

Prevalence and Predictors of Body Mass Index-Based Nutritional Status in Early Pregnancy: A Community-Based Study

D.K.M. De Silva ^{1*}, H.M.C.M. Herath ¹

¹ Faculty of Nursing, University of Colombo, Thalapatpitiya, Nugegoda, 10250, Sri Lanka.

Corresponding author*: madushandk@nursing.cmb.ac.lk

Abstract

Nutritional status in early pregnancy plays a critical role in maternal and foetal health outcomes. The maternal suboptimal nutritional status caused gestational diabetes, hypertensive disorders, intrauterine growth restriction, and preterm birth. Therefore, the current study aimed to assess the prevalence and predictors of BMI-based nutritional status in first-trimester pregnant women attending antenatal clinics in the Colombo district, Sri Lanka. A community-based cross-sectional study was conducted among 380 first-trimester pregnant women attending antenatal clinics in four purposively selected Medical Officer of Health (MOH) areas in Colombo District. Participants were selected through simple random sampling. Data collection involved a validated, interviewer-administered questionnaire. Nutritional status was categorized using international BMI cutoffs. The data were analysed descriptively for frequencies, percentages, mean, and standard deviations. Fisher's Exact Test identified associations, and significant variables ($p < 0.05$) were further analysed using multinomial logistic regression to identify independent predictors. The mean BMI was 25.79 ± 4.57 kg/m². A substantial proportion of participants were overweight (31.3%) or obese (22.4%), while 42.9% had a normal BMI and 3.4% were underweight. Significant predictors of nutritional status included residential areas ($B=0.85$, $OR=0.42$), parity ($B=-0.81$, $OR=0.44$), planned pregnancy ($B=-3.37$, $OR=0.034$), nutritional guidance ($B=-1.22$, $OR=0.29$), and dietary diversity ($B=0.1.91$, $OR=0.14$). Overweight and obesity were prevalent among first-trimester pregnant women in the selected study setting. Improving the existing antenatal health interventions focusing on dietary diversity, pregnancy planning, and nutritional counselling is essential to improve maternal nutrition in early pregnancy.

Keywords: Body Mass Index (BMI); dietary diversity; first trimester; nutritional status; pregnancy

Introduction

Maternal nutrition in the early stages of pregnancy is fundamental to maternal and foetal health and well-being (Kent et al., 2024). Globally, the burden of suboptimal maternal nutritional status remains a pressing public health concern. According to the global estimations in the most recent decade, approximately every one in six pregnant mothers was obese (Kent et al., 2024) and the prevalence of underweight among pregnant women has been reported as 22.9%, with projections indicating a decrease to 6.6% by 2030 (Rana et al., 2022). The prevalence of overweight and obesity is on the rise, particularly in low- and middle-income countries (LMICs), due to factors including urbanization, dietary transitions, and sedentary lifestyles (Munir et al., 2024). Undernutrition and overnutrition coexist in South Asia, reflecting the effects of the region's rapid socioeconomic transition. Recent statistics reveal that the prevalence of overweight among married women now surpasses that of underweight, with overweight rates ranging from 29% to 57.8%, compared to underweight rates of 4.6% to 15.7% (Health World, 2025). Sri Lanka faces a threefold challenge of malnutrition, with undernutrition, micronutrient deficiencies, and increasing rates of overnutrition, such as overweight and obesity, among women occurring simultaneously (Agampodi et al., 2021).

Body Mass Index (BMI) is a simple index that measures the nutritional status of first-trimester pregnant women, as minimal weight gain occurs during this period (Rahman et al., 2020). Inadequate nutritional status, whether due to undernutrition or overnutrition, has been linked to various negative pregnancy outcomes, including low birth weight, preterm delivery, gestational diabetes, hypertensive complications, and a higher likelihood of caesarean section (Jamalzehi et al., 2023; Kent et al., 2024; Rana et al., 2022). Various sociodemographic, behavioural, and reproductive factors have been found to influence maternal nutritional status, including age, education, income, parity, physical activity, and dietary habits (Gómez et al., 2020). However, the specific predictors of BMI-based nutritional status in early pregnancy may vary across populations and regions, underlining the need for context-specific evidence. Notably, in the local context, this data is lacking. In light of this, the current study assesses the prevalence of BMI-based nutritional status and its predictors among first-trimester pregnant women attending antenatal clinics in the Colombo district in Sri Lanka.

