for the unequal probability sampling in different strata. Frequency tables and proportions were used to describe categorical variables while means and standard deviations for continuous variables. Initially, each exposure was assessed separately for its association with the outcome variable using bivariable logistic regression, and we presented crude odds ratio (COR), 95% confidence interval (CI) and p-values. Independent variables found significant at p-value less than 0.2 (11, 22) were included in the multivariable model. We used variance inflation factor to rule out multi-co-linearity and Hosmer and Lemeshow goodness of fit test for the adequacy of the models (12).

In the multivariable analysis, we constructed two models based on the categorization of the independent variables into “individual” and “household and community level” factors. We first performed a logistic regression model which included only individual characteristics (level of education and working status) that were found significant at the binary logistic regression level. Then after, we constructed a final model which included individual characteristics adjusted for household and community characteristics (wealth index, residence and region). Adjusted odds ratios (AOR), 95% Confidence Intervals (CI) and p-values were calculated with a statistical significance level set at p-value < 0.05. Sensitivity analysis was done with only women who were underweight and had normal BMI after excluding those with BMI above 25.

Results

A total of 1,356 lactating women were included in this study (Table 1). Over half of the women were aged between 20 and 29 years (61.5%), resided in rural areas (80.5%), were currently working (82.7%) and married (88.1%). In addition, more women lived in households with more than six members (54.5%), had primary education as the highest level (59.5%) and resided in male-headed households (74.7%). Regarding geographical location, Northern region had the highest proportion of respondents (30.6%) while Eastern had the lowest (20.0%). Study participants are almost equally distributed in each wealth quintile. The mean age, weight, height, household size and BMI were 28.44 ± 6.21 , 57.83 ± 10.66 , 159.09 ± 6.39 , 6.23 ± 2.72 , and 22.83 ± 3.89 respectively.

The prevalence of underweight was 8.2% (95% CI: 7.0–10.0), and of these, 75.9% were mildly underweight, 20.5% moderately underweight, and 3.6% severely underweight.

Table 1
Background characteristics of lactating Ugandan women aged 20–49 years as per the 2016 UDHS.

Characteristics	N = 1356	%
Age		
20 to 29	834	61.5
30 to 39	441	32.5
40 to 49	81	06.0
Residence		
Rural	1092	80.5
Urban	264	19.5
Region		
Western	361	26.6
Eastern	272	20.0
Central	308	22.7
Northern	415	30.6
Sex household head		
Female	343	25.3
Male	1013	74.7
Household Size		
6 and Above	738	54.5
Less than 6	618	45.5
Working status		
Not working	233	17.2
Working	1122	82.7
Marital status		
Married	1194	88.1
Not married	161	11.9
Education Level		

^a =Working status had 1 missing value, ^b = ANC frequency had 2 missing values

Characteristics	N = 1356	%
No Education	166	12.2
Primary Education	807	59.5
Secondary Education	280	20.7
Higher	103	07.7
Wealth Index		
Poorest	330	24.3
Poorer	291	21.4
Middle	268	19.7
Richer	227	16.8
Richest	241	17.7
Underweight		
Yes	111	08.2
No	1245	91.8
ANC Frequency^b		
Less than 4 visits	547	40.4
4 visits and above	806	59.6
^a =Working status had 1 missing value, ^b = ANC frequency had 2 missing values		

Factors associated with Underweight.

Table 2 shows the findings of bivariable analysis. After adjusting for individual characteristics, both working status and education level were found to be associated with underweight. In the final logistic regression model, factors associated with underweight were: region, education level and working status as shown in Table 3. Women who had no education (AOR = 9.27; 95% CI: 1.61–53.52), primary education (AOR = 6.00; 95% CI: 1.13–31.98) were 9.27 and 6 times respectively more likely to be underweight compared to those who had higher (post-secondary) education level.

