The Academic
International Journal of Multidisciplinary Research

An Online Peer Reviewed / Refereed Journal
Volume 4 | Issue 4 | April 2026
ISSN: 2583-973X (Online), SJIF IF: 5.6
Website: www.theacademic.in

Assessment of Food Habits and Factors Influencing Dietary Patterns among Pregnant Women: A Case Study of Manipur, India

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DOI : https://doi.org/10.5281/zenodo.20094375

ARTICLE DETAILS

Research Paper

Accepted: 19-04-2026

Published: 10-05-2026

Keywords:

pregnancy, dietary pattern, food habits, food taboos, nutritional adequacy, maternal health, Manipur, India

ABSTRACT

Background: Pregnancy is a nutritionally demanding period requiring adequate dietary intake to support maternal health and foetal development. Dietary patterns during pregnancy are shaped by socio-cultural, economic, and environmental factors, including food taboos and community-based beliefs. Objective: To assess food habits and identify factors influencing dietary patterns among pregnant women in Oinam, Bishnupur District, Manipur, India. Methods: A community-based cross-sectional study was conducted among 100 pregnant women in Oinam, Bishnupur District, using a structured questionnaire. The instrument covered demographic profile, knowledge and beliefs on food taboos, dietary intake and food habits, lifestyle practices, attitudes and practices, and pregnancy-related complications. Dietary quality scores were derived from food-frequency data. Descriptive statistics and linear regression were used for analysis. Results: The diet of pregnant women in Oinam was predominantly traditional and nutrient-rich, with high consumption of green leafy vegetables (99%), fruits (96%), dairy products (96%), and fish (80%). However, intake of meat (20%) and eggs (60%) was relatively low, indicating limited diversity in animal protein sources. Fast-food consumption was negligible (1%). The mean

dietary score was [11.68 \pm 1.37] out of 15, indicating moderately high dietary adequacy. Higher scores were associated with greater consumption of eggs and meat. Regression analysis revealed that being advised to avoid certain foods significantly reduced diet scores ([p < 0.05]). Dietary patterns were influenced by education, income, occupation, family structure, and cultural beliefs, with a notable proportion of women adhering to traditional dietary practices and some exhibiting poor dietary diversity. Conclusion: Pregnant women in Oinam generally follow a nutrient-dense traditional diet, though limited intake of eggs and meat restricts animal-protein diversity. Socio-demographic and cultural factors significantly influence dietary patterns. Strengthening nutrition counselling to address food myths and promote balanced protein intake is recommended to improve maternal nutrition and pregnancy outcomes.

INTRODUCTION

Women's nutritional status is crucial for their health and well-being, particularly before and during pregnancy and while breastfeeding. Pregnant women who are free from malnutrition and who consume adequate diets, utilize essential nutrition services, and adopt optimal dietary practices are more likely to experience healthy pregnancies and fewer life-threatening complications (UNICEF, 2021). Pregnancy is one of the most critical life stages, as it determines the developmental trajectory of the child and influences long-term maternal health. Prenatal nutrition, especially intake of omega-3 fatty acids from fish or fortified products, has been associated with improved foetal brain development and cognitive outcomes (UNICEF, 2021; Wang, 2023).

An inadequate diet during pregnancy may increase the risk of gestational diabetes, preeclampsia, preterm birth, and low birth weight, and may also predispose the child to obesity, type-2 diabetes, and cardiovascular disease in later life (Marshall et al., 2021; Black et al., 2013). Balanced nutrition supports tissue repair, replenishes nutrient stores, aids lactation, and promotes healthy maternal weight gain and metabolic balance (Clark, 2020; Fleischhacker, 2023).

Dietary patterns are defined as the quantities, proportions, variety, and combinations of different foods and beverages habitually consumed (Hu, 2002; Ćatović, 2022). Globally, two broad patterns are often described: "prudent/healthy" diets rich in fruits, vegetables, whole grains, lean meats, legumes, nuts, and low-fat dairy and "Western" diets, high in processed meats, refined grains, sweets, sugary drinks, and fast foods (Frank & S., 2002; Dayeon et al., 2015). In India, plant-based or predominantly vegetarian diets are common, with reliance on cereals, pulses, vegetables, and dairy; these can be nutritionally adequate but require careful planning to meet protein, iron, and vitamin B12 needs (Selma et al., 2018; Pauline & Lois, 2015).

