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Understanding Nutritional Challenges Among Rural Women in Uttar Pradesh - A Friedman Based Analysis

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ABSTRACT

Nutrition is the process by which food was obtained and utilizes for energy, growth, and body maintenance. Nutritional knowledge includes awareness of the relationship between diet, health, and disease, as well as dietary guidelines. Women in India often face a double burden of malnutrition, making them more vulnerable to stunting, wasting, underweight, and anaemia. Poor health among women reduced productivity, earning capacity, and their ability to care for families. This study was conducted in 2025 in Uttar Pradesh, one of the most affected states in terms of malnutrition. Two districts, Prayagraj and Saharanpur, were purposively selected. From each district, three blocks were chosen, followed by two villages per block, leading to twelve villages in total. A random sample of 15 respondents per village was drawn, making 180 respondents. Results revealed that lack of awareness about government nutrition programmes (mean = 3.66) and social, cultural food restrictions (mean=4.63) were the most critical barriers. The Friedman test confirmed significant differences in challenge severity ($p < 0.01$). The study highlighted the urgent need for nutrition education, effective service delivery, and improved market access to enhance the nutritional well-being of rural women.

Keywords*: Challenges, Friedman test, Malnutrition, Nutrition, Women*

Introduction

Nutrition is essential to a healthy and active lifestyle. Food is the main source of nutrition for human beings. Optimal nutrition occurs when human beings consume an adequate amount of sufficiently diverse food. Better health improves economic growth, better economic growth allows for better health to occur (Hasan *et al.,* 2020). The amounts of essential nutrients needed vary according to age, physical activity, existing diseases (e.g., prostate cancer, breast cancer, or osteoporosis), medications, whether someone is pregnant or lactating. Women experience a double burden of malnutrition, being more likely to be stunted, wasted, underweight, and to have anaemia. Post COVID-19, people are more informed about the food's nutritional component. Livelihood development is crucial for rural transformation, especially for women in areas where conventional economic systems have historically excluded or marginalized them (Kriti *et al.,* 2025). Yet, while food production has increased, the general

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nutrition situation has not improved substantially in terms of overall intake. Women who produce, process, and distribute foods tend to put the nutritional needs of others before their health and well-being, in most cases, the family does not even know. A woman's health affects the family's economic status, mainly because she is less productive at work if she is in poor health. Education level and occupation are the most important determinants of women's nutrition knowledge. Women with higher nutrition knowledge tend to have healthier dietary practices, which underscores the value of nutrition education in enhancing dietary practices. The research aims to measure the results of nutrition-sensitive interventions or practices, specifically women's health outcomes, dietary diversity, household food availability, and well-being. As reported by the National Centre for Biotechnology Information (NCBI), the most populous state in India is Uttar Pradesh, with one-sixth of the 1.2 billion people residing in India. The most vulnerable in terms of malnutrition are women and children. Uttar Pradesh has the highest rates of malnutrition in the world, half of the children younger than 5 years of age are considered stunted in linear growth and 10% are wasted. The recently released National Family Health Survey-5 (NFHS-5) report for 2021 identified Uttar Pradesh as the third highest state for child stunting of infants aged 0-2 years with 39.7% affected. Additionally, the prevalence of anaemia in women of reproductive age in Uttar Pradesh is 50.4%, which is considered a significant public health concern (NFHS-5, 2019–2021). Geographically, the study is confined to specific rural areas within Uttar Pradesh, which have been purposively selected to represent in varying agro-ecological and socio-economic conditions. Despite several nutrition programmes, there is limited evidence on the ranked severity of nutrition-related challenges faced by women in Uttar Pradesh. The target respondents include rural women actively engaged agriculture, as well as other key stakeholders such as extension personnel and community leaders. Conceptually, the study covers the intersection of agriculture, nutrition, and extension education, aligning with the broader framework of nutrition-sensitive agriculture advocated by national and international organisations (FAO, 2019; Ruel *et al*., 2018). Therefore, in the present study the difficulties experienced by women in rural areas were assessed in terms of economic, social & cultural, and accessibility challenges.

