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RESEARCH ARTICLE

Frequency of Consumption and Daily Intake of Different Food Groups by Adults of Kumaon Region Uttarakhand

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ABSTRACT

Food consumption pattern is a strong indicator of nutritional and health status of a community. This study was conducted to assess the frequency of consumption of foods belong to different food groups and daily intake of individual food groups by the adults of Kumaon region of Uttarakhand. Equal number of male (n=100) and female (n=100) between the ages of 20 and 40 from rural, semi-urban, and urban regions of Haldwani, Kumaon, Uttarakhand were selected for the study. Food frequency questionnaire and 24-h recall method were used to get the information on food intake. Anthropometric measurements were conducted using standard methodology. Data was analyzed in Dietcal software and statistically analyzed using the statistics package SPSS for windows. Results indicated that both the male and female had significantly lower values of height however, higher values of weight and body mass index than the reference values. Further, results indicated that daily mean intake of pulses, fruits and vegetables, nuts and oil seeds, and milk was significantly lower than the recommended intake levels whereas the daily intake of cereals (309.3g), fats and oils (37.2g), sugar and jaggery (38.5g) was significantly ($p<0.05$) higher than their respective RDIs among male respondents however, the female respondent had significantly ($p<0.05$) higher intake of fats and oils (34.1g) and sugars and jaggery (37.3g). Most of the respondents consumed rice, wheat, potato, onion, tomato, milk, tulsi, oil, and sugar on a daily basis. The food consumption pattern is a strong indicator of nutritional and health status of a community. Information on dietary intake patterns may be used to predict the nutritional deficiency disorders in a community.

Key words: *Food consumption; Food frequency; Food groups; Dietary intake.*

India attained food security during 1970 but at the household level still, we are lagging behind (*Panwar et al., 2021*). In the villages, the food items that are produced on the farm, home garden, and purchased from the agricultural income or wages are consumed (*Noopur et al., 2021a*). The situation is a little different in urban and peri-urban areas. The frequency of consumption of food items belonging to a particular food group contributes significantly towards the nutritional and health status of the people of a community. Generally, the food groups consumed daily have a long-lasting or more impact on nutritional status (*Kumar and Gautam, 2022*). For instance, people consuming fruits, green leafy vegetables, milk, nuts, and oil seeds in addition to other foods on a daily basis may have good nutritional and health status as compared to people consuming fried foods, soft drinks, chocolates, and preserved foods on a daily basis (*UNICEF, 2019*). People belonging to the second category may have problems with overweight, low hemoglobin, hypothyroidism, hypertension, diabetes, and other health problems. The frequency of food quantity plays a substantial role in achieving good health and nutritional status. For instance, liberal consumption of green leafy vegetables and fruits promotes good health (*Asghari et al., 2017; Noopur et al., 2021b*) whereas the liberal consumption of fats and oils, starchy food,s, and sugars is associated with poor nutritional and health status. Indian Council of Medical Research defined recommended dietary allowances of food groups and nutrients from time to time to sustain a healthy life which is based on gender, age, physical activity level, and physiological status. Intake of an imbalanced diet on a long-term

basis may invite unwanted diseases such as diabetes, hypertension and cardiovascular diseases, anemia, night blindness, overweight, obesity, osteoporosis, nerve weakness, and hypothyroidism (*ICMR, 2010*). Chronic protein and energy deficiency is the major contributory factor of stunting the community. The National Family Health Survey-5 indicated that 18.7 per cent of male adults and 16.2 percent of female adults have low body mass index which was due to low protein and energy intake. This survey also indicated a high prevalence of anemia among women (57%) and men (25 %); while hypertension was reported to be among 21.3 per cent among women and 24.0 per cent among men and 13.5 per cent of women and 15.6 per cent of men had diabetes (*NFHS, 2019-21*). Triple burden of malnutrition which is known as stunting, wasting, overweight, and obesity as well as micronutrient malnutrition is the confounding factor of health deterioration (*Mohan et al., 2022; Kharti et al., 2022*). Imbalanced physical activity is another major contributory factor of poor nutritional and health status (*ICMR, 2020*). The low socio-economic status community or labor class people spend more energy than they consume and work continuously beyond their capacity (*Brunn et al., 2011*). On the other hand business and services class people spend less energy than consumption and slowly and slowly become a victim of overweight, obesity and diabetes (*Gupta et al., 2012*) necessitating the need to create awareness and nutritional knowledge among both groups of people are the best tools to fight against the burden of malnutrition (*Chaval and Dagar, 2017*) and making aware of household heads to allow women for training for diet and farming technology (*Sharma et al., 2012*) and making them entrepreneur in vegetable production (*Sharma et al., 2014; Chauhan et al., 2023*) and if needed engaged financial institution for promoting women entrepreneur for food production (*Chauhan and Saikia, 2021)* so that food items are produced and consumed on farm itself. The study was therefore conducted to assess the physical health status of adults through anthropometric measurements and frequency of consuming different food groups along with their quantity so that dietary awareness and advice is given to improve their nutritional and health status.

