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**Original Research Article**

# Determinants of nutritional status of pregnant women attending antenatal care in Western Regional Hospital, Nepal

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## ABSTRACT

**Background:** Good nutritional status during pregnancy is the precondition for healthy pregnancy outcome. Maternal undernutrition leads to life threatening health consequences to expectant mother and her child. Nepal has considered nutrition as right but still there is discrepancy in nutritional status of pregnant women. Reasons for this are little explored. Thus, the study was carried out to generate evidence on nutritional status of pregnant women and factors influencing it.
**Methods:** A cross sectional descriptive study was carried out using systematic random sampling technique with 282 pregnant women of ≥3rd trimester attending antenatal care in Western Regional Hospital, Pokhara, Kaski, Nepal. Semi-structured questionnaire, 24 hour recall tool, HFIAS measurement tool, MUAC tape and ANC card were used to collect information from participants. Descriptive and statistical analyses were done to summarize the result. Research was adhered to principles of research ethics.
**Results:** Pregnant women having acute malnutrition (MUAC <23 cm) were 24%, low gestational weight gain were 67% and anemic were 12%. Food security, ethnicity and dietary diversity were found to have significant association with the nutritional status of pregnant women.
**Conclusions:** The study generated the evidence on determinants of nutritional status of pregnant women. It has recommended that ensuring household food security, increasing dietary diversity and focusing ethnicity can promote nutritional status of pregnant women.

**Keywords:** Dietary diversity, Food security, Nutritional status, Pregnant women, Nepal

## INTRODUCTION

Nutritional status is the result of the biological phenomenon of food utilization.[1] Good nutritional status before and during pregnancy is prerequisite for healthy pregnancy outcome.[2] Maternal undernutrition leads to life threatening health consequences to an expectant mother and to her child.[3] Studies have suggested that there is strong association between maternal nutrition and birth outcomes i.e. poor maternal nutrition leads to low birth weight babies, preterm delivery and intrauterine growth retardation and as well as complication on maternal health.[4,5]

Globally, about 3.5 million mothers and under five children dies due to underlying causes of undernutrition.[3]

In Nepal, pregnant women are more prone to be anemic (48%) than lactating (39%), non-pregnant and non-lactating women (33%).[6] According to PoSHAN study, the prevalence of low MUAC (<22.5) between pregnant women and non-pregnant women is 35% and 25% respectively.[7]

Previously, Millennium Development goal and now Sustainable Development Goal no. 2 have focused on improving maternal nutrition status.[8] The MSNP, National health policy 2014, National Nutrition Policy 2004 and National Nutrition Program have nutrition direction to combat malnutrition.[3,9] There is discrepancy in nutritional status of pregnant women in Nepal but reasons for this are little explored. Thus, this study was conducted to generate the evidence on nutritional status of pregnant women and factors influencing it.

## METHODS

A cross sectional study was done from January to February 2016. Pregnant women in or above third trimester attending ANC in Western Regional Hospital, Pokhara, Kaski, Nepal, who were willing to participate in the study and had ANC card since first visit were included as the study participants. Pregnant women with chronic diseases such as hypertension, diabetes, Tuberculosis and HIV/AIDS were excluded by study. Sample size was calculated using the formula, $n=z^2pq/e^2$.[10] and putting the prevalence of low MUAC (21.2%) among pregnant women of hill zone of Nepal in formula,[7] and adjusting 10% of nonresponse, the required sample size was 282. Systematic random sampling was carried to select participants. Ethical principle of respecting the human participant was maintained throughout the study and in report. Semi-structured questionnaire was used for obtaining demographic, socio-economic and cultural taboos related information; Household Food Insecurity Access Scale measurement tool for measuring household food security status; 24 hour recall tool for getting dietary information; adult MUAC tape for measuring muscle mass status of mid upper arm; and ANC card for observing record of gestational weight gain and anemia status (haemoglobin level) were used.[11,12] Data entry were done in EpiData version 3.1 and analyzed in SPSS version 20. Data were summarized using descriptive statistics; further chi square test and logistic regression were used to check associations among variables. Collinearity diagnostic test of variables associated in bivariate analysis at $p \leq 0.20$, were considered for multivariate analysis.

