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Dietary diversity and food consumption patterns among rural women in Uttar Pradesh

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Abstract
Present investigation was undertaken to assess the food consumption patterns and nutritional assessment of rural women from Hapur district of Uttar Pradesh. Two hundred rural women from two villages of Hapur district were selected. Information was collected on socio-economic status, dietary habits, food and nutrient intake (24-h recall method), clinical assessment of rural women and nutritional knowledge respondent. Majority of respondents were in low-income category (Rs. < 10000) The intake of cereals, pulses, milk and milk products, roots and tubers, other vegetables, green leafy vegetables, fruits, sugar and jaggery and fats and oils were significantly (p<0.05) lower than RDI in the respondents. Majority of the respondents had inadequate nutrition knowledge regarding nutrition before imparting nutrition education. Significant (p<0.01) increase in knowledge scores regarding sources of nutrients and other important aspects was observed after imparting nutrition education. There is an urgent need to educate rural momen about the importance of balanced diet and to include nutrient-rich recipes based on locally available food stuffs in the diet to improve their nutritional status.

Keywords: Rural women, nutritional assessment, dietary assessment, nutrition education

Introduction
Food and food security have emerged as central concerns in contemporary development discourse. In response to growing apprehensions about food scarcity and nutritional needs, governments and relevant authorities are formulating policy-level initiatives. Despite a 27% reduction in global undernourishment, highlighting the need for sustained policy action and proactive measures. Ensuring food security and sustainable access to food is particularly urgent in environmentally unstable regions, where natural disasters and climate variability frequently disrupt agriculture. Climate change, driven by environmental degradation, disproportionately affects the poorest and most vulnerable populations, worsening food insecurity and nutritional challenges. There is a strong interconnection between food security and nutrition (Bandura, 2014) [1]. Traditionally food-secure communities tend to exhibit lower rates of malnutrition and related health issues. For the purpose of this study, rural women are defined as those residing in areas classified as rural according to official government standards. The specific location selected for the research is the Hamirpur district in the state of Himachal Pradesh. Rural regions in India are predominantly patriarchal, where women often occupy a subordinate status both within their households and in the broader community (Behrman, 2022) [3].

This gender disparity is reflected across various domains, including sex ratio, education, healthcare access, employment, and livelihood opportunities. Issues of safety, security, and nutrition are especially critical for women in these areas. The deeply rooted patriarchal structure contributes significantly to the systemic neglect of women's needs, often depriving them of the basic amenities essential for a dignified and healthy life (Bhaskaram, 2019) [4].

Women's empowerment in India remains a serious concern, particularly in rural settings where conditions are more alarming. Rural women typically remain dependent on male family members-fathers, husbands, or sons-throughout their lives, creating a persistent cycle of vulnerability and deprivation. Limited access to income-generating opportunities further restricts their autonomy and exacerbates their marginalization. Nutritional inequality, driven by socio-cultural norms and economic barriers, is a major contributor to the widespread malnourishment observed among rural women.

Empirical evidence from India consistently shows that women from rural and economically disadvantaged backgrounds often lack access to balanced diets and regular meals (Bhatia and Seshadri, 2020) [5]. Nutritional awareness among rural women varies significantly. While some possess moderate understanding-often shaped by local intervention programs-many remain unaware of fortified foods, essential dietary diversity, and balanced nutrition. Their food choices are further influenced by socioeconomic constraints, cultural norms, intra-household hierarchies, and limited access to nutrition education. Recent efforts by governments and NGOs aim to address these gaps. Interventions like anganwadi smartphone programs, kitchen gardens, nutrition counselling during pregnancy, and fortified food distribution are improving both knowledge and access, (ICRW 2010) [12]. However, persistent barriers-affordability, cultural food taboos, gender-based food allocation, and lack of timely education-continue to limit their impact (Bisht, and Raghuvanshi, 2018) [6].