Women who were not working were 49% less likely to be underweight compared to those working (AOR = 0.51; 95% CI: 0.28–0.96). Women in the Western (AOR = 0.14; 95% CI: 0.06–0.29), Eastern (AOR = 0.34; 95% CI: 0.18–0.64) and Central (AOR = 0.24; 95% CI: 0.10–0.57) regions were 86%, 66% and 76% less likely respectively to be underweight compared to those in the Northern region.

Table 2
Bivariable analysis of determinants of underweight among lactating
Ugandan women aged 20–49 years

Characteristics	Underweight n = 111	Not underweight n = 1245	P-Value
Household Head			0.728
Female	30 (26.7)	313 (25.2)	
Male	81 (73.3)	932 (74.8)	
Wealth Index			< 0.001*
Poorest	50 (45.0)	280 (22.5)	
Poorer	26 (23.7)	265 (21.2)	
Middle	15 (13.3)	253 (20.3)	
Richer	15 (13.3)	212 (17.1)	
Richest	5 (04.7)	235 (18.9)	
Working Status^a			0.003*
Not Working	9 (8.1)	224 (18.0)	
Working	102 (91.9)	1020 (82.0)	
Education Level			< 0.001*
No Education	25 (22.0)	141 (11.3)	
Primary	72 (64.9)	735 (59.0)	
Secondary	13 (12.0)	267 (21.4)	
Higher	1 (1.1)	102 (8.2)	
Region			< 0.001*
Western	9 (8.0)	352 (28.3)	
Eastern	16 (14.7)	255 (20.5)	
Central	11 (9.8)	297 (23.9)	
Northern	75 (67.6)	341 (27.4)	
Marital Status			0.501
Married	100 (90.1)	1095 (87.9)	

^a =Working status had 1 missing value, * = Significant at p-value < 0.20

Characteristics	Underweight n = 111	Not underweight n = 1245	P-Value
Not Married	11 (9.9)	150 (12.1)	
Age			0.978
20 to 29	68 (61.4)	765 (61.5)	
30 to 39	37 (33.0)	405 (32.5)	
40 to 49	6 (5.6)	75 (6.0)	
Residence			0.090*
Rural	97 (87.5)	995 (79.9)	
Urban	14 (12.5)	250 (20.1)	
Household Size			0.570
Six and Above	58 (51.8)	681 (54.7)	
Less than 6	53 (48.2)	564 (45.3)	
ANC Frequency			0.528
Less than 4 visits	99 (43.2)	499 (40.2)	
4 visits and above	63 (56.8)	743 (59.8)	
^a =Working status had 1 missing value, *= Significant at p-value < 0.20			

Table 3
Multi-variable analysis of determinants of underweight among lactating Ugandan women aged 20–49 years.

Characteristics	Crude model (n = 1356) OR (95%CI)	Final Model (n = 1356) AOR (95%CI)	Sensitivity Model (n = 1067) AOR (95%CI)
Age			
40 to 49	1		
30 to 39	1.08 (0.49–2.38)		
20 to 29	1.10 (0.47–2.56)		
Education Level			
Higher	1	1	1
Secondary	4.21 (0.86–20.59)	4.29 (0.70–26.52)	3.79 (0.57–25.35)
Primary	8.27 (1.85–36.88)	6.00 (1.13–31.98)	5.84 (0.97–35.07)
No Education	14.59 (3.11–68.58)	9.27 (1.61–53.52)	9.06 (1.41–58.29)
Marital Status			
Not married	1		
Married	1.25 (0.65–2.41)		
Working Status			
Working	1	1	1
Not working	0.40 (0.22–0.74)	0.51 (0.28–0.96)	0.52 (0.28–0.98)
Region			
Northern	1	1	1
Western	0.12 (0.06–0.24)	0.30 (0.20–0.44)	0.35 (0.24–0.51)
Eastern	0.29 (0.16–0.53)	0.42 (0.28–0.63)	0.44 (0.29–0.67)
Central	0.17 (0.07–0.39)	0.42 (0.25–0.72)	0.51 (0.30–0.89)
Household Size			
Less than 6	1		

bold = Significant at p-value < 0.05, Final model - Adjusted for residence, region, working status, education level and wealth index. Sensitivity model – Included only women with low and normal BMI and excluded women with BMI equal to and above 25.0. AOR: Adjusted odds ratio. COR: Crude Odds Ratio