Materials and Methods

The research took place in the state of Uttar Pradesh. This study was based on primary data collected from the Prayagraj and Saharanpur districts of Uttar Pradesh. The researcher purposively chose Uttar Pradesh. According to the study of Visaria and Visaria, 2003, Bihar, Uttar Pradesh, and Madhya Pradesh were in the bottom tier of nutrition status in India, and that the Uttar Pradesh nutrition situation is generally not good. The state of Uttar Pradesh was therefore purposively chosen (Kriti *et al*., 2025). Three blocks were chosen for study from each district, for a total of 6 blocks i.e. three blocks from Prayagraj district and three blocks from Saharanpur district which were purposively selected based on their malnourished status. Two villages were purposively selected from each block based on having limited healthcare services and a greater number of malnourished women available in those village areas thus a total of 12 villages were selected. The participants were chosen using a random sampling method. Fifteen respondents were selected from each village, resulting in a total sample size of 180 for this study. Ex post facto research design was utilized for this study (Lal *et al.* 2025). Both primary and secondary sources of data were utilized. The difficulties experienced by women in rural areas were assessed in terms of economic, social & cultural, and accessibility challenges. The interview schedule was pre-tested and validated by experts for reliability. Each statement was rated on a three-point scale of low, medium, and high challenge. The data collection of the challenges variables was analyzed using Friedman two-way ANOVA by ranks (Lal *et al*., 2016; Chandana *et al*., 2022). In this study, the test is applied to identify significant differences in the severity rankings of challenges faced by rural women in achieving proper nutritional status. The Friedman test ranks each row (respondent) across k challenges (columns) and evaluates whether the distributions of ranks differ significantly among the challenge items.

Let:

N = number of respondents

k = number of challenges

R_i, j = rank assigned by respondent *i* to challenge *j*

The Friedman test statistic is:

$$\chi_r^2 = \frac{12}{N\,k(k+1)} \sum_{j=1}^{k} \left(\sum_{i=1}^{N} R_{i,j} \right)^2 - 3N(k+1)$$

This test statistic follows a chi-square distribution with k-1 degrees of freedom. If the calculated value of X_r^2 exceeds the critical value from the chi-square distribution table, the null hypothesis (that all challenges are equally severe) is rejected.

Results

Perceived challenges faced by rural women in achieving proper nutritional status

Milton Friedman, a renowned economist, emphasized the importance of understanding constraints and barriers in effective policy implementation. In the present study, the Friedman test was used to analyze the various challenges faced by rural women in achieving proper nutritional status based on their ranked responses. This method helped to identify significant differences in the severity of the constraints, thereby providing insights into the most pressing barriers that hinder effective nutritional outcomes. The study assessed the major challenges faced by rural women in achieving proper nutritional status. These constraints were categorized into three dimensions, namely economic, social, and cultural, and accessibility challenges. To examine the relative importance of these factors based on ranked responses, the Friedman test was applied.

To find out which problems were most serious for the respondents in attaining proper nutritional scheme awareness, the average ranks of five different constraint statements were analysed using the Friedman ranking method. From Table 1, the issue that received the highest concern from rural women was the struggle with lack of awareness about government nutrition programs, with a mean score of 3.65. This was followed by difficulties in accessing government-provided nutrition benefits such as ICDS, ration, and supplements (3.40). Women also reported facing issues in prioritizing other household expenses over buying nutritious food (2.81). In addition, rural women and their family members skipped meals due to financial issues (2.56) and faced difficulty in affording nutritious food for their families (2.52). These were considered the major difficulties faced by the respondents. The higher stan-

Table 1. Friedman test results on economic challenges using descriptive statistics

S. No.	n	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th(Median)	75th
Statement 1	180	2.5528	0.79716	1.00	4.50	2.0000	2.5000	3.0000
Statement 2	180	2.5694	0.7375	1.00	4.50	2.0000	2.5000	3.0000
Statement 3	180	2.8167	0.84215	1.00	5.00	2.0000	2.5000	3.0000
Statement 4	180	3.4056	1.28571	1.00	5.00	2.5000	3.0000	4.5000
Statement 5	180	3.6556	1.09887	1.00	5.00	3.0000	4.0000	4.5000