In rural and semi-urban areas such as Manipur, traditional dietary practices, food taboos, and socio-economic constraints further shape eating behaviours during pregnancy (Chakona & Shackleton, 2019; Zerfu et al., 2016). Understanding the interplay between food habits, cultural beliefs, and socio-demographic factors is therefore essential for designing effective nutrition-intervention programmes. The present study aims to document food habits and identify factors influencing dietary patterns among pregnant women in Oinam, Bishnupur District, Manipur, India, with a view to informing context-specific maternal-nutrition policies.

MATERIALS AND METHODS

Study setting and participants:

A community-based cross-sectional study was conducted in 2025 in Oinam, Bishnupur District, Manipur. Oinam is a semi-urban locality with mixed socio-economic and cultural backgrounds, facilitating house-to-house surveys and reliable data collection. A total of 100 pregnant women from different age groups and family structures were purposively selected. Inclusion criteria were: women residing in Oinam, currently pregnant, and willing to participate; exclusion criteria were severe medical conditions rendering the woman unable to respond to the questionnaire. The study ensured voluntary participation and confidentiality of responses.

Questionnaire development and content:

A structured questionnaire was developed to assess dietary patterns, food habits, food taboos, nutritional adequacy, lifestyle factors, and maternal-health outcomes. The tool was divided into six sections:

a) socio-demographic profile (age, education, occupation, income, religion, family size, and gravida status),

b) knowledge and beliefs regarding food taboos,

c) dietary intake and food habits (frequency of major food groups),

d) lifestyle practices (physical activity, sleep duration, smoking, alcohol),

e) attitudes and practices towards nutrition counselling, and

f) pregnancy-related complications and previous obstetric history.

The questionnaire was informed by existing literature and validated by experts in food science and nutrition for clarity, reliability, and face validity. Cronbach's alpha and pilot-testing were used to refine the instrument prior to administration.

Data collection:

Data were collected through house-to-house surveys in Oinam. Each respondent was personally contacted, and the aim, procedures, and ethical considerations of the study were explained. Informed consent was obtained, and women were assured of confidentiality. Interviews were conducted in the local language and then translated into English. Information collected included socio-demographic details, dietary intake over the preceding month, frequency of consumption of major food groups, lifestyle behaviours, and any pregnancy-related complications.

Assessment of dietary quality and classification:

The frequency of intake of key food groups was recorded and converted into a dietary quality score out of 15, based on the number of food groups consumed regularly (daily or 2–3 times per week). Green leafy vegetables, fruits, dairy products, fish, eggs, meat, and fast/processed foods were considered. Scores were summed across items to obtain an overall diet score for each respondent. Respondents were then classified into two groups: lower-diet-quality group (score < 11.68) and higher-diet-quality group (score ≥ 11.68), using the sample mean as the threshold.

Statistical analysis:

Data were entered and analyzed using IBM SPSS Statistics version 21. Descriptive statistics (frequencies, percentages, means, standard deviations, and standard errors) were used to summarize socio-demographic characteristics, dietary patterns, and lifestyle practices. Independent-samples t-test was used to compare mean diet scores between the lower and higher diet-quality groups. Linear regression analysis was performed to identify predictors of diet score, with socio-demographic variables, lifestyle factors, beliefs about food taboos, and advice to avoid foods entered as independent variables. All tests were two-sided, with statistical significance set at [$p < 0.05$].

RESULTS

Socio-demographic characteristics:

The socio-demographic profile of pregnant women in Oinam, Bishnupur district, is summarized in Figure 1 in which subfigure-wise distribution of respondents across demographic and maternal variables (Fig.1a to Fig.1l). Most respondents were aged 27–34 years 43%, followed by 19–26 years 32% and 35–41 years 25%. The sample was predominantly Hindu 88%, with Meitei 11% and Christian 1% respondents forming smaller proportions. Educational attainment was relatively high, as nearly half had higher secondary education 47% and 44% were undergraduates. In terms of occupation, most women were homemakers 48%, followed by self-employed 23%, private employees 22%, and government employees 7%.