Characteristics	Crude model (n = 1356) OR (95%CI)	Final Model (n = 1356) AOR (95%CI)	Sensitivity Model (n = 1067) AOR (95%CI)
Six and above	1.89 (0.60–1.32)		
Wealth Index			
Richest	1	1	1
Richer	3.14 (0.89–11.08)	1.77 (0.43–7.39)	1.05 (0.27–4.11)
Middle	2.60 (0.74–9.14)	1.27 (0.31–5.12)	0.74 (0.20–2.69)
Poorer	4.48 (1.35–14.89)	1.74 (0.42–7.15)	0.91 (0.25–3.28)
Poorest	8.02 (2.49–25.86)	1.79 (0.45–7.05)	0.92 (0.26–3.25)
Residence			
Urban	1	1	
Rural	1.76 (0.91–3.41)	0.87 (0.39–1.91)	
Sex of household head			
Male	1		
Female	1.08 (0.70–1.68)		
ANC Frequency			
4 visits and above	1		
Less than 4 visits	1.13 (0.72–1.77)		
bold = Significant at p-value < 0.05, Final model - Adjusted for residence, region, working status, education level and wealth index. Sensitivity model – Included only women with low and normal BMI and excluded women with BMI equal to and above 25.0. AOR: Adjusted odds ratio. COR: Crude Odds Ratio			

Sensitivity Analysis

Analysis after excluding obese and overweight women and considering only women with a BMI < 25.

We conducted a sensitivity analysis where we excluded women who had a BMI equal to and above 25.0 and we coded underweight (BMI < 18.5) as one and normal BMI (18.5–24.9) coded as zero. The final adjusted model had no significant differences between the factors associated with underweight compared to the original analysis (Table 3). Education level, working status and region were still significantly associated with underweight.

Discussion

This study investigated the prevalence and factors associated with underweight among lactating Ugandan women aged between 20 to 49 years. Based on the anthropometric measurement of body mass index, 8.2% (95% CI: 7.0–10.0), of lactating women were underweight with BMI less than 18.5 kg/m² which prevalence is below the standard acceptable malnutrition rate of 10% (23). Of the 8.2%, 3.6% were severely underweight, 20.5% were moderately underweight and 75.9% mildly underweight. This prevalence is lower than studies conducted among lactating women in Ethiopia (5, 8, 12), rural Vietnam (24) and India (25) but higher than a study done in Nigeria (9). The difference in the prevalence of underweight between the current study and the other studies above could be attributed to the differences in the sociodemographic and economic characteristics between these study areas.

Underweight was significantly associated with working status, education level and region.

Women who belonged to the Western, Eastern and Central regions were less likely to be underweight compared to women in the Northern region. Region of residence has also been shown to be associated with undernutrition in similar low-income African settings (4, 26, 27) and in Afghanistan (28). Some parts of Northern Uganda especially the North-Eastern area are among the most food insecure with limited resources (29, 30). This could be attributed to the fact that this region experienced a long civil war which greatly affected their agricultural production and the economy compared to the other regions of the country that have been stable without civil conflicts (31). The decreased agricultural production and poor economy of this region induced food insecurity by reducing local food production hence decreased availability and access to food. (32). This leads to inadequate food, in both quality and quantity, risking them to underweight. Additionally, most people in the Northern region, unlike the other regions are pastoral communities (some are nomadic) and this may negatively affect their consumption of foods from the agricultural origin (crops) as they mostly focus on pastoral activities. As a matter of fact, pastoralism has been shown to increase the risk of underweight in Ethiopian pastoral communities (4).

