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Food Insecurity and Nutritional Status among Pregnant Women

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ABSTRACT

Background: Adequate nutrition during pregnancy is crucial for maternal and fetal health. This study aims to assess the nutritional status, food insecurity, and socio-demographic factors affecting the nutritional status of pregnant women in this region.

Methods: A cross-sectional study was conducted among 903 pregnant women in Kailali district. Data were collected using structured questionnaires covering socio-demographic characteristics, food insecurity and knowledge of nutrition. Nutritional status was assessed using Mid-Upper Arm Circumference (MUAC). Statistical analysis was performed to identify associations between nutritional status and various factors.

Results: The majority of women (68.6%) had normal nutritional status (MUAC >23 cm), while 31.4% were either had severe or moderate malnutrition. Approximately 10% to 12% of participants reported food insecurity. A significant association was found between higher MUAC and factors such as sufficient nutrition knowledge, regular antenatal care visits, increased dietary intake, and a higher pre-pregnancy BMI. Ethnic disparities were also noted, with Dalit, Janjati, and Brahmin women having higher MUAC compared to Madeshi and Muslim women.

Conclusions: Nutritional deficiencies and food insecurity remain significant challenges for pregnant women in Kailali district. Strengthening nutrition education, improving food security, and promoting antenatal care can improve maternal nutrition and health outcomes.

Keywords: Acute malnutrition; antenatal care; dietary Intake; early marriage; food insecurity.

INTRODUCTION

Nutrition is fundamental to health and development across all life stages. During pregnancy, adequate nutrition is essential to support fetal growth and maternal health, as nutrient demands increases significantly.[1, 2] Malnutrition, including protein-energy and micronutrient deficiencies, poses serious risks such as intrauterine growth retardation, low birth weight, stillbirth, and maternal mortality.[3, 4] Chronic undernutrition perpetuates an intergenerational cycle, as undernourished mothers are more likely to give birth to low-birth-weight infants.[5]

Food insecurity, defined as a lack of consistent access to sufficient, safe and nutritious food, is a key contributor to maternal malnutrition. Pregnant women in food-insecure households face higher risks of anxiety, depression, poor weight gain, and adverse birth outcomes.[5, 6] Many women in developing countries maintain pregnancies on nutrient intakes below recommended levels. [7]

In Kailali district, little is known about their food insecurity and nutritional status. This study aimed to determine the status of food insecurity and undernutrition among pregnant women in Kailali district of Nepal.

METHODS

A cross-sectional study was conducted to assess food insecurity and nutritional status among pregnant women

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in Kailali district, Nepal.

The study was conducted in Kailali district, which is administratively divided into 6 rural municipalities, 6 urban municipalities, and 1 sub-metropolitan city.

Ethical approval for this study was obtained from the Nepal Health Research Council. Written informed consent was obtained from all participants prior to data collection. For illiterate participants, verbal consent and fingerprint confirmation were obtained after explaining the purpose and importance of the study. Confidentiality and privacy of the respondents were maintained throughout the study.

Pregnant women residing in the Kailali district for at least six months and willing to participate were included in the study. Exclusion criteria included severely ill pregnant women, and those who refused to participate.

The required sample size was calculated to be 1,000 pregnant women, based on an assumed prevalence of undernutrition of 50% (P=0.5), a 5% margin of error (d=0.05), a design effect of 1.58, and an additional 5% to account for non-responses. [8]However, due to logistical constraints, 903 participants were included in the final analysis.

A cluster sampling technique was used, with 30 wards selected proportionately from the rural municipalities, urban municipalities and sub-metropolitan area. Systematic sampling was applied to select households within the wards.

The district comprises 6 rural municipalities, 6 urban municipalities, and 1 sub-metropolitan city, with a total of 131 wards. A sample of 903 (non-response rate 9.7%) pregnant women was collected using cluster sampling, with 30 wards chosen proportionately: 11 from rural municipalities, 14 from municipalities and 5 from the sub-metropolitan area. Systematic sampling was done to select households.

The study included pregnant women residing in Kailali for at least six months and willing to participate, while those severely ill, refusing participation. Data were collected using a semi-structured, pretested, interviewer-administered questionnaire in Nepali. The questionnaire included sociodemographic variables (age, marital status, education status, husband's educational status, occupation, husband's occupation and family size), socioeconomic variables (household income and food insecurity), sociocultural factors: early marriage: (marriage done before 18 years), history of teenage pregnancy(pregnancy at the age of 13-19 years) , polygamy, and intra-household food distribution, and individual and behavioural variables(nutrition knowledge, health service contact, dietary practices, alcohol and tobacco consumption, birth interval, number of children, and latrine possession). Food insecurity questionnaire was adopted from the Nepal Demographic and Health Survey 2016 (NDHS).[9]

Pretesting of the questionnaire was conducted in wards outside the study area to assess understand ability, time requirements, consistency among variables, and acceptability. Necessary revisions were made with input from experts.