## RESULTS

This study revealed, 23.8% of the pregnant women were acutely malnourished (MUAC less than 23 cm), 67% were having low gestational weight gain (less than 10 kg) and 12.1% were anaemic (hemoglobin level less than 11 gm/dl) (Table 1).

**Table 1: Nutritional status of participants (n=282).**

| Characteristics | Category | Number | Percentage (%) |
|---|---|---|---|
| **MUAC of the participants** | ≥23 cm (Normal) | 215 | 76.2 |
| | <23 cm (acute malnutrition) | 67 | 23.8 |
| **Gestational weight gain** | ≥10 kg (normal) | 93 | 33 |
| | <10 kg (below normal) | 189 | 67 |
| **Hemoglobin level** | ≥11 gm/dl (non anaemic) | 248 | 87.9 |
| | <11 gm/dl (anaemic) | 34 | 12.1 |

*Statistically significant association (p<0.05).

**Table 2a: Association with mid upper arm circumference of pregnant women.**

| Characteristics | MUAC of the participant N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥23 cm | <23 cm | | |
| **Age (in years)** | | | | |
| ≥20 | 191 (78.9) | 51 (21.1) | 242 | 0.009* |
| <20 | 24 (60.0) | 16 (40.0) | 40 | |
| **Ethnicity** | | | | |
| Dalit/Madhesi/Muslim | 48 (66.7) | 24 (33.3) | 72 | |
| Janjati | 61 (84.7) | 11 (15.3) | 72 | 0.038* |
| Brahmin/Chhetri/Others | 106 (76.8) | 32 (23.2) | 138 | |
| **Education level** | | | | |
| No formal education | 12 (66.7) | 6 (33.3) | 18 | 0. 047* |
| Below SLC | 86 (70.5) | 36 (29.5) | 122 | |
| Above SLC | 117 (82.4) | 25 (17.6) | 142 | |

Continued.

| Characteristics | MUAC of the participant N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥23 cm | <23 cm | | |
| **Occupation of the participant** | | | | |
| Unpaid*[1] | 183 (75.3) | 60 (24.7) | 243 | 0.358 |
| Paid*[2] | 32 (82.1) | 7 (17.9) | 39 | |
| **Husband's occupation** | | | | |
| Unpaid*[3] | 22 (78.6) | 6 (21.4) | 28 | 0.760 |
| Paid*[4] | 193 (76.0) | 61 (24.0) | 254 | |

*Statistically significant association (p<0.05) *[1]house wife/student/agriculture *[2]wage/ salary/ business *[3]unemployed/student/ agriculture *[4]wage/salary/business/labour migrant.

**Table 2b: Association with mid upper arm circumference of pregnant women.**

| Characteristics | MUAC of the participant N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥23 cm | <23 cm | | |
| **Household income** | | | | |
| ≥Average (Rs 30,121) | 89 (84.8) | 16 (15.2) | 105 | 0.010* |
| <Average | 126 (71.2) | 51 (28.8) | 177 | |
| **Food taboos** | | | | |
| Yes | 79 (81.4) | 18 (18.6) | 97 | 0.137 |
| No | 136 (73.5) | 49 (26.5) | 185 | |
| **Household food security** | | | | |
| Food secure | 185 (77.7) | 53 (22.3) | 238 | 0.172 |
| Food insecure | 30 (68.2) | 14 (31.8) | 44 | |
| **Dietary diversity** | | | | |
| High | 85 (84.2) | 16 (15.8) | 101 | |
| Medium | 103 (74.6) | 35 (25.4) | 138 | 0.019* |
| Lowest | 27 (62.8) | 16 (37.2) | 43 | |

*Statistically significant association (p<0.05).

