Short Communication

Calorie- and Protein-Deficient Diets Despite Adequate Dietary Diversity among Pregnant Women in a Low-Income Urban Area in Delhi, India

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Abstract

We interviewed 221 antenatal women in the second or third trimester of pregnancy attending a primary care antenatal clinic at a low-income area in Delhi, India, during 2019–20. The Minimum Dietary Diversity-Women (MDD-W) score for 10 food groups was calculated using the open recall method during a 24-h recall period. The median MDD-W score was 6 (IQR 4–7). Low dietary diversity (MDD-W <5) was observed in 65 (29.4%) participants. Low SES and higher age (≥25 years) were statistically significant predictors of lower dietary diversity, but it was unrelated to parity. Furthermore, protein deficit was observed in 185 (83.7%) and calorie deficit in 210 (95%) participants.

Keywords: Antenatal women, dietary deficiency, dietary diversity, maternal undernutrition

Introduction

Pregnancy is a physiological state characterized by increased dietary needs to meet the nutritional requirements of both the mother and the growing fetus.[1] Nutritional inadequacy due to suboptimal dietary practices contribute to maternal undernutrition that increases the risk of adverse outcomes for the mother and baby including preterm delivery, intrauterine growth restriction, and low birthweight.[2] Enhancing the diversification of the daily maternal diet by including a variety of foods including grains, vegetables, fruits, protein-rich foods, and dairy promotes balanced nutrition.[3]

Dietary diversity represents the number of different standardized food groups consumed within a specified reference period.[4] However, dietary diversity, especially among pregnant women in low- and middle-income countries (LMICs) of Asia and Africa is often low, which is driven by a combination of biological, socioeconomic, cultural, behavioral, and environmental factors.[5,6]

Despite a large nutritionally vulnerable population wherein nearly one in three Indian women of the reproductive age group are undernourished (BMI <18.5), there is a paucity of evidence regarding measurement of dietary diversity among pregnant women in India.[7] Nevertheless, recognizing the dietary practices, patterns, and deficits among pregnant women is needed to assess the effectiveness of existing public health nutritional interventions and focus on evidence-based action to improve maternal nutritional status.

We therefore conducted this study with the objective of determining the dietary diversity of pregnant women attending an antenatal clinic in a low-income urban area in Delhi.

Materials and Methods

Study design, population, and setting

We conducted a cross-sectional study among attendees of an antenatal clinic in an urban resettlement colony and slum in the north-east district of Delhi, India, with an estimated population

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of ~29,500. The study was conducted in two waves: October to December 2019 and June to August 2020.

The study area was under coverage of the Government of India's Integrated Child Development Services Scheme (ICDS), which also provides nutritional supplementation equivalent to 600 kcal/day and protein of 18–20 g/day through either cooked meals (pre-COVID-19 pandemic) or take-home rations through a network of Anganwadi centers (post-Covid-19 pandemic.[8] The women attending the antenatal clinic were provided brief dietary advice on healthy eating during pregnancy by the team of resident doctors and interns only at the time of prescription writing.

All pregnant women with at least 12 completed weeks of gestation (second or third trimester) were included while those attending the clinic for their initial visit were excluded. Women in the first trimester likely to experience physiological factors like nausea and vomiting which contribute to reduced dietary intake were not included in the study. Women who had fasted or attended a feast or eaten dinner outside their home on the day before the interview were also excluded.

Sample size

Low birthweight (LBW) in newborns was used as a proxy for low dietary diversity in the antenatal women. At 95% confidence levels, considering 16.4% prevalence of LBW,[7] and taking 5% absolute precision, the sample size was calculated as 211.

Study instrument

The Minimum Dietary Diversity-Women score (MDD-W) questionnaire was adapted for use in this study. The original MDD-W in English was translated into the local language, Hindi, with introductory sentences explaining the purpose of the survey and this section was back-translated into English by two investigators who were proficient in both the languages. The example food items were replaced with the locally available food items and the seasonal foods that were consumed by the local communities. The MDD-W was pretested in five women to assess comprehension of the food categories in the questionnaire. The MDD-W included 10 food categories and two optional food categories. Consumption of a food item in a specific category was scored as 1, and non-consumption scored as 0. The sum of scores for all the 10 food categories was the total MDD-W score.[4]

Study procedure

The pregnant women at the clinic were enrolled consecutively with a maximum of 10 women enrolled during a single clinic session held once each week. The women were interviewed face-to-face by a trained female investigator, and the MDD-W was verbally administered. The open-recall method in the last 24 hours was used to estimate MDD-W, calorie and protein intake. Utilization of the ICDS by the participants was also investigated through an open-ended question in 15 participants selected purposively.