Women who were not working were 49% less likely to be underweight compared to those who were working. Working status has been shown in other studies conducted in Ethiopia, Senegal and Cambodia to be associated with underweight (12, 33, 34). The workload due to labour-intensive activities that involve high physical activity increase energy expenditure which further predisposes these women to underweight. Similarly, a study done among lactating Senegalese women shows weight loss due to negative energy balance associated with agricultural labour (33) which agricultural activities are the commonest source of income in Uganda (18). Another possible reason could be tight working schedules affect the dietary patterns of lactating mothers, this, coupled with the increased nutrition needs, makes lactating mothers prone to underweight (35, 36).

Similar to studies done in Ethiopia (12), Nepal (2), Tanzania (4), Iran (1), Kenya (37) and Botswana (38), education level in this study was significantly associated with the nutritional status. Women who had no education and those with primary level were 9.27 and 6 times more likely respectively, to be underweight

compared to those that had a post-secondary level of education. Education level has been shown to be one of the indicators of women empowerment hence less educated women tend to have less nutrition knowledge, be less empowered to access economic resources and also less likely to make right decisions (2) which negatively affects the use of health-care facilities, accessibility of nutritious food, better health-promoting behaviours and management of the limited household resources. All these predisposes them to inadequate dietary intake due to poor dietary consumption patterns like skipping meals and /or having unbalanced diets and eventually leading to underweight (39).

Strengths

Standardised procedures are a requirement of DHS surveys in data collection and validated questionnaires were used which ensured the internal and external validity of the results.

Secondly, we used a nationally representative sample and weighed the data for analysis and therefore our results are generalized to all Ugandan women aged 20 to 49 years.

Limitations

The cross-sectional design is limited by lack of temporality hence causality inferences cannot be made. Most data on the predictors was based on self-reporting and could not be verified through records which risks socially acceptable answers hence information bias. Other important predictors of underweight such as dietary diversity score, nutritional knowledge, co-morbidities and food security were not available to be included in the analysis. There is also possibility of recall and interviewer biases as respondents gave answers about events that occurred in the past and possibility of respondents giving positive answers to please the interviewer.

Conclusion

Based on the anthropometric measurement of body mass index, 8.2% (95% CI: 7.0–10.0), of lactating women were underweight with BMI less than 18.5 kg/m^2 which prevalence is below the standard acceptable malnutrition rate of 10% (23). Our study established that the factors associated with underweight among Ugandan lactating women were level of education, working status and region. Based on the findings of this and other studies, it is important for the government to design targeted underweight reduction programs with special emphasis on working, women from the Northern region and those whose highest level of education is primary.

Abbreviations

EA Enumeration area

AOR Adjusted Odds Ratio

CI Confidence Interval

COR Crude Odds Ratio

DHS Demographic Health Survey

UDHS Uganda Demographic Health Survey

OR Odds Ratio

SD Standard Deviation

WHO World Health Organization

BMI Body Mass Index

GDP Gross Domestic Product

SPSS Statistical Package for Social Science

USAID United States Agency for International Development.

Kg Kilograms

UNICEF United Nations Children's Fund

ANC Antenatal Care

Declarations

Availability of data and materials

The data set used is openly available from MEASURE DHS website and the modified data set that was used for final analysis can be availed upon request from the corresponding author.

Ethics approval and consent to participate

High international ethical standards are ensured for MEASURE DHS surveys as ethical approval from the country is obtained from a national ethical review board and local authorities before implementing the survey and well-informed verbal consent is sought from the respondents prior to data collection (16, 20) This data set was obtained from the MEASURE DHS website (URL:

<https://www.dhsprogram.com/data/available-datasets.cfm>) after getting their permission and no formal ethical clearance was obtained since we conducted secondary analysis of publicly available data.

Consent for publication

Not applicable.

Competing interests

All authors declare that they have no competing interests.

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Authors' contributions

QS Conceived the idea, drafted the manuscript, performed analysis and interpreted the results. DM participated in conceiving the idea and helped in results interpretation and writing. JK, MM. MK, IAK, HT, LMM and RT reviewed the first draft and drafted the subsequent versions of the manuscript. All authors read and approved the final manuscript.

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