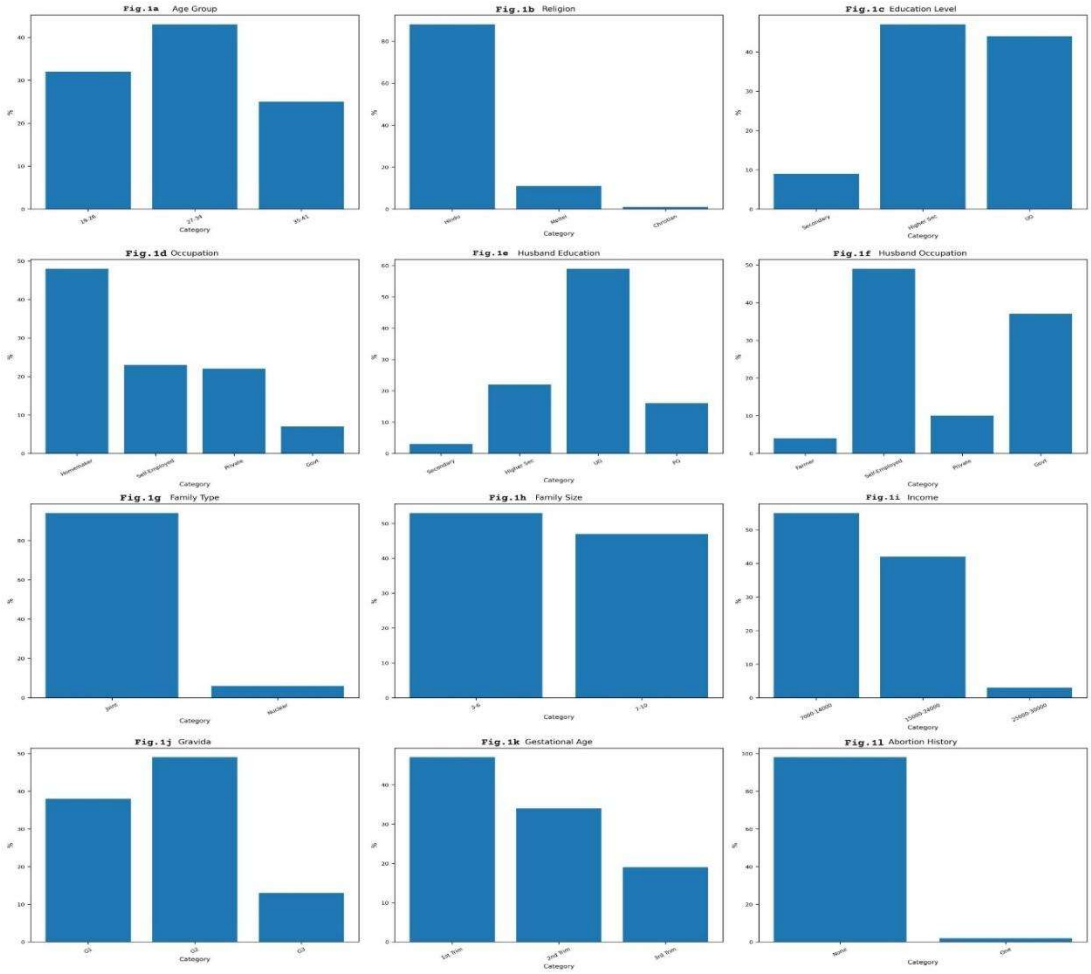
Household and maternal profile:

Regarding husband's education, the majority were undergraduates 59%, followed by higher secondary 22%, postgraduate 16%, and secondary education 3%. A large share of husbands were self-employed 49%, while 37% were government employees, 10% were private employees, and 4% were farmers. Most respondents belonged to joint families 94%, and family size was mainly 3–6 members 53% or 7–10 members 47%. Monthly family income was concentrated in the ₹7000–14000 range 55%, followed by ₹15000 - 24000 (42%) and ₹25000–30000 (3%).