Understanding rural women's food consumption and their nutrition awareness is essential for crafting targeted interventions. Addressing their specific dietary deficits, empowering informed food choices, and ensuring equitable intra-household distribution are fundamental to improving maternal health, child development, and community well-being across rural India (Breinbauer and Maddaleno, 2020) [7]. In consideration of these issues in mind, the presented study was designed with the following specific objectives:

1. To create the socio-demographic profile of the respondents;
2. To analyze the Nutritional Status of vulnerable groups in the Hapur district on the basis of secondary data.
3. To assess the awareness regarding nutrition among the respondents.

Methodology

Participants: The present study was conducted on rural women in the Hapur District of Uttar Pradesh. Total 200 rural women were selected proportionately for the study from the two villages randomly.

Tool Used: An interview schedule was prepared to collect the data as per objectives of the study.

The interview schedule was pre-tested. Based on the results of the pre-test, the schedule was modified and finalized.

Statistical Analysis: The data thus, collected were computed, tabulated and analyzed using frequency, percentage, mean score, Z-distribution test, Paired 't' test.

Procedure

The study was conducted in district Hapur of Uttar Pradesh state. There are four blocks i.e. Garhmukteshwar, Dhaulana, Simbhaoli, and Hapur and 352 villages in Hapur district. Out of these, two villages *viz*. Bajhera Khurd and Basatpur from same block were selected randomly.

Proportionately, a sample of 200 respondents was covered under this study. A set of 14 independent variables and defendant variable, constituted the variables for the study.

Result

Socio-personal profile of the respondents

The results regarding socio-economic and personal profile of the respondents (Table 1) reveal that 76.0 percent of the respondents were in middle age group. Huge majority of the respondents (90.0%) were married, had small family size (71.0%), 77.0 percent of respondents had nuclear family background (77.0%).

Further, it was observed that nearly one-third (31.0%) of the respondents were illiterate. More than half of the respondents (53.5%) reported to have low family education status. Respondents who took two meals a day were 73.5% whereas 26.5% took three meals a day. During the study it was revealed that 88percent of the respondents were vegetarian while 12 percent were non-vegetarian (Table 1). Similar result was found in the study of Deepti 2008; Gita, 2010 and Yadav, 2013.

Table 1: Socio-economic and personal profile of the respondents, (n=200)

Sr. No	Variables	Category	Total
1.	Age (Years)	Young (up to 24)	2 (11.5)
		Middle (25- 45)	15 (76.0)
		Old (above 45)	24 (12.0)
2.	Marital status	Unmarried	17 (8.5)
		Married	180 (90.0)
		Widow	3 (1.5)
3.	Family type	Nuclear	154 (77.0)
		Joint	46 (23.0)
4.	Family size	Small (<5)	142 (71.0)
		Medium (5-8)	40 (20.0)
		High(>8)	18 (9.0)
5.	Respondent's education	Illiterate	62 (31.0)
		Primary	45 (22.5)
		Middle	44 (22.0)
		High school	42 (21.0)
		Graduate & Post Graduate	7 (3.5)
6.	Family education Status	Low	107 (53.5)
		Medium	69 (34.5)
		High	24 (12.0)
7.	Respondent's occupation	Farming	160 (77.5)
		Agriculture laborers	27 (13.5)
		Others	13 (6.5)
8.	Family occupation	Farming	155 (77.5)
		Agriculture laborers	30 (15.0)

		Others	15 (7.5)
9.	Family income (monthly)	Low (up to Rs 10000)	116 (58.0)
		Medium (Rs 10000-20000)	64 (32.0)
		High (Above 20000)	20 (10.0)
10.	House type	Mixed	58 (29.0)
		Pucca	142 (71.0)
11.	Land holding	Land less	32 (16.0)
		Small	132 (66.0)
		Marginal	22 (11.0)
		Large	14 (7.0)
12.	Eating habits	Vegetarian	176(88.0)
		Non- vegetarian	24 (12.0)
13.	No. of meals	2	147 (73.5)