METHODOLOGY

Two hundred respondents (an equal number of males and females; from rural, semi-urban and urban backgrounds) aged between 20-40 years, with sedentary and moderate work activities, were selected for the study. Physical assessment and data collection on food frequency and food intake of respondents were done using anthropometric measurements, food frequency questionnaire and 24-hour recall method. Data was collected and compiled during 2021-2022. The data obtained were quantified and subjected to statistical analysis in order to draw meaningful conclusions. The data were statistically analyzed using the statistics package SPSS (version 16.0) for Windows. Means of height, weight, BMI, waist and hip circumference and food intake were compared with reference values using a one-sample t-test. *P* values less than 0.05 were considered statistically significant. Height was measured in centimeters using a seca stadiometer, weight was measured in kilograms using seca automatic electronic balance and waist and hip circumferences were measured in centimeters using seca fiber tape however, body mass index and waist-to-hip ratio were calculated. All the measurements were taken twice using calibrated types of equipment as per the methodology explained by the World Health Organization (*WHO, 2011*). According to the methodology and objectives of the study, a pre-structured food frequency questionnaire was constructed to gather information on the frequency of consumption of different food items belonging to a particular food group and 24-hour recall. By conducting one-on-one interviews, the data was collected for the pre-structured questionnaire. Before collecting data on food frequency and food intake an exhaustive list of locally available food items and food ingredients were recited to the respondent to get a better recall of consumed food items. Data on the intake of different food items from a particular food group was cleaned and analyzed in Dietcal software from where the collective intake of a particular food group was obtained and was compared with the recommended dietary intake suggested by *ICMR (2020).*

RESULTS AND DISCUSSION

The weight of male and female adults was significantly ($p \leq 0.05$) higher than their respective reference value (Table 1). The weight of males was higher than females recording 68.8 kg and 57.6 kg respectively. The height of male (169.8cm) and female (156.1cm) respondents was observed significantly ($p \leq 0.05$) lower than the reference values. It was

Table 1. Anthropometric measurements of adults of Kumaon region Uttarakhand

Variable	Reference value (male)	Male (n=100)	t value	Reference value (female)	Female (n=100)	t value
Height (cm)	175.0[1]	169.8±1.69	4.37*	162.0[1]	156.1±3.9	12.8*
Weight(kg)	65.0[1]	68.8±5.2	2.4*	55.0[1]	57.6±6.6	2.2*
BMI (kg/m^2)	20.75[1]	22.0±1.67	10.1*	20.95[1]	21.8±2.49	2.42*
Waist circumference(cm)	<94.0[2]	93.5±4.7	11.5*	<80.0	87.8±8.5	1.92^{NS}
Hip circumference(cm)	94-105[2]	98.1±2.6	1.92^{NS}	97-108	98.5±6.8	1.92^{NS}
Waist-to-Hip Ratio	≤0.90[2]	0.95 ±0.09	2.78*	≤0.85[2]	0.89±0.06	2.12*

Values are Mean ± SD; *Significant at 5% level; ^{NS} Non –significant; [1] ICMR (2020); [2] WHO (2008) standards

found the mean values of BMI of male and female adults were 22.0 kg/m^2 and 21.8 kg/m^2, respectively. The recorded values of BMI in the male and females were significantly ($p\leq 0.05$), ($p\leq 0.01$) higher than the reference values. Further, perusal of data presented in Table 1 indicated that the mean waist-to-hip ratio of males and females was 0.95 and 0.89, respectively. The recorded values in both the males and females were significantly higher ($p\leq 0.05$) than the reference value. BMI higher than reference values and a higher waist-to-hip ratio have been found indicating a strong possibility of becoming overweight and obese in the near future. The results of the present study are corroborated with the findings of *Chakroborty et al. (2022)*.

