

Food Insecurity and its Association with Dietary Diversity: A Cross-Sectional Study in Rural Households in Jammu

Bhavna Langer, Rajiv Kumar Gupta, Rashmi Kumari, Richa Mahajan

Department of Community Medicine, GMC Jammu, Jammu and Kashmir, India

Abstract

Background: Food insecurity is a matter of public health concern as it is associated with adverse health outcomes particularly among vulnerable population. Accessibility and availability of nutritious and culturally appropriate food is paramount to achieve zero hunger. To assess the prevalence of household food insecurity, to estimate the household dietary diversity and its association with household food insecurity. **Material and Methods:** Using multistage sampling 381 rural households were surveyed. Household Food Insecurity Access Scale and Household Dietary Diversity Scale were used as study instruments. Chi square test was used to compare the two groups and $P < 0.05$ was considered to be statistically significant. **Results:** Prevalence of household insecurity was 33.3% (127) among the surveyed households and 8.1% (31) had severe food insecurity. The mean HFIS score was 6.85 ± 4.82 . The household Dietary diversity score was 8.14 ± 1.54 for food secure and 6.51 ± 1.38 for severely food insecure households. There was a statistically significant difference in intake of milk and milk products, fruits, eggs and meat/poultry among food secure and insecure households ($P < 0.001$ respectively). **Conclusion:** Food insecurity was high in rural households and was associated with lower dietary intake of foods from protein group, necessitating a need to reinforce the food security programmes in rural India with focus to enhance protein rich diet.

Keywords: Diet, food insecurity, household, rural, prevalence

INTRODUCTION

Food insecurity (FI), a global phenomenon, is widely prevalent in poor households. FI is a state of chronic, economically or physically deprived access to food in quality or quantity, and the dietary intake is not able to meet the nutritional needs and support the overall health of the people residing in a household or entire community.^[1] At the household level, FI is suggestive of psychosocial dysfunction, social and familial problems, and a resultant decline in health status, of which malnutrition is the most serious consequence.

Besides extreme environmental conditions, FI is influenced by social risk factors, such as employment, economic dimensions, gender, and residence (urban or rural). Household FI also affects food diversity (FD), and the most vulnerable groups are children and women. FI leads to lower consumption of fruits and vegetables, causing micro- and macronutrient deficiencies and affecting the physical and mental health status of the individual.^[2]

Population explosion, weather vagaries, and ever-declining land for cultivation are all making food security (Sustainable

Development Goal 2) difficult to achieve.^[3] Disease outbreaks and ongoing conflicts or wars are adding to the problem of FI. Fragilities in the agrifood system, disruption in supply chains, increased prices of seeds and fertilizers, etc., have led to a rise in food prices. India ranked at number 68 in the Global Food Security Index 2022.^[4]

A study on the prevalence of FI helps governments to rethink and replan about making nutritious diets available and affordable, leaving no one behind. There is a paucity of literature on FI in rural areas; hence, this study was conducted to assess the prevalence of household FI in a rural area, find its associated factors, and estimate the household FD and its association with household FI.

Address for correspondence: Dr. Rashmi Kumari,
PG Department of Community Medicine, GMC Jammu,
Jammu and Kashmir – 180 001, India.
E-mail: rashmi.kailu@yahoo.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Langer B, Gupta RK, Kumari R, Mahajan R. Food insecurity and its association with dietary diversity: A cross-sectional study in rural households in Jammu. Indian J Community Med 2024;49:70-5.

Received: 29-09-22, **Accepted:** 06-11-23, **Published:** 12-01-24

Access this article online

Quick Response Code:



Website:
www.ijcm.org.in

DOI:
10.4103/ijcm.ijcm_811_22

METHODOLOGY

Study design: Cross-sectional study

Study area: Village Kirpind of R.S. Pura Block, Jammu, UT of Jammu and Kashmir.

Sample size calculation: Assuming that FI has a prevalence of 50.4% with a relative precision of 15%, a confidence interval of 95%, a design effect of 2, and a rate of nonresponse of 10%, the sample size was calculated as 369.^[5]

Study period: The study was conducted between January and March 2019.