**Table 3a: Association with gestational weight gain.**

| Characteristics | Gestational weight gain, N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥10 kg | <10 kg | | |
| **Age (in years)** | | | | |
| ≥20 | 82(33.9) | 160 (66.1) | 242 | 0.426 |
| <20 | 11 (27.5) | 29 (72.5) | 40 | |
| **Ethnicity** | | | | |
| Dalit/Madhesi/Muslim | 20 (27.8) | 52 (72.2) | 72 | |
| Janjati | 25 (34.7) | 47 (65.3) | 72 | 0.547 |
| Brahmin/Chhetri/Others | 48 (34.8) | 90 (65.2) | 138 | |
| **Education level** | | | | |
| No formal education | 6 (33.3) | 12 (66.7) | 18 | |
| Below SLC | 35 (28.7) | 87 (71.3) | 122 | 0.393 |
| Above SLC | 52 (36.6) | 90 (63.4) | 142 | |
| **Occupation of the participant** | | | | |
| Unpaid*[1] | 75 (30.9) | 168 (69.1) | 243 | 0.059 |
| Paid*[2] | 18 (46.2) | 21 (53.8) | 39 | |
| **Husband's occupation** | | | | |
| Unpaid*[3] | 9 (32.1) | 19 (67.9) | 28 | 0.921 |
| Paid*[4] | 84 (33.1) | 170 (66.9) | 254 | |

*Statistically significant association (p<0.05) *[1]house wife/student/agriculture *[2]wage/ salary/ business *[3]unemployed/student/ agriculture *[4]wage/salary/business/labour migrant.

**Table 3b: Association with gestational weight gain.**

| Characteristics | Gestational weight gain, N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥10 kg | <10 kg | | |
| **Household income** | | | | |
| ≥Average (Rs 30,121) | 44 (41.9) | 61 (58.1) | 105 | 0.014* |
| <Average | 49 (27.7) | 128 (72.3) | 177 | |
| **Food taboos** | | | | |
| Yes | 37 (38.1) | 60 (61.9) | 97 | 0.182 |
| No | 56 (30.3) | 129 (69.7) | 185 | |
| **Household food security** | | | | |
| Food secure | 85 (35.7) | 153 (64.3) | 238 | 0.023* |
| Food insecure | 8 (18.2) | 36 (81.8) | 44 | |
| **Dietary diversity** | | | | |
| High | 48 (47.5) | 53 (52.5) | 101 | 0.001* |
| Medium | 35 (25.4) | 103 (74.6) | 138 | |
| Lowest | 10 (23.3) | 33 (76.7) | 43 | |

*Statistically significant association (p<0.05).

**Table 4a: Association with anemia status of pregnant women.**

| Characteristics | Anemia status (Hb level) N (%) | | Total Sample | P value |
|---|---|---|---|---|
| | ≥11 g/dl | <11 g/dl | | |
| **Age (in years)** | | | | |
| ≥20 | 215 (88.8) | 27 (11.2) | 242 | 0.254 |
| <20 | 33 (82.5) | 7 (17.5) | 40 | |
| **Ethnicity** | | | | |
| Dalit/Madhesi/Muslim | 61 (84.7) | 11 (15.3) | 72 | 0.398 |
| Janjati | 62 (86.1) | 10 (13.9) | 72 | |
| Brahmin/Chhetri/Others | 125 (90.6) | 13 (9.4) | 138 | |
| **Education level** | | | | |
| No formal education | 16 (88.9) | 2 (11.1) | 18 | 0.989 |
| Below SLC | 107 (87.7) | 15 (12.3) | 122 | |
| Above SLC | 125 (88.0) | 17 (12.0) | 142 | |
| **Occupation of the participant** | | | | |
| Unpaid*[1] | 214 (88.1) | 29 (11.9) | 243 | 0.875 |
| Paid*[2] | 34 (87.2) | 5 (12.8) | 39 | |
| **Husband's occupation** | | | | |
| Unpaid*[3] | 24 (85.7) | 4 (14.3) | 28 | 0.703 |
| Paid*[4] | 224 (88.2) | 30 (11.8) | 254 | |

*[1]house wife/student/agriculture *[2]wage/ salary/ business *[3]unemployed/student/agriculture *[4]wage/salary/business/labour migrant.