In a previous study, *Semwal et al. (2019*) observed that 24.5 and 8.9 per cent of the adults were found to be overweight and obese, respectively in the Garhwal region of Uttarakhand. They concluded that imbalanced dietary intake was found to be associated directly with overweight and obesity.

Data on the frequency of consumption of foods from different food groups among adults have been depicted in Table 2. It was observed that among cereals and millet products, wheat and rice were found to be consumed on a daily basis and finger millet locally known as *mandua,* and barnyard locally known as *jhangora* were consumed on a weekly basis. While pulses were consumed on alternative days. The other vegetables were also found to be consumed on alternative days while green leafy vegetables, were consumed on a weekly basis. Fruits and vegetables, except tomato were consumed on a weekly basis. *Noopur (2015*) stated that tribal women besides consuming food produced and parched and also collected from the forest and many leafy plants were categorized as underutilized vegetables. Flesh foods were found to be consumed weekly and these were consumed mainly among male respondents. Besides, milk in the form of tea, potato, onion, tomato, *tulsi* leaves, garlic and ginger, oil, ghee, and sugar were found to be consumed daily indicating non-adherence to the suggested daily dietary intake given by *ICMR (2020*). As per their recommendation pulses, milk, vegetables, and green leafy vegetables should be consumed daily, and nuts and fruits should be consumed at least three times a week or alternatively.

Assessment of dietary intake of adults : The mean daily intake of cereals and millets among male respondents engaged in sedentary work activity was found to be 309.3g which was significantly ($p\leq 0.05$) higher than the recommended dietary intake (RDI) as advocated by *ICMR (2020*). On the other side mean intake of cereals and millets among female respondents engaged in moderate work activity was 265.1g which was significantly ($p\leq 0.05$) lower than the corresponding RDI (Table 3). Cereals and millets are the concentrated sources of energy besides protein and minerals. Higher consumption may lead to overweight and lower consumption may lead to energy malnutrition therefore it should be consumed as per the suggested amounts.

Pulses and flesh foods are the concentrated source of protein however unlike flesh foods pulses are endowed with antinutrients which may limit the bioavailability of protein. It was observed that male respondents had only 56.5g of pulse and flesh foods in their daily diets which was substantially ($p\leq 0.01$) less than the RDI. Concerning female respondents, an analogous trend was noted. The average intake of pulses among female respondents was 51.0g, which was likewise considerably ($p\leq 0.01$) less than the comparable RDI. It was also observed that unlike male respondents they did not consume flesh foods.

Milk is another rich source of protein with excellent

Table 2. Frequency of food consumption pattern by adults of Kumaon region of Uttarakhand

Foodstuffs	Daily	Alternately	Weekly	Fortnightly	Rarely	Not consumed
Cereals						
Wheat	200(100)	-	-	-	-	-
Rice	200(100)	-	-	-	-	-
Refined flour		21(10.5)	83(41.5)	66(33.0)	30(15.0)	
Finger Millet		09(4.5)	45(22.5)	72(36.0)	70(35.0)	13(6.5)
Barnyard Millet		-	120(60.0)	51(25.5)	03(1.5)	26(13.0)
Pulses						
Bengal gram		28(14.0)	106(53.0)	52(26.0)	14(7.0)	
Black gram		60(30.0)	108(54.0)	28(14.0)	04(2.0)	
Green gram		39(19.5)	116(58.0)	44(22.0)	01(0.5)	
Red gram		49(24.5)	110(55.0)	32(16.0)	09(4.5)	
Mothbean					34(17.0)	166(83.0)
Lentil		28(14.0)	106(53.0)	60(30.0)	06(3.0)	
Soyabean		19(9.5)	56(28.0)	103(51.5)	22(11.0)	
Black soybean		02(1.0)	125(62.5)	46(23.0)	27(13.5)	
Horsegram		04(2.0)	38(19.0)	147(73.5)	11(5.5)	-
Dubke		07(3.5)	108(54.0)	51(25.5)	34(17.0)	
GLV						
Bathua		22(11.0)	116(58.0)	44(22.0)	18(9.0)	-
Coriander	14(7.0)	59(29.5)	97(48.5)	30(15.0)		
Fenugreek		08(4.0)	101(50.5)	79(39.5)	12(6.0)	
Mustard leaves			95(47.5)	26(13.0)	79(39.5)	
Mint leaves	05(2.5)	19(9.5)	96(48.0)	66(33.0)	14(7.0)	
Spinach			115(57.5)	29(14.5)	56(28.0)	
Roots and tubers						
Radish		07(3.5)	90(45.0)	83(41.5)	20(10.0)	
Carrot		07(3.5)	68(34.0)	115(57.5)	10(5.0)	
Potato	200(100)	-				
Onion	200(100)	-				
Colocasia				14(7.0)	184(92.0)	02(1.0)
Ginger	185(92.5)	15(7.5)	-	-		
Garlic	181(90.5)	19(9.5)	-	-		
Turnip		02(1.0)	53(26.5)	76(38.0)	69(34.5)	
Other vegetables						
Brinjal		75(37.5)	100(50.0)	25(12.5)		
Tomato	125(62.5)	75(37.5)	-	-		
Cauliflower		70(35.0)	94(47.0)	36(18.0)		
Cabbage		22(11.0)	116(58.0)	62(31.0)		
Greenchilly	06(3.0)	10(5.0)	66(33.0)	67(33.5)	51(25.5)	
Lady finger		79(39.5)	95(47.5)	26(13.0)		
Peas		41(20.5)	126(63.0)	33(16.5)		
Capsicum		44 (22.0)	142(71.0)	14(7.0)		
Pumpkin		44 (22.0)	142(71.0)	14(7.0)		
Fruits						
Guava		03(1.5)	52(26.0)	106(53.0)	39(19.5)	
Apple		10(5.0)	69(34.5)	105(52.5)	16(8.0)	
Banana		04(2.0)	55(27.5)	87(43.5)	54(27.0)	
Ber		02(1.0)	34(17.0)	86(43.0)	78(39.0)	
Lemon	02(1.0)	23(11.5)	85(42.5)	63(31.5)	27(13.5)	
Orange		16(8.0)	66(33.0)	99(49.5)	19(9.5)	
Any other		04(2.0)	83(41.5)	107(53.5)	06(3.0)	