Dietary Assessment of rural women

Frequency of food consumption of rural women

Data on food frequency of rural women of Hapur district has been depicted in Table 2. In India, cereals are the main part of our diet. Among cereals, wheat was consumed daily by all the respondents. Rice was consumed by 2.5, 6.0, 15, 16.5 and 9.0 percent families on daily, alternately, weekly, fortnightly and rarely basis, respectively. Bajra was consumed by ten percent of respondents on daily basis and 17, 17.5, 4.5, 1 percent of respondents were consuming it on alternately, weekly, fortnightly and rarely basis, respectively, in winter season. Regarding the consumption of maize, none of the respondents was consuming maize on daily and alternate basis only 2.5 and 10 percent of respondents consumed it on weekly and fortnightly basis, respectively in winter season.

As far as consumption of pulses was concerned, only five of the respondents were consuming green gram dal on daily basis. Bengal gram was consumed by 12% and green gram by 5% respondents on alternate day. Of the respondents consumed black gram (19.0%) and lentil (12.5%) on weekly basis. Moth bean and soya bean were consumed rarely by 27.5 and 10 percent respondents, respectively.

Data regarding consumption of green leafy vegetables revealed that spinach was consumed on rarely and fortnightly basis by 6.0 and 17.5 percent respondents, respectively, followed by 17.5 percent respondents consumed it weekly. Twelve percent respondents consumed *bathua* leaves fortnightly and 20.5 percent on weekly basis. Coriander was consumed by 25 percent of the respondents alternatively followed by 9.0, 13.5 and 1.5 percent of respondents who were consuming it on weekly, fortnightly and rarely basis, respectively. Fenugreek leaves were consumed by 15.0 percent respondents on fortnightly basis. Bengal gram leaves were consumed fortnightly by 7.5 percent of the respondents followed by 5.0 percent respondents consumed it weekly. Mustard leaves were consumed by 14 percent and 10 percent of respondents on fortnightly and weekly basis, respectively. Mint leaves were consumed by majority of respondents (24%) on rarely basis. None of the respondents were consuming any of the green leafy vegetables on daily basis.

The data on consumption of roots and tubers indicated that colocassia, turnip and carrot were not consumed on daily basis by majority of respondents (Table 2). Majority of respondents (32%) consumed potato on daily basis followed by 18 percent respondents who consumed potato on the alternate days. Onion was the part of daily diet of majority of respondents. Colocassia was consumed fortnightly and rarely in the diet by the respondents. Forty-five and 21.0 percent respondents consumed ginger and garlic on weekly basis, respectively. Most of the respondents (19.5%) took turnip fortnightly in the diet.

Among other vegetables, brinjal was consumed by 19 percent and 13 percent of the respondents on weekly and fortnightly basis, respectively. Majority of the respondents were consuming tomatoes daily. Cauliflower was consumed by 18.5 and 12 percent of the respondents on weekly and alternately basis, respectively. Forty-seven respondents consumed cabbage on weekly basis. Most of the respondents were consuming green chillies on daily basis (36%). Twenty percent respondents consumed ladyfinger on weekly basis. Majority of respondents (23.5%) consumed peas weekly.

It has been evident from the data presented in Table 2 that fruits were not the part of the daily diet of the majority of respondents except banana that was consumed by only 2.5 percent respondents Apple, lemon, orange, any other (papaya, pears, watermelon and muskmelon) were consumed rarely by majority of the respondents. Fifteen percent and 20.5 percent respondents consumed orange and lemon on fortnightly basis, respectively.

Data in Table 2 illustrated that consumption of cow's milk was daily by 6.0 percent of the respondents while 37.5 percent respondents consumed buffalo's milk on daily basis. Majority of the respondents (20%) consumed curd on alternative days. Six and 16.5percent respondents consumed curd on daily and weekly basis, respectively. Butter milk was consumed on alternate days by 15.5 percent of the respondents. Butter was consumed by 14 percent of the respondents on weekly basis. Most of the respondents (29%) consumed sweet on rarely basis.