**Table 4b: Association with anemia status of pregnant women.**

| Characteristics | Anemia status (Hb level) N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥11 g/dl | <11 g/dl | | |
| **Household Income** | | | | |
| ≥Average (Rs 30121) | 95 (90.5) | 10 (9.5) | 105 | 0.314 |
| <Average | 153 (86.4) | 24 (13.6) | 177 | |
| **Food taboos** | | | | |
| Yes | 84 (86.6) | 13 (13.4) | 97 | 0.615 |
| No | 164 (88.6) | 21 (11.4) | 185 | |
| **Household food security** | | | | |
| Food secure | 209 (87.8) | 29 (12.2) | 238 | 0.878 |
| Food insecure | 39 (88.6) | 5 (11.4) | 44 | |

Continued.

| Characteristics | Anemia status (Hb level) N (%) | | Total sample | P value |
|---|---|---|---|---|
| | ≥11 g/dl | <11 g/dl | | |
| **Dietary diversity** | | | | |
| High | 90 (89.1) | 11(10.9) | 101 | 0.047* |
| Medium | 125 (90.6) | 13 (9.4) | 138 | |
| Lowest | 33 (76.7) | 10 (23.3) | 43 | |

*Statistically significant association (p<0.05)

**Table 5: Independent association with MUAC of the pregnant women.**

| Characteristics | Low MUAC | | | |
|---|---|---|---|---|
| | B | AOR | 95% CI | P value |
| **Constant** | 0.710 | | | |
| **Age of the participant (in years)** | | | | |
| ≥20 | -0.714 | 0.490 | 0.226–1.060 | 0.070 |
| <20 (Ref) | | | | |
| **Ethnicity** | | | | |
| Dalit/Madhesi/Muslim | 0.010 | 0.990 | 0.475–2.064 | 0.978 |
| Janajati | -0.889 | 0.411 | 0.178–0.950 | 0.037* |
| Brahmin/Chhetri/Others (Ref.) | | | | |
| **Education level** | | | | |
| No formal education | 0.668 | 1.950 | 0.562–6.768 | 0.293 |
| <SLC | 0.379 | 1.461 | 0.723–2.953 | 0.291 |
| ≥SLC (Ref.) | | | | |
| **Household income** | | | | |
| ≥Average (Rs 30,121) | -0.578 | 0.561 | 0.286–1.098 | 0.092 |
| <Average (Ref.) | | | | |
| **Food taboos** | | | | |
| Yes | -0.502 | 0.605 | 0.312–1.174 | 0.605 |
| No (Ref.) | | | | |
| **Household food security** | | | | |
| Food secure | -0.462 | 0.630 | 0.296 – 1.342 | 0.231 |
| Food insecure (Ref.) | | | | |
| **Dietary diversity** | | | | |
| High | 0.855 | 0.425 | 0.175–1.035 | 0.060 |
| Medium | 0.627 | 0.534 | 0.247–1.153 | 0.110 |
| Lowest (Ref.) | | | | |

**Table 6: Independent association with gestational weight gain of the participant.**

| Characteristics | Gestational weight gain below normal | | | |
|---|---|---|---|---|
| | B | AOR | 95% CI | P value |
| **Constant** | 1.885 | | | |
| **Occupation of participants** | | | | |
| Unpaid | 0.481 | 1.617 | 0.789–3.313 | 0.189 |
| Paid (Ref.) | | | | |
| **Household income** | | | | |
| ≥Average (Rs 30 121) | -0.402 | 0.669 | 0.391–0.146 | 0.143 |
| <Average (Ref.) | | | | |
| **Food taboos** | | | | |
| Yes | -0.322 | 0.725 | 0.418–1.257 | 0.252 |
| No (Ref.) | | | | |
| **Household food security** | | | | |
| Food secure | -0.922 | 0.398 | 0.170–0.928 | 0.033* |
| Food insecure (Ref.) | | | | |

Continued.