Table 2. Friedman test statistics and Mean rank scores of economic nutrition challenges

	Statistics of the Friedman test		
1.	n	180	
2.	Chi-Square	127.181	
3.	df	4	
4.	'p ' value	.000	
Code	Economic challenges	Mean rank score	Rank
State 1	To what extent do you face difficulty in affording nutritious food for your family?	2.55	V
State 2	How often do you or your family members skip meals due to financial issues?	2.57	IV
State 3	How much do you prioritize other household expenses over buying nutritious food?	2.82	III
State 4	Do you faced difficulties accessing government-provided nutrition benefits (ICDS, ration, supplements)?	3.41	II
State 5	How much do you struggle with a lack of awareness about government nutrition programs?	3.66	I

dard deviation values, particularly for statements 4 (1.28) and 5 (1.09), show greater variability in responses, suggesting that rural women differed widely in their opinions regarding these challenges. In contrast, the lower standard deviation values for statements 1 (0.79) and 2 (0.73) indicate that respondents were more consistent in their views. Overall, the outcomes of economic challenges faced by the respondents ranged between 1.00 and 5.00.

The Friedman test was used to see whether the respondent's rankings of the five major barriers to achieving nutritional status differed in a way that was statistically significant. As shown in table 2, the test produced a Chi-square value of 127.181 with 4 degrees of freedom and a p-value of 0.000. This indicates that the differences in the rankings of the constraints were highly significant at the 1% level; some problems were faced more seriously than others by the respondents. The results showed that the most severe challenge was *Statement 5* (rank I, mean = 3.66), followed by *Statement 4* (rank II, mean = 3.41). *Statement 3* was placed at rank III with a mean score of 2.82. On the other hand, *Statement 2* (rank IV, mean = 2.57) and *Statement 1* (rank V, mean = 2.55) were considered relatively less severe challenges by the respondents.

To find out which problems were most serious for the respondents in attaining proper nutritional scheme awareness, the average ranks of five different constraint statements were analysed using the Friedman ranking method. From Table 3, the issue that received the highest concern among rural women was the restriction of food choices due to cultural beliefs and traditions, with a mean score of 4.62, followed by difficulties in accessing health centres that provide nutrition counselling (mean = 3.17). Lack of knowledge about balanced diets and essential nutrients was also reported as a challenge (mean = 2.80). Furthermore, women expressed difficulties when men in the household received better food portions than women (mean = 2.20), and in preparing nutritious meals due to their heavy workload (mean = 2.00). The least reported challenge was the difficulty in affording nutritious food for their families. In contrast, the lower standard deviation values for statements 3 (0.65) and 4 (0.58) indicate that respondents were more consistent in their views. Overall, the outcomes of social and cultural challenges faced by the respondents ranged between 1.00 and 5.00.

The Friedman test was used to see whether the respondent's rankings of the five major barriers to

Table 3. Friedman test result on social and cultural challenges using descriptive statistics

S.No.	n	Mean	Std.Deviation	Minimum	Maximum	Percentiles		
						25^{th}	50^{th}(Median)	75^{th}
Statement 1	180	2.8778	0.80955	1.50	5.00	2.5000	2.5000	3.5000
Statement 2	180	4.6278	0.77157	1.00	5.00	4.5000	5.0000	5.0000
Statement 3	180	2.2306	0.65023	1.00	5.00	1.6250	2.0000	2.5000
Statement 4	180	2.0861	0.58575	1.00	5.00	1.5000	3.0000	2.5000
Statement 5	180	3.1778	0.81813	2.00	5.00	2.5000	3.0000	4.0000

Table 4. Friedman test Statistics and Mean rank of Social and cultural nutrition challenges