Materials and Methods

A community-based cross-sectional study was conducted among first-trimester pregnant women attending antenatal clinics in four purposively selected Medical Officer of Health (MOH) areas in Colombo District, Sri Lanka. These areas were chosen based on demographic diversity, including variations in population density, income levels, and healthcare access.

The current study included all first-trimester pregnant mothers without considering their age, excluding those with chronic illnesses, serious mental health conditions, or communication impairments.

Sample

A sample of 422 participants was enrolled by using Daniel's sampling formula. $n = \frac{Z^2 P(1-P)}{d^2}$ (Daniel, 1999). Participants were chosen using simple random sampling and were proportionally distributed across MOH areas according to clinic records.

Data were collected through a validated, interviewer-administered questionnaire comprising socio-demographic details, anthropometric measurements (height and weight), dietary practices using a Food Frequency Questionnaire (FFQ) developed in the Sri Lankan context, and pregnancy and health-related data. The questionnaire's internal consistency was evaluated through Cronbach's alpha, which produced a score of 0.78, demonstrating acceptable reliability. The data were collected at the respective antenatal clinics without interfering with participants' medical care. An information sheet was provided to eligible participants, and all relevant details were explained by the researchers. Informed consent forms were then distributed, and those who agreed to participate were given a questionnaire to complete. Participants' height was measured using a calibrated stadiometer. Height was recorded in centimetres (cm). Participants' weight was measured using a digital weighing scale. They were instructed to stand still on the scale without shoes and wearing minimal clothing. Weight was recorded in kilograms (kg).

Ethical Considerations

Ethical approval for the study was granted by the Ethics Review Committee of the Faculty of Medicine, University of Colombo.

Data analysis

Data analysis was conducted using SPSS version 26. Descriptive statistics, such as frequencies, means, and standard deviations, were employed to summarize the characteristics of the participants. Maternal nutritional status was categorized based on international BMI cutoffs (Table 2). Dietary data collected through FFQ were classified into eight food groups: cereals, vegetables, pulses, meat, seafood, eggs, fruits and dairy products. The dietary diversity score (DDS) was calculated by summing the number of food

groups consumed over one week. The DDS were categorized into tertiles, with the highest tertile classified as "high" dietary diversity and the two lower tertiles combined as "low" dietary diversity. Associations between BMI-based nutritional status and potential predictor variables were examined using Fisher's Exact Test. Variables with significant associations ($p < 0.05$) were further examined using multinomial logistic regression to determine independent predictors.

Results

Socio-demographic characteristics of the participants

Table 1. Presents the socio-demographic data of the participants. Most of the participants (63.9%) were aged between 30–39 years, while the majority had attained a higher level of education (86.8%). More than half were employed (56.1%), and a significant proportion (73.7%) resided in urban areas. Almost all participants were married (98.2%). Regarding household income, 43.2% reported a high-income level. In terms of religious affiliation, the majority were Buddhist (95.5%).