Fats and oils were used daily by most of the families for food preparation. Desi ghee was consumed daily by 19.5 percent of the respondents. Fifteen and thirty-five percent of the respondents used hydrogenated fat and refined oil on daily basis, respectively. Only 7.5 percent of respondents consumed mustard oil on daily basis.

Most of the respondents were not consuming meat products. Only five and one percent of the respondents were consuming eggs and meat too on fortnightly basis.

Food consumption pattern of rural women

Data regarding mean daily food intake rural women have been presented in Tables 2.

Table 2: Frequency of food consumption of rural women (n=200)

Food stuffs	Daily	Alternately	Weekly	Fortnightly	Rarely	Not consumed
Cereals						
Wheat	100(100.0)	-	-	-	-	-
Rice	5(2.5)	12(6.0)	30(15.0)	33(16.5)	18(9.0)	2(1.0)
Bajra	20(10.0)	34(17.0)	35(17.5)	9(4.5)	2(1.0)	-
Maize	-	-	5(2.5)	20(10.0)	37(18.5)	38(19.0)
Pulses						
Bengal gram	-	24(12.0)	30(15.0)	26(13.0)	15(7.5)	5(2.5)
Black gram	-	2(1.0)	38(19.0)	26(13.0)	24(12.0)	10(5.0)
Green gram	5(2.5)	10(5.0)	59(29.5)	5(2.5)	21(10.5)	-
Red gram	-	10(5.0)	29(14.5)	31(15.5)	15(7.5)	15(7.5)
Mothbean	-	-	-	5(2.5)	55(27.5)	40(20.0)
Lentil	-	30(15.0)	25(12.5)	22(11.0)	19(9.5)	4(2.0)
Soyabean	-	-	37(18.5)	38(19.0)	20(10.0)	5(2.5)
Green leafy Vegetables						
Bathua leaves	-	-	41(20.5)	24(12.0)	11(5.5)	24(12.0)
Coriander leaves	-	50(25.0)	18(9.0)	27(13.5)	3(1.5)	2(1.0)
Fenugreek leaves	-	15(7.5)	21(10.5)	30(15.0)	26(13.0)	8(4.0)
Bengal gram leaves	-	-	10(5.0)	15(7.5)	38(19.0)	37(18.5)
Mustard	-	13(6.5)	20(10.0)	28(14.0)	34(17.0)	5(2.5)
Mint	-	-	20(10.0)	20(10.0)	48(24.0)	12(6.0)
Spinach		15(7.5)	35(17.5)	35(17.5)	12(6.0)	3(1.5)
Roots & Tubers						
Radish	2(1.0)	15(7.5)	35(17.5)	39(19.5)	9(4.5)	-
Carrot	-	8(4.0)	64(32.0)	16(8.0)	12(6.0)	-
Potato	64(32.0)	36(18.0)	-	-	-	-
Onion	95(47.5)	3(1.5)	-	-	-	2(1.0)
Colocassia	-	-	-	5(2.5)	45(22.5)	50(25.0)
Ginger	9(4.5)	15(7.5)	45(22.5)	19(9.5)	9(4.5)	3(1.5)
Garlic	34(17.5)	29(14.5)	21(10.5)	10(5.0)	4(2.0)	2(1.0)
Turnip	-	-	15(7.5)	39(19.5)	35(17.5)	11(5.5)
Other Vegetables						
Brinjal	-	5(2.5)	38(19.0)	26(13.0)	23(11.5)	8(4.0)
Tomato	36(18.0)	28(14.0)	28(14.0)	8(4.0)	-	-
Cauliflower	-	24(12.0)	37(18.5)	20(10.0)	19(9.5)	-
Cabbage	-	15(7.5)	47(23.5)	31(15.5)	7(3.5)	-
Green Chilly	72(36.0)	18(9.0)	6(3.0)	4(2.0)	-	-
Lady finger	-	-	40(20.0)	25(12.5)	35(17.5)	-
Peas	-	-	47(23.5)	38(19.0)	13(6.5)	2(1.0)
Other vegetables	-	-	-	7(3.5)	93(46.5)	-
Fruits						
Guava	-	-	32(16.0)	47(23.5)	21(10.5)	-
Apple	-	-	3(1.5)	34(17.0)	58(29.0)	5(2.5)
Banana	5(2.5)	8(4.0)	30(15.0)	34(17.0)	23(11.5)	-
Ber	-	12(6.0)	37(18.5)	28(14.0)	23(11.5)	-
Lemon	-	-	39(19.5)	41(20.5)	20(10.0)	-
Orange	-	3(1.5)	10(5.0)	30(15.0)	55(27.5)	2(1.0)
Any other	-	-	-	9(4.5)	91(45.5)	-
Milk & Milk products						
Cow's Milk	12(6.0)	15(7.5)	12(6.0)	15(7.5)	43(21.5)	3(1.5)
Buffalo's Milk	75(37.5)	10(5.0)	-	5(2.5)	10(5.0)	-
Curd	12(6.0)	40(20.0)	33(16.5)	12(6.0)	3(1.5)	-
Butter Milk	36(18.0)	31(15.5)	15(7.5)	18(9.0)	-	-
Butter	10(5.0)	14(7.0)	28(14.0)	21(10.5)	27(13.5)	-
Sweets	-	-	6(3.0)	36(18.0)	58(29.0)	-
Fats & Oils						
Desi Ghee	39(19.5)	13(6.5)	14(7.0)	18(9.0)	10(5.0)	6(3.0)
Hydrogenated Fat	30(15.0)	22(11.0)	15(7.5)	-	28(14.0)	5(2.5)
Refined Oil	70(35.0)	24(12.0)	-	-	-	6(3.0)
Mustard Oil	15(7.5)	25(12.5)	8(4.0)	21(10.5)	25(12.5)	6(3.0)
Meat products						
Eggs	-	-	-	10(5.0)	5(2.5)	85(42.5)
Meat	-	-	-	2(1.0)	5(2.5)	93(46.5)
Any other	-	-	-	--	1(0.5)	99(49.5)