Data were entered and analysed using IBM statistics SPSS version 25. Descriptive statistics, including frequency distribution, mean and percentages were computed to summarize socio-demographic and other relevant variables. Independent sample t-test and One-Way ANOVA were used for computing relationship between dependent and independent variables.

RESULTS

The table shows demographic characteristics of 903 pregnant women from Kailali district, with a mean age of 24±4.5 years. The majority were aged 20-24 years (44.3%), with the largest ethnic group being Janjati (44.7%), followed by Brahmin/Chhetri (35.3%). Hinduism was the dominant religion (97.3%). Regarding education, 37.5% had completed secondary education or higher, and 8.5% had no formal education. Most respondents were housewives (64.7%), and their husbands (40.1%) primarily worked in agriculture. Early marriage (43.9%) and teenage pregnancy (30.4%) were common among the participants. Despite 90.8% reporting equal food sharing during scarcity, 16.7% of mothers served food after both their husbands and children, highlighting gender disparities in meal allocation (Table 1).

The study results showed that 68.6% of the women had a normal nutritional status (MUAC >23 cm), while 17.3% had moderate malnutrition (MUAC 21–23 cm), and 14.1% had severe malnutrition (MUAC <21 cm) (Table 2). Approximately 10-12% of women reported food insecurity indicators such as worrying about food or being unable to eat preferred foods. Knowledge about nutrition was sufficient in 63% of women (Table 3). Table 5 reveals that 30.2% of respondents were underweight before pregnancy, which could impact maternal and fetal health (Table 4). The study results highlight

significant associations between MUAC and factors like early marriage, teenage pregnancy, and knowledge of nutrition, antenatal care visits, ethnicity, and dietary intake (Table 5).

Table 1. Socio demographic characteristics of the respondents. (n=903)

Variables	Number (N)	Percentage(%)
Age (Years)		
<20	103	11.4
20-24	400	44.3
25-29	265	29.4
30-34	111	12.3
>=34	23	2.5
Mean Age(M±SD) = 24 ±4.5		
Ethinicity		
Dalit	137	15.2
Janjati	403	44.7
Madhesi	10	1.1
Muslim	4	0.4
Bhramin/Chettri	318	35.3
Thakuri	30	3.3
Religion		
Hindu	878	97.3
Buddhist	7	0.8
Muslim	3	0.3
Christian	14	1.6
Educational Status		
No education	77	8.5
Primary	238	26.4
Some secondary	249	27.6
SLC or above	338	37.5
Husband's education		
No education	40	4.4
Primary	223	24.7
Some secondary	247	27.4
SLC or above	392	43.5
Occupation		
Professional/ Managerial	10	1.1
Clerical	52	5.8
Sales and services	40	4.4
Skilled manual	60	6.7
Unskilled manual	17	1.9
Housewife	584	64.7
Agriculture	139	15.4
Husband's occupation		
Professional/ Managerial	32	3.5
Clerical	78	8.6
Sales and services	63	7.0
Skilled manual	208	23.1
Unskilled manual	23	2.5
Agriculture	362	40.1
Work in foreign land	136	15.1
Early marriage		
Yes	396	43.9%
No	506	56.1%
History of teenage pregnancy		
Yes	270	30.4%
No	628	69.6%
Measures taken when the food to be eaten was small		
Shared equally	819	90.8%
Given to children only	53	5.9%
First given to husband and shared	26	3.3%
Allocation of the best portion of the food during meal		
Shared equally	851	94.3
Given to husband	13	1.8
Given to children	34	3.9
Time of dishing of mother portion during meal		
Along with husband	684	75.8
After husband	63	7.0
After husband and children	151	16.7

Table 2. Nutritional status of the pregnant women. (n=903)

Nutrition status	Number (N)	Percentage (%)
Normal (MUAC >23cm)	619	68.6
Moderate acute malnutrition (MUAC 21-23 cm)	156	17.3
Severe acute malnutrition (MUAC <21 cm)	127	14.1

Table 3. Household food insecurity access scale (HFIAS) of pregnant women in Kailali district of Nepal. (n=903)