Table 1: *Socio-demographic characteristics of the participants*

Characteristic	Frequency (%)	Characteristic	Frequency (%)
Age (Years)		Marital status	
21 – 29	137 (36.1)	Married	373 (98.2)
30 – 39	243 (63.9)	Unmarried	07 (1.8)
Highest education level		Family income (LKR)	
Up to Secondary level (Advanced level)	367 (96.6)	<45,000	135 (35.5)
Higher education level (Degree/diploma)	13 (3.4)	45,000 – 60,000	81 (21.3)
Employment status		>60,000	164 (43.2)
Employed	213 (56.1)	Religion	
Unemployed	167 (43.9)	Buddhist	363 (95.5)
Residential area		Christian	15 (3.9)
Urban	280 (73.7)	Tamil	02 (0.5)
Rural	100 (26.3)		

Prevalence of nutritional status of the participants

The mean BMI of the participants was 25.79 ± 4.57 kg/m². Based on international BMI classifications, 42.9% of participants had a normal weight, while a substantial proportion were either overweight (31.3%) or obese (22.4%). Only 3.4% of the women were classified as underweight (Table 2).

Table 2: *Prevalence of BMI-based nutritional status of the participants*

BMI category	Frequency (n)	Percentage (%)
Mean (\pm SD) BMI	25.79 \pm 4.57	
Underweight (<18.5 kg/m ²)	13	3.4
Normal weight (18.5 – 24.9 kg/m ²)	163	42.9
Overweight (25.0 – 29.9 kg/m ²)	119	31.3
Obese (>30 kg/m ²)	85	22.4

Associated factors for nutritional status among participants

Several socio-demographic and health and pregnancy-related factors were found to be significantly associated with nutritional status among the participants (Table 3). Education level ($p = 0.032$), residential area ($p = 0.047$), Marital status ($p = 0.012$), family income ($p < 0.001$), Parity ($p = 0.002$), Unplanned pregnancies ($p < 0.001$), receiving nutritional advice ($p = 0.017$), dietary diversity ($p < 0.001$) and adequate sleep and rest ($p < 0.001$) showed a significant association with participants BMI-based nutritional status.

No significant associations were found between BMI-based nutritional status and age, religion, occupation, regular clinic follow-ups, recent illness, or receiving worm treatment.

Table 3: *Associated factors for BMI-based nutritional status of the participants*

Variable	Underweight	Normal weight	Overweight/obese	P
Highest education level				
Up to Secondary level (Advanced level)	11 (100)	137 (93.2)	219(98.6)	0.015*
Higher education level (Degree/diploma)	0(0)	10(6.8)	3(1.4)	
Residential area				
Urban	11(84.6)	129(79.1)	140(68.6)	0.047*
Rural	02(15.4)	34(20.9)	64(31.4)	
Marital status				
Married	13(100)	163(100)	197(96.6)	0.012*
Unmarried	0(0)	0(0)	7(3.4)	
Family income				
Low	2(15.4)	65(39.9)	68(33.3)	<0.001*
Middle	11(84.6)	26(16)	44(21.6)	
High	0(0)	72(44.2)	92(45.1)	
Parity				
Nulliparous	4(30.8)	101(62)	92(45.1)	0.002*
Multiparous	9(69.2)	62(38)	112(54.9)	
Planned pregnancy				
Yes	2(15.4)	129(79.1)	148(72.5)	<0.001*
No	11(84.6)	34(20.9)	56(27.5)	
Had nutritional guidance				
Yes	13(100)	151(92.6)	174(85.3)	0.017*
No	0(0)	12(7.4)	30(14.7)	
Adequate sleep and rest				
Yes	4(30.8)	137(84)	183(89.7)	<0.001*
No	9(69.2)	26(16)	21(10.3)	
Dietary Diversity				
Low	2(15.4)	95(58.3)	37(18.1)	<0.001*
High	11(84.6)	68(41.7)	167(81.9)	

Note. *Fisher's Exact Test

Predictors of the nutritional status of the participants

Multinomial logistic regression analysis identified several significant predictors of BMI-based nutritional status (Table 4). The likelihood ratio tests revealed that residential area ($p = .016$), nulliparous status ($p = .004$), planned pregnancy ($p < .001$), receiving nutritional advice ($p = .002$), and dietary diversity ($p < .001$) were significant predictors of nutritional status.