Cereals

The mean daily cereal intake of the rural women was 164.03 g which was 91.12 percent of RDI (Table 2). The mean daily cereals intake of women of bajhera khurd and women of

basatpu was 164.11 g and 163.92 g, respectively (Table 3). It was found that the intake of cereals by rural women did not differ significantly. Bhaskaram, 2019 [4] who also reported low intake of cereals by the respondents. Similar findings have also been reported by other investigators that cereals were lower in children than RDI. Choudhary *et al* 2022 [8]; Bhatia and Seshadri. 2020 [5]; Bandura, 2014 [1].

Pulses

The data presented in Table 3 indicated that daily mean intake of pulses among rural women was 40.71 g which was 67.85 percent of RDI. The mean daily pulses intakes of rural women were 41.60 g and 38.89 g, respectively (Table 3). It was found that intake of pulses was significantly ($P \leq 0.05$) higher by rural women. Contento, Randell and Basch, (2023) [9] also reported that majority (76%) of respondents were consuming pulses on weekly basis.

Fats and Oils

Table 3: Mean daily food intake of rural women (n=200)

Food Stuffs (gm)	RDI (gm)	Mean daily food intake	z value	Overall intake %age of RDI
Cereals	180	164.03 ±27.10	-5.89**	91.12
Pulses	60	40.71±21.27	-7.73**	67.85
Fats & Oils	30	12.92 ±3.18	-61.54**	43.06
Sugars & Jaggery	20	14.98±3.35	-24.30**	14.9
Green Leafy Vegetables	100	37.09±31.73	-19.83**	37.09
Roots & tubers	100	52.16±32.73	-14.62**	52.16
Other Vegetables	100	40.01±23.27	-25.78**	40.01
Fruits	100	31.48±19.93	-34.39**	31.48
Milk & Milk products	500	146.92±45.95	-76.92**	27.36