Aromatic plants						
Curry leaves		09(4.5)	70(35.0)	71(35.5)	45(22.5)	05(2.5)
Fennel	30(15.0)	60(30.0)	50(25.0)	30(15.0)	30(15.0)	
Medicinal plants						
Tulsi	190(95.0)	10(5.0)	-	-	-	
Giloy	75(37.5)	65(32.5)	60(30.0)	-	-	
Mulethi	70(35.0)	100(50.0)	30(15.0)	-	-	
Milk and milk products						
Cow milk	91(42.5)	15(7.5)	27(13.5)	33(16.5)	34(17.0)	-
Buffalo milk	89(44.5)	03(1.5)	31(15.5)	71(35.5)	06(3.0)	-
Curd	27(13.5)	75(37.5)	46(23.0)	29(14.5)	23(11.5)	
Buttermilk		20(10.0)	74(37.0)	99(49.5)	-	7(3.5)
Butter	02(1.0)	31(15.5)	70(35.0)	66(33.0)	31(15.5)	
Sweets	02(1.0)	18(9.0)	58(29.0)	101(50.5)	21(10.5)	
*Fats and oil*s						
Desighee	20(10.0)	47(23.5)	74(37.0)	49(24.5)	09(4.5)	01(0.5)
Hydrogenated fat	06(3.0)	60(30.0)	21(10.5)	101(50.5)	12(6.0)	
Refined oil	109(54.5)	43(21.5)	35(17.5)	13(6.5)		
Mustard oil	150(75.0)	45(22.5)	05(2.5)	-		
Flesh foods						
Eggs		17(8.5)	77(38.5)	58(29.0)	05(2.5)	43(21.5)
Meat		02(1.0)	50(25.0)	84(42.0)	21(10.5)	43(21.5)
Any other			43(21.5)	69(34.5)	48(24.0)	40(20.0)

bioavailability both the male and female respondents had consumed significantly lower consumption of milk than its respective RDI. Besides protein, milk also serves as an excellent source of calcium and B-complex vitamins. The mean daily consumption of milk and milk products among male and female respondents was 195.7 ml 180.5 ml, respectively.

Vegetables are an excellent source of minerals and vitamins and have been categorized as protective foods as they play a pivotal role in providing immunity and fighting against infection and inflammation (*Noopur et al., 2023*). Per day five to six servings of vegetables and fruits (500-600g) are suggested by ICMR to keep our body healthy and free from diseases. Results indicated that male respondents consumed 381.2g and female respondents consumed 357.3g of fruits and vegetables which was significantly ($p \leq 0.01$) lower than its respective RDIs. Similarly, results of low intake of vegetables among rural households were observed by *Kareem et al., (2016*). Similar results were observed by *Rao et al. (2017*) they indicated that the intake of all foods except other vegetables and roots and tubers were below recommended levels among rural man and women.