With respect to reproductive characteristics, nearly half of the respondents were in their second pregnancy 49%, followed by first pregnancy 38% and third pregnancy 13%. Nearly half were in the first trimester 4%, while 34% and 19% were in the second and third trimesters, respectively. A history of

abortion or miscarriage was rare, with 98% reporting no such history and only 2% reporting one occurrence.

Figure 1: Demographic Profile of Respondents (N = 100)



(Subfigure-wise distribution of respondents across demographic and maternal variables.)

Major food groups consumed:

The dietary pattern of respondents was predominantly traditional and plant-based (Table 1). Almost all women consumed green leafy vegetables (99%), fruits (96%), and milk and dairy products (96%), indicating a strong intake of micronutrient-rich foods. Fish was frequently consumed by 80% of respondents, reflecting the use of local protein sources. However, meat intake was low (20%), and egg intake was moderate (60%), indicating limited diversity in animal-source proteins. Fast- or processed-food consumption was negligible (1%).

Table 1 Major food groups frequently consumed by respondents (N=100)

Food group	Daily (n)	2-3 times/ week (n)	Percentage (%)
Green-leafy vegetables	69	30	99
Fruits	80	16	96
Milk & dairy products	68	28	96
Fish	12	68	80
Eggs	2	58	60
Meat	-	20	20
Fast/processed food	-	1	01

Diet quality score and group classification

The mean diet score was [11.68 ± 1.37] out of 15, representing approximately 77.9% of maximum possible score (Table 2). Negative skewness (−0.45) indicated that most respondents had relatively better dietary practices, with fewer women exhibiting poor diets.

Table 2: Descriptive statistics for diet score

Diet score		Point range	Mean ± SD	Std. Error	Skewness
Minimum	Maximum	6.00	11.68±1.37	0.13	- 0.45
8.00	14.00				

Distinctive dietary patterns were identified within the pregnant women and the respondents were categorized into two groups as higher and lower quality diet group using the sample mean 11.68 as the threshold (Table 3) which creates a balanced, comparable groups. The independent t test was conducted between the two groups above with diet score as dependent variable. Since p value <0.05, there is significant difference between these two groups in term of their mean dietary score. The lower group has smaller mean value than the higher group which were presented in Table 3 below .Using the mean score as a cut-off, respondents were classified into lower-diet-quality group (<11.68; n=50) and higher-diet-quality group (≥11.68; n=50). The independent-samples t-test revealed a statistically significant difference in mean diet scores between the two groups $p < 0.05$ (Table 3).

Table 3: Classification of respondents with respect to diet score (N=100)

Class	Frequency (n)	Mean diet score	Standard Error	95% confidence Interval		Mean Difference	Std. Error Difference	df	t value
Lower Diet quality group (<11.68)	50	10.6	0.14	Lower	Upper	2.16	0.17	86.39	2.69*
				10.31	0.83				
Higher diet quality group (>11.68)	50	12.76	0.09	12.56	2.95				

*Significant at p≤0.05

Table 4 below showed the group (lower and higher diet score group) comparison on frequently consumed of different food groups by the respondents. For green leafy vegetables, fruits and dairy, both groups demonstrate strong adherence to traditional protective foods, with the higher group achieving perfect consistency (100% frequent intake). This indicates that a base intake of vitamins, minerals, fiber, and calcium is common across the entire sample. While a majority in both groups eat fish frequently, there is still a noticeable gap (68% vs. 72%). The higher group shows better consistency in consuming this key local protein and omega 3 fatty acids. Eggs are a major divisor, 44 per cent of the lower score group eat eggs frequently, compared to 76 per cent of the higher score group. While meat consumption is the biggest divisor, only 8 per cent of the lower score group eat meat frequently, compared to 64 per cent of the higher score group. Animal protein consumption shows the primary distinguishing factor between diet quality groups. Fish remains the culturally preferred protein source for both groups, while eggs and especially meat show dramatic differences in regular consumption patterns. Both groups almost completely avoid fast and processed food. This is a major strength of the traditional diet.