Values are mean ± SD, ** Significant at 5% level.
n= number of rural women, RDI- Recommended Dietary Intake (ICMR 2010)
Z value shows comparison of nutrients intake with RDI

Daily mean intake of fats and oils of rural women was 12.92 g which was 43.06 percent of RDI (Table 3). The intake was significantly ($P \leq 0.05$) lower than RDI. The consumption of fats and oils was higher in women of Bajhera Khurd (44.5%) than women (38.3%) of Basatpur (Table 3). Results of the present study are also in agreement with those of Fisher and Birch (2017) [10].

Sugar and Jaggery

The data in Table 3 revealed that the daily mean intake of sugar and jaggery of rural women was 14.98 g which was 74.9 percent of the RDI. The results highlighted almost similar consumption of sugar and jaggery among women of Basatpur (74.85% of RDI) than women (74.8% RDI) of Bajhera Khurd (Table 3).

Green Leafy Vegetables

Mean daily intake of green leafy vegetables of rural women was 37.09 g (37.09% of RDI) and it was significantly ($P \leq 0.05$) lower than the RDI. The consumption of green leafy vegetables was similar in women of Basatpur and Bajhera Khurd. Similarly, Hertzler and Anderson (2022) [11], and Bisht and Raghuvanshi (2018) [6] also reported that majority of the families were consuming green leafy vegetables on weekly basis.

Roots and Tubers

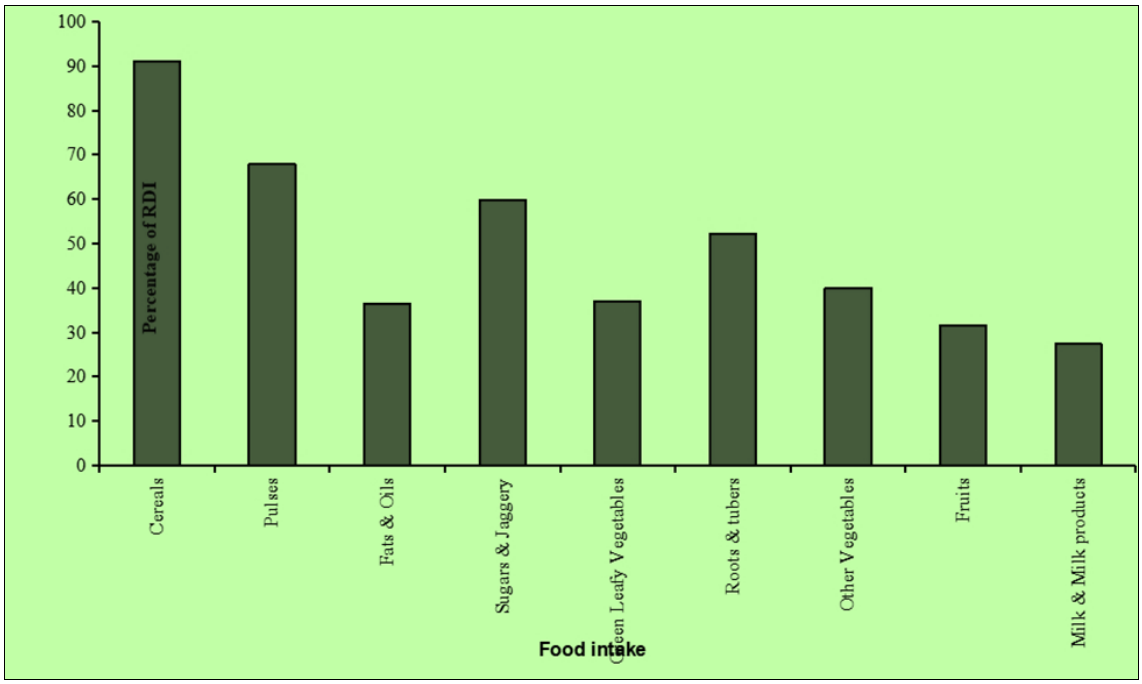

Fig 1: Mean daily food intake of the respondents

The intake of roots and tubers by rural women was 52.16 g/day which was significantly ($P \leq 0.05$) lower than the RDI (Table 3). It was observed that intake of roots and tubers was lower in women of Bajhera Khurd (49.83 g) than in women of Basatpur (54.49 g) however, the differences were non-significant (Table 3).