Statistics of the Friedman test			
1.	n	180	
2.	Chi-Square	436.957	
3.	df	4	
4.	'p ' value	.000	
Code	Social and cultural challenges	Mean rank score	Rank
State 1	How much do you struggle with a lack of knowledge about balanced diets and essential nutrients?	2.88	III
State 2	Do cultural beliefs or traditions restrict your food choices?	4.63	I
State 3	Do men in the family receive better food portions than women?	2.23	IV
State 4	Does your workload prevent you from preparing nutritious meals?	2.09	V
State 5	How much do you struggle with a lack of access to health centres that provide nutrition counselling and supplements?	3.18	II

achieving nutritional status differed in a way that was statistically significant.As shown in table 4, the test produced a Chi-square value of 436.957 with 4 degrees of freedom and a p-value of 0.000. This indicates that the differences in the rankings of the constraints were highly significant at the 1% level, some problems were faced more seriously than others by the respondents. The results showed that the most severe challenge was *Statement 2* (rank I, mean = 4.63), followed by *Statement 5* (rank II, mean = 3.18). *Statement 1* was placed at rank III with a mean score of 2.88. On the other hand, *Statement 3* (rank IV, mean = 2.23) and *Statement 4* (rank V, mean = 2.09) were considered relatively less severe challenges by the respondents.

To find out which problems were most serious for the respondents in attaining proper nutritional scheme awareness, the average ranks of five different constraint statements were analysed using the Friedman ranking method. From Table 5, the issue of greatest concern among rural women was the difficulty in accessing fresh and healthy food from the market, with a mean score of 2.95, followed by challenges in including a variety of nutritious foods in their meals (mean = 2.55). Women also reported health-related problems caused by poor nutrition (mean = 2.30) and difficulties due to the impact of seasonal changes on food availability (mean = 2.18). The higher standard deviation values, particularly for statements 1 (0.71) and 3 (0.76), show greater variability in responses, suggesting that rural women differed widely in their opinions regarding these challenges. In contrast, the lower standard deviation values for statements 2 (0.65) and 4 (0.59) indicate that respondents were more consistent in their views. Overall, the outcomes of accessibility challenges faced by the respondents ranged between 1.00 and 4.00.

The Friedman test was used to see whether the respondent's rankings of the five major barriers to achieving nutritional status differed in a way that was statistically significant. As shown in table 6, the test produced a Chi-square value of 66.068 with 3 degrees of freedom and a p-value of 0.000. This indicates that the differences in the rankings of the constraints were highly significant at the 1% level; some problems were faced more seriously than others by the respondents. The results showed that the most severe challenge was *Statement 2*(rank I, mean = 2.96), followed by *Statement 3* (rank II, mean = 2.55). On the other hand, *Statement 4* was placed at rank III with a mean score of 2.31 and *Statement 1*

Table 5. Friedman test results on challenges related to accessibility using descriptive statistics

S. No.	n	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25^{th}	50^{th}(Median)	75^{th}
Statement 1	180	2.1861	0.71111	1.00	4.00	1.5000	2.0000	2.5000
Statement 2	180	2.9556	0.80378	1.00	4.00	2.5000	3.0000	3.5000
Statement 3	180	2.5528	0.76132	1.00	4.00	2.0000	2.5000	3.0000
Statement 4	180	2.3056	0.87706	1.00	4.00	2.0000	2.0000	3.0000

Table 6. Friedman test Statistics and Mean rank scores of nutrition challenges

Statistics of the Friedman test			
1.	n	180	
2.	Chi-Square	66.068	
3.	df	3	
4.	'p ' value	.000	
Code	Challenges related to accessibility	Mean rank score	Rank
State 1	To what extent do seasonal changes affect your food availability?	2.19	IV
State 2	How challenging is it for you to access fresh and healthy food from the market?	2.96	I
State 3	How much do you struggle to include a variety of nutritious foods in your meals?	2.55	II
State 4	To what extent have you or your family faced health issues (e.g., anaemia, weakness) due to poor nutrition?	2.31	III

(rank IV, mean = 2.19) were considered relatively less severe challenges by the respondents.