Operational definitions

(i) Low (inadequate) dietary diversity was defined as the Minimum Dietary Diversity-Women (MDD-W) score <5
(ii) Calorie requirement was considered as 2250 (1900 + 350) kcal/day
(iii) Protein requirement = body weight in kg *0.83 g/kg/day + (7 g/kg/day if second trimester OR 23 g/kg/day if third trimester)[9]
(iv) Socioeconomic status (SES) was ascertained by calculating the per capita income and stratifying as per the BG Prasad Scale updated for the current consumer price index[10]

Statistical analysis

Data was entered and analyzed with IBM's Statistical Package for the Social Sciences (SPSS) version 25. Results were expressed in frequency and proportion for categorical variables, and mean (standard deviation) and median (interquartile range) for continuous variables. The association between categorical variables was assessed using the Chi-squared test. The variables which showed statistically significant association with low dietary diversity were included in binomial logistic regression model. A P value < 0.05 was considered statistically significant.

Ethics

The study was approved with exemption from full review by the Institutional Ethics Committee, Maulana Azad Medical College and Associated Hospitals (F.1/IEC/MAMC/(68/03/2019/No154)). Written and informed consent was obtained from all the participants.

Results

The response rate of the survey was 100%. We enrolled 221 pregnant women in the study. The mean (SD) age of the participants was 25.7 (3.71) years. The education levels of the particiapnts consisted of 16 (7.2%) illiterate, 15 (6.7%) with primary education, 41 (18.6%) with middle school, and 149 (67.4%) with high school education or beyond. All the participants were married but only 14 (6.3%) were employed. The SES of the participants was class I 15 (6.8%), class II 59 (26.7%), class III 122 (55.2%), class IV 22 (10%), and class V 3 (1.4%).

A total of 102 (46.1), 97 (43.9), 21 (9.5), and 1 (0.5%) participant had none, one, two and three children, previously. The period of gestation was 12 to 26 weeks in 136 (61.5%) and ≥27 weeks in 85 (38.5%) participants.

The median MDD-W score was 6 (IQR 4–7). Low dietary diversity (MDD-W <5) was observed in 65 (29.4%) participants. Dietary intake was low for nuts and seeds (20.8%), eggs (23.1%), and meat, poultry or fish products (24.9%) [Table 1]. The mean (SD) number of fruit or vegetable groups out of the four that were consumed by the women was 2.5 (1.3).

Among the participants having low dietary diversity, maximum consumption categories included grain/roots/tubers (100%),

Table 1: Dietary diversity based on the open-recall method among the participants (*n*=221)

Food Group	Yes *n* (%)	95% Confidence Interval
Grains, roots, and tubers	219 (99.1)	96.8, 99.7
Pulses (bean, peas and lentils)	145 (65.6)	59.1, 71.5
Nuts and seeds	46 (20.8)	16.0, 26.6
Dairy	183 (82.8)	77.3, 87.2
Meat, poultry, and fish	55 (24.9)	19.6, 31.0
Eggs	51 (23.1)	18.0, 29.0
Dark green leafy vegetables	161 (72.9)	66.6, 78.3
Vitamin A–rich fruits	136 (61.5)	55.0, 67.7
Other vegetables	135 (61.1)	54.5, 67.3
Other fruits	127 (57.5)	50.9, 63.8

dairy (60%), pulses (58.5%), dark greens (47.7%), while consumption was lower for other fruits and vegetables (≤20%).

The mean (SD) body mass index (BMI) of the participants was 23.5 (4.3) with 19 (8.6%) participants having a low BMI (<18.5). Based on the 24-hour recall method, protein deficit was observed in 185 (83.7%) and calorie deficit in 210 (95%) participants. The median (IQR) protein deficit was 22.9 (13.4, 34.3) g/kg/day (n = 185), and the median (IQR) calorie deficit was 834 (589, 1057) kcal/day (n = 210). However, no significant correlation was observed between the MDD-W score and protein intake (r = 0.074, P = 0.276), calorie intake (r = 0.080, P = 0.236) or the BMI (r = −0.131, P = 0.052). On adjusted analysis, women of higher than median age had 1.9 times higher odds and those from lower SES households had 2.44 times higher odds of having low dietary diversity [Table 2]. It was observed that women from the poor backgrounds more frequently utilized the ICDS scheme but were also likely to share the food obtained with their family members. Most women preferred take-home rations compared to cooked meals.