Table 4: *Predictors of the BMI-based nutritional status of the participants*

Variable	B	R	OR	P
Residential area	0.85	8.297	0.42	0.016
Parity	-0.81	10.939	0.44	0.004
Planned pregnancy	-3.37	18.803	0.03	<0.001
Nutritional guidance	-1.22	12.845	0.29	0.002
Dietary Diversity	-1.91	51.965	0.14	<0.001

Note. Reference category for outcome: Underweight.

Reference groups for predictors: Urban (residential area), Multiparous (parity), Unplanned (pregnancy), Not received (nutritional guidance), and high (dietary diversity).

Discussion and Conclusion

According to the findings of this study, the mean BMI range of the participants fell within the Overweight category, while more than half of the participants belonged to suboptimal nutritional groups. In line with the current findings, the global data also revealed, 39% of women of reproductive age were overweight and 15% were obese (WHO, 2025). Considering the local context Adikari et al. (2016), reported that 24.6% of pregnant women in Sri Lanka were classified as overweight or obese. In comparison, the current study found a higher prevalence of 53.7%, indicating a rising trend over time. Concerning underweight, only a minimal proportion of pregnant women fell into this category, which is lower than other South Asian countries, including India and Bangladesh, with underweight rates often exceeding 15% (National Family Health Survey, 2021). These results highlight the pressing need for public health interventions that tackle the increasing risk of obesity-related pregnancy complications, while continuing to prevent undernutrition.

The current finding revealed several predictors of the BMI-based nutritional status of first-trimester pregnant women. Residential area is a key predictor in determining nutritional status. In urban settings, pregnant women exhibited a lower risk of being overweight/obese compared to those in rural areas. This finding contrasts with global trends, where urbanization is often associated with increased prevalence of overweight and obesity due to sedentary lifestyles and higher availability of energy-dense foods (Ghosh et al., 2023). However, in this population, it is possible that urban residents had better access to health information, more opportunities for physical activity, or greater health consciousness compared to rural counterparts, who may face limited healthcare access and nutritional education.

According to the current findings that nulliparous women were less likely to be overweight/obese, which aligns with the hypothesis that first-time pregnancies may not be associated with the same cumulative weight gain observed in multiparous women. Further, women with prior pregnancies might possess different health behaviours or experiences affecting their nutritional status (Vineetha et al., 2025). The relationship between pregnancy planning and nutritional status is underscored by findings that unplanned pregnancies significantly raise the odds of being underweight. Planned pregnancies may afford women the opportunity to prepare adequately for their nutritional needs, thereby enhancing their health status during pregnancy (Ambreen et al., 2024) justify the current findings.

Dietary behaviours, specifically in the context of receiving advice on dietary management during early pregnancy, also appear to be a significant predictor. Women who reported receiving nutritional guidance were less likely to be overweight/obese. This underscores the critical role of nutrition counselling during pregnancy in promoting healthier dietary behaviours. Targeted dietary interventions improve women's overall diet quality, leading to healthier pregnancy outcomes (Surbakti et al., 2021). Additionally, a lower Dietary Diversity has been strongly associated with reduced odds of being overweight/obese. While low dietary diversity typically correlates with undernutrition, in this context, it may reflect simpler, lower-calorie diets with fewer processed foods, which might reduce obesity risk. Alternatively, it may suggest that overweight and obesity in this population are linked to more varied but calorie-dense diets. Further, results shed a light in other confounding factors related to diet that may affect the BMI-based nutrition level.

The current study highlights a notable prevalence of overweight and obesity among first-trimester pregnant women, with only a small proportion being underweight. Nutritional status was significantly associated with several socio-demographic and pregnancy-related factors. Multinomial logistic regression analysis identified key predictors of BMI-based nutritional status, including residential area, parity, pregnancy planning, receipt of nutritional guidance, and dietary diversity. These findings emphasize the importance of integrating targeted nutritional interventions and counselling, especially for women with unplanned pregnancies, lower dietary diversity, or residing in rural areas, into the existing antenatal care models. Strengthening antenatal nutritional support could play a critical role in improving maternal health outcomes.

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