Low Dietary Diversity Score is the Cause of Underweight Among Expectant Mother from Rural Ethiopia: A Community Based Cross-Sectional Study

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Research

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Abstract

Background: Maternal underweight is a challenging public health issues globally affecting women in most developing countries and consequently affect their newborns. Such information however is scantly in the study area and thus we examined the contribution of low dietary diversity score towards underweight among expectant mothers from rural Ethiopia.

Methods: This study was based on data extracted from a large data set gathered from three rural villages from September 2017 to June 2018 in a district of North-Shewa Zone of Amhara Regional State which is 220 km north of Addis Ababa, the capital city of Ethiopia. Data on socio demographic characteristics food groups consumed and Mid-Upper Arm Circumference (MUAC) measurement were taken for all expectant mothers by trained health extension workers in accordance with relevant ethical guidelines and regulations. The collected data were entered into Epi-data software version 3.02 and analyzed using SPSS version 20. Statistical significance was affirmed at a p-value ≤ 0.05.

Result: Of the 400 consented participants, 380 of them had adequate information and thus analyzed for their variety of food groups consumption and their MUAC measurement outcomes. The magnitude of underweight was 18.2% and the mean (±SD) dietary diversity score was 4.45(±1.32). interestingly, the relationship between poor dietary diversity score and underweight of the participants was significant (AOR= 2.4; 95% CI=1.05 to 5.3).

Conclusion: Our study revealed a significant relationship between low dietary diversity score and underweight of expectant mothers. it is thus, essential to improve the dietary diversity and nutritional status of pregnant women through strengthening the ongoing productive safety net program and empower women to earn more income so that mothers would purchase variety of foods and ultimately break the intergeneration cycle of malnutrition.

Background

Maternal underweight is a challenging public health issues globally affecting women in most developing countries including Ethiopia and responsible for the death of mothers and children (1-4). Because of the grave consequences of malnutrition women are advised to take more diversified food to get adequate energy and multiple nutrients to satisfy their demand as well as their offspring. Mothers in most developing countries however, do not adhere to the nutritional advices provided to them during their antenatal follow up due to several factors that include limited access to and consumption of micronutrient rich foods, frequent illnesses, teenage pregnancy with narrow birth intervals and high fertility rates (1,6).

The solution requires effective multisectoral interventions that include health, social welfare, education, water, sanitation, in addition to consumption of balanced diet which contributes to the wellbeing of the mother as well as her offspring (7). In line with this, the government of Ethiopia has developed a revised

national nutrition program (NNP) in 2016 to address the burden of malnutrition in pregnant and lactating women (8).

Despite the implementation of the revised NNP initiative, maternal underweight remained a pressing problem according to the 2016 Ethiopian demographic health survey which documented 22.4% of women in reproductive ages (15–49 years) were undernourished (9).

Other than the aforementioned documented report, several pocket studies in the country also revealed underweight to prevail and ranged from 9.2% to 31.8% (10-14).

Other recent studies done on pregnant women indicated that poor dietary scores in the same age and sex groups are documented to be another important problem that have a strong positive relationship between appropriate maternal nutritional status and birth outcomes and ranged from 24.2%-74.6% (15-17).

Nonetheless, such information for expectant mothers from rural north Shewa is scanty and therefore, examined the association of low dietary diversity score with the nutritional status of pregnant women based on a large data set collected in a rural community to generate evidence that can be used to design appropriate interventions for the villages as well as for the region and the country.

Methods

Study Area and Population

This study was extracted from a large data set gathered in a Community based cross-sectional study conducted among expectant mothers from September, 2017 to June, 2018 in a rural district of North-Shewa Zone of Amhara Regional State which is 220 km north of Addis Ababa, the capital city of Ethiopia [Master Thesis, 2018] (18).

A total of 400 expectant mothers from five villages were randomly selected in accordance with relevant ethical guidelines and regulations in the initial mother document and allocated proportionally to each of the villages based on the constituted sampling frame obtained from health posts.

Data on socio demographic characteristics food groups consumed (nine food groups as displayed in Table 1) and MUAC measurement were taken for all expectant mothers by trained health extension workers. Maternal MUAC was measured using non stretchable tape (MUAC) and recorded as normal or abnormal when MUAC >22cm and <22cm, respectively (19). Dietary diversity scores (DDS) was formed by summing up the number of food groups consumed over a 24-hour period by an individual and labeled as high and low DDS when the food groups consumed were more than five and below five, respectively as recommended by FAO and FHI 2016 (20). The collected data were entered into Epi-data software version 3.02 and analyzed using SPSS version 20 (21-22).