Table 4: Group comparison on "frequent" intake of different food groups

Food Group	Lower diet score group "frequent" intake* (n)	Percentage (%)	Higher diet score group "frequent" intake* (n)	Percentage (%)	Difference (% points)
Green leafy vegetables	49	98	50	100	+2
Fruits	46	92	50	100	+8
Milk & dairy products	46	92	50	100	+8
Fish	34	68	36	72	+4
Eggs	22	44	38	76	+32
Meat	4	8	32	64	+56
Fast/processed food	1	2	0	0	-2

The common dietary pattern is strong in plant-based foods and dairy. However, the higher-quality dietary pattern is defined by greater diversity of animal-source proteins, specifically more frequent consumption of eggs and meat. Improving overall diet quality in this population of pregnant women may therefore depend on addressing barriers to accessing or accepting these specific protein-rich foods.

Regression analysis in Table 5 below shows that respondents (self and spouse) with higher educational levels have negative but non-significant associations with diet score ($p > 0.5$), suggesting education level here does not significantly impact diet score compared to lower educational level. Self, private, and government occupations for both respondents and their husbands show no significant effects on diet score ($p > 0.26$). Religions Meitei and Christian also show non-significant negative associations relative to Hindu religion ($p > 0.3$). Family size (7–10) compared to 3–6 shows a positive coefficient, but not statistically significant ($p = 0.36$). Age shows a positive relationship ($\beta = 0.05$) with the diet score and is not statistically significant ($p = 0.19$). Income in the highest group (25-30k) shows a larger positive coefficient (1.290) than middle group (15-24k), but neither reach significance ($p > 0.15$). Gravidity and gestational age variables are not significantly related to diet score ($p > 0.15$). Being allergic tends to lower the diet score ($\beta = -0.779$) but this is marginally non-significant ($p = 0.09$). Engaging in physical

activity shows a negative association with diet score (β = -0.56, p = 0.10), but not significant. Sleep duration 7–9 hours vs 5–7 hours show minimal effect on diet score (p = 0.91). Beliefs in traditional food myths (yes or not always) show negative impacts but are not significant predictors of diet

Table 5: Factor influencing dietary pattern of the respondents

Variable	Reference	B (Unstd. Coeff.)	SE	B (Std. Coeff.)	t - value	p - value
Intercept		9.06	2.74		3.29	0.002
Education Self (Higher)	Lower Education	0.26	0.40		-0.66	0.51
Education Husband Higher)	Lower Education	0.19	0.48		-0.41	0.68
Religion (Meitei)	Hindu	-0.44	0.51		-0.86	0.38
Religion (Christian)	Hindu	-1.02	1.51		-0.67	0.50
Family Size 7-10	Family size 3-6	0.29	0.32		0.91	0.36
Age		0.05	0.04	0.204	1.31	0.19
Income 15k-24k	Income 7k-14k	0.18	0.36		0.51	0.60
Income 25k-30k		1.29	0.89		1.44	0.15
Gravida 2	Gravida 1	-0.14	0.39		-0.36	0.71
Gravida 3		0.020	0.63		0.03	0.97
Gestation 2nd Trimester	Gestation 1st Trimester	-0.012	0.36		-0.03	0.97
Gestation 3rdTrimester		-0.64	0.45		-1.41	0.16
Allergic(yes)	Allergic (No)	-0.77	0.45		-1.70	0.09
Physical Activity (yes)	Physical Activity (No)	-0.56	0.34		-1.62	0.10
Sleep duration (7-9 hrs.)	Sleep(5-7hrs)	-0.04	0.34		-0.11	0.91

Belief Myth (Yes)	Belief Myth (No)	-0.41	1.19		-0.34	0.72
Belief Myth (Not Always)	Belief Myth (No)	-0.34	1.16		-0.29	0.76
Diet Counselling (Yes)	Diet Counselling (No)	-0.22	0.34		-0.65	0.51
Told Avoid Food (Yes)	Told Avoid Food (No)	-1.02	0.48		-2.08	0.04
Told Avoid Food (Not sure)	Told Avoid Food (No)	-1.09	0.48		-2.28	0.02
Occupation (self)	Occupation (Homemaker)	-0.16	0.40		-0.41	0.68
Occupation (Private)	Occupation (Homemaker)	0.34	0.52		0.64	0.52
Occupation (Government)	Occupation (Homemaker)	0.04	0.63		0.06	0.94
Occupation Husband (Self)	Farmer	0.74	0.77		0.96	0.34
Occupation Husband (Private)	Farmer	1.07	0.95		1.12	0.26
Occupation Husband (Government)	Farmer	0.81	0.86		0.94	0.35