Both the male and female respondents consumed

Table 3. Mean daily dietary intake of adults under study

Food groups	RDI (g)	Male (n=100)		RDI	Female (n=100)	
		Actual Intake	t value		Actual intake	t-value
Cereals and Millets	275.0	309.3±7.6	2.2*	300.0	265.1±5.9	2.5*
Pulses/flesh foods	80.0	56.5±10.4	9.2**	90.0	51.0±6.8	7.6**
Milk and Milk Products	300.0	195.7±5.1	20.3**	300	180.5±5.6	23.6**
Roots and Tubers	100.0	89.9±2.4	13.5**	100.0	79.2±5.4	8.6**
Green leafy Vegetable	150.0	50.6±12.0	2.6*	150.0	60.2±21.5	2.3*
Other Vegetables	200.0	160.2±5.03	1.9*	200.0	144.8±3.1	3.4**
Fruits	150.0	80.5±20.3	9.6**	150.0	73.1±3.2	23.7**
Fats and Oils	25.0	37.2±18.2	3.96**	20.0	34.1±6.0	9.7**
Oilseeds and Nuts	30.0	5.76±1.3	7.15**	30.0	5.3±1.4	36.2**
Sugar and Jaggery	30.0	38.5±3.3	21.4**	30.0	37.3±12.2	2.6*

RDI-Recommended Dietary Intake (ICMR 2020). Values are Mean ± SD; * Significant at 5%; **Significant at 1% level

37.2g and 34.1g fat and oil, respectively which was significantly higher than the respective RDI's (Table 3). Fats and oils are a concentrated source of energy, and add palatability and satiety value to foods. However, excessive use of fats and oils is harmful and may cause unwanted health problems. Nuts and oilseeds consumption for both male and female respondents was 5.76 and 5.30, respectively which was significantly lower than RDI values of 30 g.

The sugar and Jaggery consumption among male and female respondents were observed to be 38.5g and 37.3g, respectively (Table 3), which was significantly higher than the respective RDIs. Similar results of imbalanced and low intake of foods were observed by *Nasreddine et al. (2007)*. In another study it was revealed that social disparity plays an important role in inadequate food intake, specifically micronutrient deficiencies causing hidden hunger (*Vij and Mann, 2022*).

CONCLUSION

The frequency of consumption of foods from different food groups indicated that the frequency of consuming milk and milk products, pulses, fruits and vegetables, nuts, and oil seeds was not found to be followed as per the guidelines of ICMR on healthy diets. Similarly, the consumed quantity of pulses, milk and milk products, fruits and vegetables, and oil seeds and nuts was found significantly lower than their respective RDIs. The consumed quantity of fats oils and sugars was found to be significantly higher than the respective RDIs. The measurements of weight, waist circumferences, hip circumferences, and waist to hip ratio have indicated the prevalence of overweight and abdomen obesity. There is an urgent need to impart nutrition education such as the importance of various food groups, balanced diets, and quantities of food groups to be consumed among adults of Kumaon region Uttarakhand to avoid double burden of malnutrition.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

REFERENCES

Asghari, G.; Mirmiran, P.; Yuzbashian, E. and Azizi, F. (2017). A systematic review of diet quality indices in relation to obesity. *British J. Nutri.*, **117**(8):1055-1065.

Brunn, H.H.; Togo, P.; Andersen, L.B. and Heitmann, B.L. (2011). Adult food intake patterns are related to adult and childhood socioeconomic status. *J. Nutr.*, **141**(5):928-934.

Chakroborty, K.; Gupta, D. S. and Pal, P. (2022). Nutritional status of rural households: A case study in Cooch Behar district of West Bengal. *Indian Res. J. Ext. Edu.*, **22**(1):97-102.

Chauhan, J.K. and Saikia, P. (2021) Complications of financial institutions in promoting women entrepreneurs**.** *Curr. Micro. Appl. Sci..,* **10** (1) 1872-1875.

Chayal, K. and Dagar, A. (2017). Effectiveness of the training programme on "infant feeding practices" in terms of gain in knowledge of rural women. *Indian Res. J. Ext. Edu.*, **17**(2):5-8.