Discussion

The present study is conducted in selected villages of Prayagraj and Saharanpur districts of Uttar Pradesh to assess the challenges faced by rural women in achieving proper nutritional status. The results indicate that a lack of awareness of government nutrition programmes was perceived as the most significant barrier (mean = 3.66), with concerns over accessing government supported nutrition benefits such as ICDS, ration and supplements ranked second (mean = 3.41). This suggests that although government nutritional programmes exist, ineffective communication and lack of delivery mechanisms impacted these programmes. Kumari and Kumari (2024) report similar findings, pointing out that lack of knowledge and administrative processes hinder the effective implementation of the National Nutrition Mission in Bihar. Moreover, the prioritization of other household expenditures to nutritious food (mean = 2.82) indicates the financial insecurities associated with rural households in which nutrition is often compromised for urgent expenditures. This aligns with Upadhyay and Palanivel (2011), who state that economic constraints are one of the significant barriers to food security in India. Financial problems such as missing meals (mean = 2.57), and inability to buy healthy food (mean = 2.55), emphasized the ongoing poverty and vulnerability of rural women. The findings are consistent with Kodavanti *et al*. (2010)'s position that dietary inadequacies for women are mostly attributed to low household income. Social and cultural factors also play a significant role. Restrictions on food choices due to traditions and customs (mean = 4.63) emerge as the most pressing challenges under this category. This finding echoes the observations of Vir and Malik (2015), who report that deeply rooted cultural practices and gender norms often deprive women of adequate nutrition in India. Similarly, Jhaveri *et al*. (2023) highlight that family influence and traditional beliefs in Uttar Pradesh strongly affect maternal nutrition behaviour. Accessibility-related constraints such as difficulties in obtaining fresh and healthy food from markets (mean = 2.96) and lack of dietary diversity (mean = 2.55) suggest weak market linkages and poor infrastructure in rural areas. This result is comparable to the study of Feruglio and Nisbett (2018), who find that rural women in Odisha struggle to access quality food due to poor delivery systems and limited accountability mechanisms in nutrition schemes. While the findings of this study are largely consistent with previous research, some dissimilarities are also noted. For instance, Patrick and Ferdinand (2016) report that rural women in Nigeria actively seek nutrition information when channels are accessible, whereas in the present study, low awareness persists despite the availability of government programmes. This suggests that awareness generation alone may not be sufficient, structural barriers must also be addressed. Overall, the results underline the urgent need to strengthen nutrition education, improve service delivery mechanisms, and enhance access to diverse foods. The convergence of economic, social, and accessibility constraints indicates that multi-sectoral interventions are required to improve the nutritional well-being of rural women in Uttar Pradesh.

Conclusion

The present study identifies the major challenges faced by rural women in achieving proper nutritional status in selected districts of Uttar Pradesh. Findings reveal that among economic challenges, lack of awareness about government nutrition programmes and difficulties in accessing government provided benefits are the most critical barriers. Under social and cultural challenges, restrictions due to food related traditions and customs emerge as the most pressing constraints, followed by limited access to nutrition counselling centres. Accessibility-related challenges show that rural women struggle most with obtaining fresh and healthy food from the market, along with inadequate dietary variety. The Friedman test confirms significant differences in the severity of challenges, indicating that some are perceived more seriously than others. The results underline the urgent need to strengthen nutrition education, ensure effective delivery of schemes, and improve market access. Addressing these issues through integrated policies and awareness campaigns enhances nutritional well-being and household health.

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Conflict of Interest

The authors declare no conflict of interest or competing interest regarding this manuscript.

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Ethics Statement

The studies involving human participants were approved by the Social Sciences Research Ethics Committee of the Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh. The studies were conducted in accordance with local legislation and institutional requirements. The ethics committee/institutional review board waived the need for specific written informed consent procedures, as the research adhered to the principle of maintaining complete anonymity of participants. No personally identifiable information or photographs were collected during the study. Participants were informed about the purpose of the research, and their voluntary participation was obtained verbally.

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