HFIAS	Frequency(N)	Percentage (%)
Worry about food		
Rarely	79	8.8
Sometimes	10	1.1
Often	9	0.9
No	804	89.1
Unable to eat preferred food		
Rarely	82	9.1
Sometimes	6	0.7
Often	10	1.1
No	804	89.1
Eat just a few kind of food		
Rarely	81	9
Sometimes	7	0.8
Often	9	1
No	805	89.2
Eat food they really do not want to eat		
Rarely	86	9.5
Sometimes	10	1.1
Often	8	0.9
No	798	88.5
Eat a smaller meal		
Rarely	74	8.2
Sometimes	5	0.6
Often	6	0.7
No	817	91.1
Eat fewer meal in a day		
Rarely	70	7.8
Sometimes	4	0.4
Often	6	0.7
No	822	91.1
No food of any kind in household		
Rarely	25	2.8
Sometimes	5	0.6
Often	0	0
No	872	96.6
Go to sleep hungry		
Rarely	56	6.2
Sometimes	3	0.3
Often	0	0
No	838	92.9
Go a whole day and night without eating		
Rarely	61	6.8
Sometimes	0	0
Often	0	0
No	841	93.2

Table 4. Pre-pregnancy BMI of respondents. (n=903)

Nutritional Status	Frequency (n)	Percentage (%)
Underweight (<18.5 kg/m2)	272	30.2
Normal (18.5-24.99 kg/m2)	500	55.4
Overweight (25-29.9 kg/m2)	107	11.9
Obese (>30 kg/m2)	23	2.5

Table 5. Association between nutritional status (MUAC) and different variables. (n=903)

Variables	MUAC measurements
Early marriage	
Yes	23.93 ±2.43
No	24.21 ±2.17
t/p	**2.1/0.05**
Teenage pregnancy	
Yes	23.76 ± 2.32
No	23.43 ± 2.24
t/p	**0.35/0.005**
Knowledge about nutrition	
Sufficient knowledge	24.01 ± 2.15
Insufficient knowledge	24.32 ± 2.51
t/p	**6.3/0.012**
Regular ANC visit	
Yes	24.11 ± 2.26
No	23.53 ± 2.88
t/p	**NA**
Ethnicity	
Dalit	24.26 ± 2.50
Janjati	24.21 ± 2.24
Madeshi	21.85 ± 1.05
Muslim	22.00 ± 0.00
Brahmin	23.9 ± 2.25
F/p	**2.49/0.021**
Diet intake	
Increased during pregnancy	24.24 ± 2.33
Decreased during pregnancy	24.21 ± 1.95
No change during pregnancy	24.08 ± 2.29
F/p	**0.95/0.012**
Pre-pregnancy BMI	
Underweight	23.79 ± 2.08
Normal	24.1 ± 2.38
Overweight	24.51± 2.37
Obese	24.53 ± 1.58
F/p	**2.97/0.031**

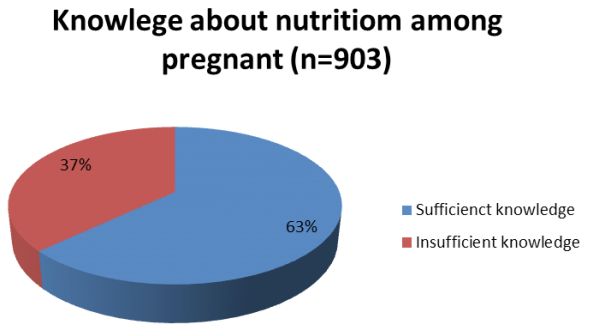

Figure 1. Knowledge about nutrition.

DISCUSSION

The current study tried to reveal the magnitude of food insecurity and undernutrition and the factors affecting undernutrition among pregnant women in Kailali district of Nepal.

The magnitude of undernutrition among pregnant women in Kailali district of Nepal is 31.4 %. The result was almost similar to the result reported from Kenya which was 31.7%. [10] and Ethopia which is near 28%[2]. A similar study in rural Ethiopia reported a 21.4% prevalence of malnutrition among pregnant women using MUAC <23 cm as the cutoff. [11] In Bangladesh, a study found that 25% of pregnant women were malnourished based on MUAC measurements.[12] These rates align closely with the findings of this study, suggesting that malnutrition is a common issue in low-resource settings, particularly in South Asia and sub-Saharan Africa.

Approximately 10%-12% of pregnant women in Kailali reported worrying about food availability, consuming a limited variety of food, or eating undesirable foods. These findings are consistent with a systematic review done in middle income and low income countries, which highlighted that 10%-15% of pregnant women in low-income countries experience moderate food insecurity, adversely impacting nutritional outcomes[13]. Similarly, a study in Kenya found that food insecurity was significantly associated with maternal malnutrition, anxiety, and adverse birth outcomes.[14]

The prevalence of early marriage (43.9%) and teenage pregnancy (30.4%) in Kailali district is consistent with findings from South Asia, where early marriage rates remain high due to cultural norms. According to UNICEF (2020), 40% of women in South Asia are married before the age of 18, contributing to teenage pregnancies and

poorer maternal health outcomes.[15] This reinforces the need for community-based interventions to delay marriage and first pregnancies.