Results

Of the 400 recruited mothers, only 380 of them who had complete information were included in the analysis and the rest were excluded. The mean (±SD) age was 22.5 ± 4.3 years indicating younger age groups.

Consumption of the Modified Dietary Diversity Score (MDDS)

Grain, white roots, and tubers were amongst the commonly consumed grains by all expectant mothers predominantly in the form of breads, pasta, macaroni, porridge, rice. The second most commonly consumed meals as their integral part of the main dish for the vast majority (98.7%) was vegetables. Consumption of pulses and other vitamin A-rich fruits/vegetables was also reported in 66.3% and 55.3% of them, respectively. Milk and milk products (dairy), and other dark green leafy vegetables were consumed in 46.6% and 29.7%, respectively. Meat, poultry, and fish were consumed in 27.6%. the details of food groups are displayed in Table 1.

Table 1: Consumption of the MDDS of the respondents by nine food groups

Food groups	Frequency	Percentage (%)
1. Grains, white roots and tubers, and plantains	380	100
2. Other vegetables	375	98.7
3. pulses (beans, peas and lentils)	252	66.3
4. Other vitamin A-rich fruits and vegetables	210	55.3
5. Dairy	177	46.6
6. Dark green leafy vegetables	113	29.7
7. Meat, poultry and fish	105	27.6
8. Egg	62	16.3
9. Other fruits	17	4.5

As shown in Table 2, the proportion of mothers who consumed more than five food groups (high dietary diversity score) was nearly 43.0% while those who consumed five or less (low dietary diversity score) were close to 57.0%. The mean DDS was 4.45±1.32.

Table 2: Dietary diversity score of the expectant mothers

Dietary diversity scores	N(%)
G Consumption of 5 or less food groups (low DDS)	217(57.1%)
Consumption of more than 5 food groups (high DDS)	163(42.9%)
Mean (±SD)	4.45(±1.32)

Underweight level determined by MUAC and its association with dietary diversity score

As displayed in Table 3, a large number (81.8%) of expectant mothers had optimum nutritional status while less than a quarter (18.2 %) were underweight based on the suggested cut off point for MUAC. The proportion of underweight mothers was higher in the age group of 15 to 24 years than those above 25 years and the difference noted was statistically significant in the bivariate analysis (COR=0.56; 95%CI=0.03 to 0.95). Nevertheless, this association when further analyzed, its significance was lost in the multivariate regression analysis.

As expected on the other hand, DDS was significantly associated with the nutritional status of the expectant mothers in the multivariate analysis (AOR= .4; 95% CI=1.05 to 5.3).

Table 3: Association of Dietary diversity scores and nutritional status

Characters	Normal	Underweight	**COR (95% CI)**	**AOR (95% CI)**
Age (in years)				
15-25	136(77.3%)	40(22.7%)	0.56(.033-.955)	0.18(.22-1.5)
Greater than 25	175(85.8%)	29(14.2%)	1	1
Total	311(81.8%)	69(18.2%)		
Dietary diversity score				
≥5	131(80.4%)	32(19.6%)	0.841(.498-1.421)	2.4(1.056-5.3)*
<5	180(82.9%)	37(17.1%)	1	1
Total	311(81.8%)	69(18.2%)		

COR-Crude Odds Ratio AOR – Adjusted Odds Ratio

Discussions

The association of low dietary diversity score with the underweight status of expectant mother from rural Ethiopia was examined and showed the overall proportion of underweight to be less than a quarter and the majorities to have low DDS. Nonetheless, when the proportion of underweight is disaggregated against age, the most affected age group was those in the age group between 15 and 25 years. In the same breath, the proportion of underweight was significantly higher among mothers with low DDS indicating low dietary diversity is a significant factor associated with the nutritional status of mothers.

The magnitude of underweight observed in the present study is concordant with Northwest Ethiopia (23), Sri Lanka (24) and Kenya (25) which documented 14.4%, (15%) and (19.3%) of underweight among pregnant mothers, respectively.

On the other hand, when compared with the Indian (61.5%) and South West Ethiopia (44.9%), our finding is expressively lower than the finding documented for India (26) and south west Ethiopia (27).