Gupta, R.; Deedwania, P.C.; Sharma, K.; Gupta, A.; Guptha, S.; Achari, V.; Asirvatham, A.J.; Bhansali, A.; Gupta, B.; Gupta, S. and Jali, M.V. (2012). Association of educational, occupational and socioeconomic status with cardiovascular risk factors in Asian Indians: a cross-sectional study. *Public Library of Sci.,* **7** (8):48-55.

ICMR (2010). Reference anthropometric measurements. Dietary guidelines for Indians. A report of the expert group of the Indian Council of Medical Research, New Delhi, National Institute of Nutrition, Hyderabad, India.

ICMR (2020). Nutrient requirements and recommended dietary allowance for Indians. A report of the expert group of the Indian Council of Medical Research, New Delhi, National Institute of Nutrition, Hyderabad, India.

Kareem, O.W; Oladipo, F.O. and Kharde, P.B. (2016). Consumption pattern of vegetables among rural households in Moro local government area of Kwara State, Nigeria. *Indian Res. J. Ext. Edu.*, **16**(1):72-75.

Khatri, K; Singh, S.P.; Khatri, M. and Shinde, R. (2022). Knowledge level of rural women on health and nutritional practices in Tikamgarh district of M.P. *Indian Res. J. Ext. Edu.***, 22**(3):135-139.

Kumar, I. and Gautam, M. (2022). Enhance nutritive value through dietary diversity in the rural area of Uttar Pradesh. *Indian Res. J. Ext. Edu.***, 22**(2): 29-33.

Mohan, N. and Saikia, P. (2022). Knowledge of tribal women regarding nutrition practices in Assam. *Indian Res. J. Ext. Edu.***, 22**(5):313-316.

Nasreddine, L.; Hwalia,N.; Sibai, A.; Hamze , M. and Massin, D.P. (2007). Food consumption patterns in an adult urban population in Beirut, Lebanon. *Public Health Nutr.*, **9**(2): 194–203.

Noopur, K. (2015). Underutilized crops of North East: Potential conventional foods of the future. In Proc. National seminar on a seminar on Sustaining Hill Agriculture in changing Climate, held during 5-7 Dec at Agartala, pp 41.

Noopur, K.; Babu, S. and Somasundaram, E. (2021a). On-farm assessment of French bean (*Phaseolus vulgaris* L.) cultivars for seed production in the Nilgiri hills. *Ind. J. Hill. Farm*. **34** (1):158-161.

Noopur, K.; Ansari, M.A. and Panwar, A.S. (2021b). Self-reliance in year-round vegetable production and consumption through Kitchen-garden model in Indo Gangetic Plains: *Ind. J. Agri. Sci.* **91**(12): 1773-7.

Noopur, K.; Chauhan, J.K.; Walia, S.S.; Verma, M.R.; Dhar, U.; Choudhary, S. and Chikkeri, S.S. (2023). Constraints in vegetable production in India: A review. *Indian Res. J. Ext. Edu.,* **3**(3): 14-19

Panwar, A.S.; Ravisankar, N.; Singh, R.; Prusty, A.K.; Shamim, M.; Ansari, M.A. and Noopur, K. (2021). Potentially integrated farming system modules for divers' ecosystems of India. *Indian J. Agro*., **66** (5th IAC Special issue): S15-S32.

Rao, K.M.; Balakrishna, N.; Arlappa, N.; Laxmaiah, A. and Brahmam, G.N.V. (2017). Diet and nutritional status of women in India. *J. Human Eco.,* **29**(3): 165-170.

Semwal, J.; Shikha, D.; Srivastava, A.K.; Vyas, S. and Juyal, R. (2019). An epidemiological evaluation of predictors of overweight and obesity in Garhwal region of Uttarakhand. *J. Prev. Med. and Hyg.*, **60** (3) : E211.

Sharma, A.; Venya, V. and Chauhan, J. (2014). Entrepreneurial behavior of potato growers in Kohima district of Nagaland. *Indian Res. J. Ext. Edu.*, **14** (2): 82-86.

Sharma, A.K.; Chauhan, J., and Kumar, V. (2012). Perception dynamics of farmers affecting the sustainability of mustard production: An analytical study. *Indian Res. J. Ext. Edu.*, **13** 93):25-29.

UNICEF (2019). The State of the World's Children 2019. Children, Food, and Nutrition: Growing well in a changing world. UNICEF, New York.

Vij, A. and Mann, S.K. (2022). Food consumption pattern of farming families in Punjab. *Indian J. Ext. Edu.,* **58** (2):21 -25.

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