Discussion

This study found that women from a low socioeconomic background had significantly lower odds of having low dietary diversity especially in their intake of fruits and vegetables. Consumption of meat, fish, and egg was low due to the prevalent vegetarian ethos in the majority of the local population. However, protein consumption—especially animal-based—is also positively correlated with the household economic status in India.[11] Compared to our study findings, a nationally representative cross-sectional survey among women of the reproductive age group (15–45 years) in India observed lower daily consumptions of pulses (45%), and dairy (45%), and once a week fruit consumption (46%) (7). A 2021 study in the Palghar district of Maharashtra reported that only 56.5% of the lactating mothers achieved adequate dietary diversity with a significantly larger proportion of higher income groups reporting the consumption of diverse foods compared to the lower income groups. Moreover, consumption of non-vegetarian food and fresh fruits and vegetables was low, a finding consistent with the present study.[12] Similarly, another 2020 study conducted amongst mothers of under-5 children in an urban slum setting in west Delhi observed that only half of the mothers were able to achieve adequate dietary diversity.[13] The higher dietary diversity observed in this study could be due to the socioeconomic and cultural differences in the study populations, as also the potential difference in dietary habits of pregnant compared to lactating women.

It is well established that dietary patterns of pregnant women in Asia and Africa are largely cereal-based with paucity of vegetables, fruits, and animal products in their diet.[6] Studies in Ethiopia[14] and Nepal[15] have reported lower mean diversity scores among pregnant and lactating women in comparison to the present study.

Our study findings signify that antenatal women in the second and third trimester of pregnancy in a low-income urban setting were likely to consume diverse diets, reasonably rich in fruits and vegetables, but grossly deficient in their required protein and calorie requirements. Consequently, inadequate food consumption despite operation of a major government program (ICDS) for nutritional supplementation including pregnant women as beneficiaries is a major public health concern that warrants further exploration. Moreover, although poor dietary practices in pregnant women can be avoided with comprehensive health education, the provision of meagre advice on food and nutrition in antenatal clinics of resource-poor settings with high client load also represents a challenge requiring effective public health interventions.[16] However, a limitation of the present study was that food insecurity in the participants was not assessed and utilization of ICDS was only evaluated in a small subset of the participants. The pre-pregnancy weight was unavailable which precluded calculation of pre-pregnancy BMI, while the mean upper arm circumference (MUAC)—a validated method for assessing maternal undernutrition—was not estimated in this study.[17] Furthermore, the cross-sectional design was unable to identify the change in dietary behavior and patterns in the women during their transition from pre-pregnancy to advancement in pregnancy and the association with birth outcomes.

In conclusion, nearly 7 in 10 pregnant women residing in an urban resettlement and slum area in Delhi reported adequate dietary diversity but accompanied with high calorie and protein deficits. Women from low SES and increasing age had lower dietary diversity but it was unrelated to parity. Food consumption deficits were the highest for poultry, eggs, and nuts and seed groups.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Table 2: Distribution of factors associated with low dietary diversity (*n*=221)

	Total (*n*=221)	Low Dietary Diversity (*n*=65)	Unadjusted Odds (95% CI)	Adjusted Odds (95% CI)
Age (in years)				
≤25	114	27 (23.7)	1 (Ref)	1 (Ref)
≥26	107	38 (35.5)	1.77 (0.98, 3.18)	1.92 (1.05, 3.50)
P			0.06	0.03
Education (in years)				
≤5	31	13 (41.9)	2.97 (1.04, 8.52)	-
<6-9	41	8 (19.5)	1 (Ref)	
≥10	149	44 (29.5)	1.72 (0.73, 4.03)	
P			0.13	
SES				
I/II	74	14 (18.9)	1 (Ref)	1 (Ref)
III/IV/V	147	51 (34.7)	2.27 (1.16, 4.46)	2.44 (1.23, 4.85)
P			0.02	0.01
Number of children				
Nil	102	26 (25.5)	1 (Ref)	-
≥1	119	39 (32.8)	1.42 (0.79, 2.56)	
P			0.24	
Male children				
Nil	166	47 (28.3)	1 (Ref)	-
≥1	55	18 (32.7)	1.23 (0.63, 2.37)	
P			0.54	

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Conflicts of interest

There are no conflicts of interest.

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