In our study, women who experienced early marriage and teenage pregnancy had significantly lower MUAC compared to those who did not (p=0.05 and p=0.005, respectively). Early marriage and teenage pregnancy are widely recognized as contributors to maternal malnutrition due to incomplete physical development and inadequate nutritional reserves. [16]A study in Ethiopia also found that early marriage was associated with a 1.8-fold increased risk of maternal undernutrition.[17] Similarly, a study in Bangladesh highlighted that teenage mothers had a 2.3 times higher likelihood of malnutrition compared to adult mothers.[18] These findings confirm that delaying marriage and pregnancy can significantly improve maternal nutritional outcomes.

Our study found that women with sufficient knowledge about nutrition during pregnancy had significantly higher MUAC compared to those with insufficient knowledge (p=0.012). This emphasizes the role of education in empowering women to make informed dietary choices during pregnancy. A study in Nigeria reported that women with good nutritional knowledge were 25% less likely to suffer from malnutrition.[19] Similarly, a study done in India found that awareness programs targeting maternal nutrition improved dietary diversity and nutritional status among pregnant women.[20] These studies underscore the need for nutrition education programs in maternal health strategies.

Regular ANC visits were associated with higher mean MUAC in our study (24.11 ± 2.26 vs. 23.53 ± 2.88). ANC visits provide an opportunity for nutrition counselling and supplementation, which are critical for improving maternal nutritional status. A study in Kenya found that women who attended at least four ANC visits had a 30% lower risk of malnutrition compared to those with fewer visits.[14] Similarly, a study in Ethiopia reported that ANC attendance was positively associated with dietary diversity and maternal BMI. [11]

Significant differences in nutritional status were observed among ethnic groups in Kailali. Madeshi and Muslim women had the lowest mean MUAC compared to Dalit, Janjati, and Brahmin women (p=0.021). These disparities may stem from systemic inequities, cultural food practices, and access to healthcare. Ethnic disparities in maternal nutrition have been reported in other regions as well. In one study done in Nepal, found that women from marginalized communities, such as Dalits and Madeshi, were more likely to experience food insecurity and malnutrition compared to Brahmin and Chhetri women.[21] Similarly, a study in India highlighted that women from Scheduled Castes had lower dietary diversity and higher rates of malnutrition.[22]

Women who increased their dietary intake during pregnancy had higher MUAC compared to those with no change or decreased intake (p=0.012). Increased food intake during pregnancy is critical to meet the heightened nutritional demands of fetal growth and maternal health. A study in Ethiopia found that pregnant women who reported increased dietary intake had significantly better nutritional outcomes, including higher MUAC and BMI.[23] Similar findings were reported in India, where dietary improvements during pregnancy were associated with better birth outcomes.[24]

Pre-pregnancy BMI was significantly associated with nutritional status (p=0.031). Women with higher pre-pregnancy BMI (overweight and obese) had higher MUAC compared to those with underweight or normal BMI. Studies have consistently shown that pre-pregnancy BMI is a strong predictor of maternal nutritional status during pregnancy. For example, Rahman study done in Bangladesh reported that underweight women had a higher risk of micronutrient deficiencies and adverse birth outcomes.[12] Conversely, the rising prevalence of overweight and obesity among pregnant women in urban Nepal has been linked to gestational diabetes and hypertension, highlighting the double burden of malnutrition.[25]

This study has certain limitations that should be acknowledged. First, its cross-sectional design restricts the ability to establish causal relationship between variables, such as food insecurity and nutritional status. Longitudinal studies are needed to provide stronger evidence of these associations. Second, many variables, including dietary intake, food security and knowledge about nutrition were self-reported, which might have introduced recall bias potentially affecting the accuracy of the findings.

CONCLUSIONS

This study underscores the significant nutritional challenges faced by pregnant women in Kailali district, Nepal. While 68.6% of women had normal nutritional status (MUAC >23 cm), 31.4 % were malnourished. Food insecurity emerged as a critical issue, with approximately 10-12 % of women reporting difficulties such as worrying about food and consuming limited or

undesirable food. Key factors influencing malnutrition included early marriage, teenage pregnancy, inadequate nutritional knowledge, irregular antenatal care visits, and ethnic disparities, with Madeshi and Muslim women at higher risk.

Addressing these issues requires targeted interventions, such as nutrition education, promoting delayed marriage, and reducing teenage pregnancies. Strengthening food security programs, particularly for marginalized groups, and integrating dietary assessments into mental health programs are essential. A multisectoral approach involving health, education, and community support is vital to improve maternal nutrition and pregnancy outcomes in this region.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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