Other Vegetables

The daily mean intake of other vegetables of rural women was 40.01 g (40.01% of RDI) (Table 3). The intake of other vegetables was significantly ($P \leq 0.05$) lower than RDI. It was found that daily mean intake of other vegetables by women of Bajhera Khurd was lower than women of Basatpur and the differences were non-significant.

Fruits

Data in Table 3 revealed that the mean daily intake of fruits of rural women was 31.48 gm. The fruits intake was significantly ($P \leq 0.05$) lower than RDI. The mean intake of fruits was found to be higher in women of Basatpur (33.26 g) than the Bajhera Khurd (28.89 g) (Table 3). Similar findings have been reported by Jelliffe *et al*. (2016) [13] that majority of respondents were consuming fruits once or twice a week.

Milk and milk products

The mean daily intake of milk and milk products of rural women was 146.92 g which was only 29.38 percent of the RDI (Table 3).

Gain in knowledge scores obtained by respondents

The pre and post knowledge scores were obtained before and after imparting nutrition knowledge to the respondents. Pre-scores of nutrition knowledge indicated that most of the respondents had inadequate knowledge about various aspects before imparting nutritional knowledge. Post-scores indicated a highly significant ($P \leq 0.01$) gain in knowledge of respondents. The gain in knowledge scores were due to the nutrition education given to respondents for 45 days (Table 4).

Table 4: Gain in knowledge scores obtained by respondents (n=50)

Sr. No.	Component	Pre scores	Post scores	Gain in knowledge	't-value'
1.	Balanced diet	13.98±1.69	15.69±1.66	2.72±1.70	6.96*
2.	Sources of nutrients in diet	22.55±3.41	29.94±2.47	6.39±2.13	15.41*
3.	Importance of Green Leafy Vegetables and fruits in diet	15.40±1.14	18.97±0.69	3.58±0. 94	8.38*
4.	Nutrient deficiency disorders and their prevention	18.25±3.11	23.73±2.12	4.48±2.48	10.76*
5.	Conservation of nutrients	26.16±2.95	35.38±2.60	8.22±2.20	15.54*

It was found that there was a significant increase in knowledge of respondents regarding importance of balanced diet, source of nutrients in diet, importance of green leafy vegetables and fruits in diet, nutrient deficiency disorder and their prevention, conservation of nutrients. Similarly, other workers like Singh and Matvienko *et al.* (2015) [14] also reported low intake of roots and tubers and vegetables by the respondents. On the contrary Nwadi and Anyakoha (2017) [18] reported that consumption of roots and tubers in the respondents was more than RDI. Results of the present study were in conformity with the findings of other investigators Van't Riet *et. al.* 2015 [15]. who also reported significant increase in the knowledge of mothers after imparting nutrition education.

Conclusion

The dietary assessment of rural women in Hapur district revealed that while cereals formed a major part of the daily diet, the intake of other essential food groups such as pulses, green leafy vegetables, roots and tubers, fruits, milk, and milk products was significantly lower than the recommended dietary intake (RDI). The data showed minimal daily consumption of green leafy vegetables and fruits, with most items being consumed on a weekly or fortnightly basis. Intake of fats, oils, and animal products was also found to be low, indicating dietary inadequacies. However, a significant improvement in nutritional knowledge was observed among the women after a 45-day nutrition education program, suggesting that awareness can positively impact food choices and dietary patterns. These findings highlight the need for targeted nutrition education and interventions to improve the dietary practices and nutritional status of rural women.

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