DISCUSSION

The present study assessed the food habits and dietary patterns among pregnant women and revealed that the majority of respondents followed a traditional and relatively balanced diet, with frequent consumption of green leafy vegetables, fruits, and milk and milk products. Nearly all respondents consumed green leafy vegetables (99%), fruits (96%), and dairy products (96%), indicating a good intake of micronutrient-rich foods. These findings are in line with the study conducted by Wesolowska et al. (2019), which reported that increased consumption of fruits and vegetables during pregnancy contributes to improved maternal and fetal health outcomes.

Fish consumption was also found to be moderately high (80%), reflecting the inclusion of locally available protein sources in the daily diet. However, the intake of other animal protein sources such as eggs (60%) and meat (20%) was comparatively low. This imbalance suggests that although the respondents had access to plant-based and some protein-rich foods, dietary diversity in terms of animal protein intake was limited. Similar findings were reported by Chakona and Shackleton (2019), where socio-economic and cultural factors influenced the consumption of animal-based foods during pregnancy.

The overall dietary pattern score indicated a moderately good diet quality, with a mean score of 11.68 ± 1.37, representing approximately 77.9% of the maximum possible score. The negative skewness observed in the distribution suggests that most respondents had relatively better dietary practices, with fewer individuals exhibiting poor dietary habits. This finding is consistent with the study by Gomez et al. (2020), which highlighted that improved awareness and accessibility of nutritious foods contribute to better dietary patterns among pregnant women.

However, when respondents were classified into lower and higher diet quality groups, a significant difference ($p \leq 0.05$) was observed between the two groups. While both groups showed high consumption of protective foods such as vegetables, fruits, and dairy products, the higher diet quality group had significantly greater intake of animal protein sources, particularly eggs and meat. This indicates that diet quality is strongly influenced by the inclusion of protein-rich foods, which are essential for fetal growth and maternal health. These findings are supported by Koletzko et al. (2019), who emphasized the importance of adequate protein intake during pregnancy.

Furthermore, the study findings suggest that dietary patterns are influenced by multiple factors such as education, income, and cultural practices. Despite good consumption of micronutrient-rich foods, the lower intake of animal proteins in some respondents may be attributed to economic constraints, food preferences, or cultural beliefs. This observation aligns with the findings of Amare (2022), who reported that socio-demographic factors play a crucial role in shaping dietary behavior during pregnancy.

CONCLUSION

The present study concludes that the majority of pregnant women followed a traditional dietary pattern characterized by high consumption of green leafy vegetables, fruits, and milk and milk products, which ensures adequate intake of essential micronutrients. The overall dietary pattern score indicated a moderately good diet quality among the respondents. However, the study also identified limitations in dietary diversity, particularly with respect to the intake of animal protein sources such as eggs and meat,

which were consumed in comparatively lower amounts. A significant difference in diet quality between groups further highlights the variability in dietary practices among pregnant women.

The findings also reveal that dietary patterns are significantly influenced by several factors, including education level, occupation, income, family type, and cultural beliefs. Additionally, traditional practices, food preferences, and advice from family members play an important role in shaping food choices during pregnancy. Therefore, it can be concluded that while the intake of protective foods is satisfactory, improvements are needed in protein-rich food consumption and overall dietary balance. There is a strong need for targeted nutrition education and awareness programs that address socio-cultural influences and promote healthy dietary practices to improve maternal nutrition during pregnancy.

Thus, the study will contribute to evidence-based recommendations for improving maternal nutrition through targeted dietary guidance and public health strategies, thereby supporting better pregnancy outcomes and long-term health for both mother and child.

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