The difference might be due to that the study in India exclusively included participants from lower social classes. Further, the discrepancies might be attributed to the difference in stage of pregnancy, nutritional practice, a seasonal variation on food consumption and the use of different cut off points for mid-upper arm-circumference measurement in different studies.

The proportion of mothers with high DDS in our study is better than that of Pakistani report (80.4 vs 5.0) which documented only 5% of mothers to have high DDS (28).

In contrast, when compared with the Kenyan study our finding is lower (80.4 vs 92.4) (24). Such variations are expected due to the differences in the sociodemographic status and to some extent to the cultural reasons of the participants. The mean DDS(±SD) observed in our study is closer to the findings of pregnant women reported mothers in Southwest Ethiopia (4.6 vs 4.3) (30), Bangladesh (4.6 vs 4.38) (31) and higher than the study finding from central Ethiopia (4.6 vs 3.5) (32). On the other hand, compared with the Kenyan which reported a mean DDS of 6.8 (33) and South Ethiopian mean DDS of 7.0 (34), the present figure is however lower than the above-mentioned findings possibly due to their differences in socio-socioeconomic status, and cultural/seasonal variations.

As in many developing countries, this study showed that plant-based foods are the major sources of both macro and micronutrient for the vast majority of the mothers and were consumed in the form of breads, pasta, macaroni, porridge, rice followed by vegetables. While consumption of animal-based proteins which are good sources of nutrients is markedly low and consequently increased the risk of nutritional deficiencies. Similar findings were reported in Kenya, southwest Ethiopia and Eastern Ethiopia (12, 30,32, 33-36).

In this study, less than a quarter of the expectant mothers were underweight based on the suggested cut off point of MUAC measurement of less than or equal to 22cm and most of the underweight cases were among the younger age group and our finding is concordant with some studies conducted in the country and elsewhere. For instance, in Northwest Ethiopia, Sri Lanka and Kenya (23-27, 30), the magnitude of underweight among same groups was reported to be 14.4%, 15% and 19.3%, respectively. When compared with the Indian study (26), our finding is markedly lower (18.7 vs 61.5) and this difference is probably attributed to cultural and economic factors as most of the cases in India were from the lower social classes.

As expected, the odds of underweight were 4 times higher among mothers with poor DDS than their referent groups and our finding is concordant with some previous pocket studies conducted locally (30, 36). It is eminent that when women consume less food groups, particularly low consumption of animal-based proteins which are good sources of nutrients, there would be an increased risk for malnutrition and similar finding is reported in west Ethiopia (30,36).

Strength and limitations

The strength of this study is that we used rural community that had no data collection fatigue and validated tool. Nonetheless, the study had some limitations emanated from the nature of study design which might led to recall bias.

Conclusion

This study demonstrated that low dietary diversity score is significantly associated with the observed level of maternal underweight. In order to improve the situations, it essential that all development sectors need to strengthen the current ongoing productive safety net program and empower women to earn more income that would enable them to purchase variety of foods to improve their nutritional status and ultimately break the intergeneration cycle of malnutrition. Other than this, mothers need to be counselled on the importance of the nutritional value of different food groups and its use.

Abbreviations

AOR: Adjusted Odds Ratio

DDS: Dietary diversity Score

MDDS: Consumption of the Modified Dietary Diversity Score

MUAC: Mid upper Arm circumference

NNP: National Nutrition Program

Declarations

Ethics approval and consent to participate

Ethical clearance and approval were obtained from Ethical approval committee of Debre Berhan University as well as from all relevant sectors of the zonal health offices of the Amhara Regional state. Each study participant was adequately informed about the purpose, methods, and anticipated benefits of the study by the data collectors. Respondents who were available and signed the written consent form at the time of data collection were interviewed without writing their names on the questionnaire, though code was used, to ensure confidentiality. In addition, underweight mothers with low DDS were counseled and linked to the PSNP through the zonal offices. All data collection methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials: All data generated or analyzed are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors contribution: NA[1] participated in the design, reanalyzed the data and drafted the manuscript. KE[2] has participated in the design, collected the data, analyzed and wrote the thesis. JH[3] has supervised the entire work from inception and preparation of the thesis and has critically reviewed the draft for the intellect and submitted the MS. All authors had approved the final version of the MS.

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