| Characteristics | Gestational weight gain below normal | | | |
|---|---|---|---|---|
| | B | AOR | 95% CI | P value |
| **Dietary diversity** | | | | |
| High | -1.012 | 0.364 | 0.159–0.830 | 0.016* |
| Medium | -0.176 | 0.839 | 0.370–1.899 | 0.673 |
| Lowest (Ref.) | | | | |

**Table 7: Independent association with anemia status (Hb level).**

| Characteristics | Anemic | | | |
|---|---|---|---|---|
| | B | AOR | 95% CI | P value |
| **Constant** | -1.194 | | | |
| **Dietary diversity** | | | | |
| High | -0.908 | 0.403 | 0.157–1.037 | 0.060 |
| Medium | -1.069 | 0.343 | 0.138–0.852 | 0.021* |
| Lowest (Ref.) | | | | |

Ref. = Reference Category, AOR= Adjusted Odds Ratio, *Statistically significant association (p<0.05).

Chi square test found that age, ethnicity, education level, household income and dietary diversity of pregnant women were significantly associated with their MUAC (Table 2a, 2b). Similarly, household income, household food security and dietary diversity of the pregnant women were significantly associated with their gestational weight gain (Table 3b). But none of the demographic, socioeconomic, cultural factors and food security were significantly associated with anemia status of pregnant women except their dietary diversity (Table 4a, 4b).

Binary logistic regression revealed that pregnant women being Janajati were 58.9% less likely to be acutely malnourished (MUAC <23 cm) as compared to Brahmin/ Chhetri/Other (AOR: 0.411, CI: 0.178 – 0.950, p=0.037) (Table 5). Similarly, food secured pregnant women were 60.2% less likely to have low gestational weight gain as compared to food insecure (AOR: 0.398, CI: 0.170–0.928, p=0.033) and pregnant women having high dietary diversity were 63.6% less likely to have low gestational weight gain as compared to their counterpart (AOR: 0.364, CI: 0.159–0.830, p=0.016) (Table 6). Pregnant women having medium dietary diversity were 65.7% less likely to be anemic as compared to those having lowest dietary diversity (AOR: 0.343, CI: 0.138–0.852, p=0.021) (Table 7).

## DISCUSSION

This study evoked that about 24% of the pregnant women were acutely malnourished (MUAC<23 cm) which is slightly higher than the result shown by PoSHAN study. This may be because of 0.5 cm difference in cutoff point of MUAC between these two studies.[7] But a cross sectional study done on patient files from the maternity ward at Okhaldhunga Community Hospital in Nepal found similar prevalence of undernourished.[13] The prevalence of low gestational weight gain in this study was less (67%) than the prevalence (80%) found by a hospital based case control study conducted in Dhulikhel hospital, Nepal.[14] Prevalence of anemia among pregnant women were 4 times less as compared to the findings of NDHS 2011.[6]

None of the socioeconomic, cultural, household food security and demographic factors had significant independent association with MUAC of pregnant women except ethnicity. However, unadjusted data of dietary diversity showed a significant association with MUAC of the pregnant women. These associations were supported by the study done in rural Northern Bangladesh and India respectively.[14]

Only household food security and dietary diversity had significant independent association with gestational weight gain but unadjusted data showed a significant association between household income and gestational weight gain. These findings were supported by the study done in Malaysia, Pakistan and Bangladesh.[4,14] Whereas the study done in Nigeria reflected that age, education and occupation of the participants also have significant association with gestational weight gain.[14]

Dietary diversity was the only factor which had significant association with anemia status of pregnant women in the study but the study done in Pakistan contrast with this finding.[4] Whereas, study done in Bangladesh and Nepal revealed that maternal anemia was associated with age, education level and income.[14,15]

## CONCLUSION

The study concluded that about one fourth of the pregnant women were acutely malnourished, more than two third were below normal gestational weight gain and more than one tenth were anemic. Ethnicity, food security and dietary diversity were the factors having significant association with nutritional status of pregnant women. So, these factors should be given special consideration to improve nutritional status of pregnant women.

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