Data collection: R.S. Pura Block has eight health zones. Using multistage sampling, firstly Simbal Zone was selected using the lottery method; in the second stage, the villages in the Simbal Zone were listed and Village Kirpind was selected randomly. Village Kirpind has a population of 3825, and there are 723 households. All the houses in the village were line listed, and using a table of random numbers, households were selected till the sample size was achieved. Village panchayat members were informed about the purpose of the survey. The head of the household was approached and explained about the study. After seeking permission, the participant was approached and explained the objective of the study. A predesigned, semi-structured, and pretested questionnaire was used as a study instrument. The time taken to administer the tool and record the responses was 20 minutes. The confidentiality of each participant was ensured. Written consent was sought from the participants. The interview was conducted in privacy to make sure that participants did not conceal the true food situation of the household and did not feel embarrassed to give correct answers in front of family members.

Inclusion criteria

1. Participants included females aged 20 years or above.
2. Females responsible for the preparation and distribution of food in the household at least twice a day for at least the last 4 weeks.
3. Nonpregnant and non-lactating.

Exclusion criteria

1. Eligible participant not available or preoccupied in at least two visits.
2. Did not give consent.

Institutional Ethics Committee (IEC) Approval: The study was duly accorded permission by the Institutional Ethical Committee of Govt. Medical College Jammu (No. IEC/2018/591).

Study instrument: It comprises three parts

1. Sociodemographic profile—It includes type of family, age, education status, employment status, and family income.

2. Household Dietary Diversity Scale (HDDS)^[6]—It reflects the dietary quality of the household as a whole and includes a set of 12 food groups. The person who cooked food in the household was requested to answer the questions. The

reference period was the previous 24 hours. For this study, food consumed included those prepared and not prepared at home. The value of the HDDS variable for a household ranges from 0 to 12 for food consumed by members of the household (0 = no, 1 = yes). The scores of each household are added up.

$$\text{Average HDDS} = \frac{\text{Sum of HDDS}}{\text{Total no. of households}}$$

3. Household FI Access Scale (HFIAS)^[7]: The person who used to prepare food most of the time was asked to reply to the questionnaire. It consists of nine occurrence questions representing access, perceptions regarding the vulnerability of food, behavioral responses to insecurity, and nine questions enquiring about the frequency, which were asked to determine how often the condition occurred in the previous four weeks (30 days). The responses are recorded as a range, presented as rarely (1), sometimes (2), or often (3). “Household” included “persons who for at least four days of a week took meals together and slept under the same roof.” The score for a household ranged from a maximum of 27 to a minimum score of 0. If the score is high, then the household is considered to be experiencing more FI (access). The HFIAS score (0–27) was calculated by summing up the frequency of occurrence during the last 4 weeks for all the FI-related conditions.

$$\text{Average HFIAS Score}^{[7]} = \frac{\text{Sum of HFIAS scores in the sample}}{\text{Number of HFIAS scores (i.e., households) in the sample}}$$

Households were categorized into four levels of household FI (access): food secure and mild, moderately, and severely food insecure based on affirmative responses to more severe conditions as given in responses to questions marked with different colors in Table 1. The occurrence questions in HFIAS focus on three different domains of FI: anxiety and uncertainty about the supply of food in the household, insufficient quality both in terms of variety and preferences for a particular type of food, and insufficiency in food intake and the physical consequences occurring because of it.

Food-secure household (FSH) had “members who were rarely worried in the last four weeks for not taking enough food.”

Mildly food-insecure households (MI-FIH) had “members sometimes or often worried that they were not having enough food, and/or were not able to eat foods which they liked, ate monotonous, and rarely took undesirable foods.”

Moderately food-insecure households (MO-FIH) had “members who sometimes or often ate a diet that was not desirable or, had started cutting rarely or sometimes on the quantity by decreasing the meal portion or number and frequently reduced food quality.”

Severely food-insecure households (SE-FIH) had “often to cut on meal portions or the number and/or faced any of the

Table 1: Assessment of household food insecurity using HFIAS among the surveyed households

	No	Rarely	Sometimes	Often
1. In the past 4 weeks, did you worry that your household would not have enough food?	264 (69.3)	54 (14.2)	45 (11.8)	18 (4.7)
2. In the past 4 weeks, were you or any household members not able to eat the kinds of foods you/they preferred because of a lack of resources?	275 (72.2)	42 (11.0)	45 (11.8)	19 (5.0)
3. In the past 4 weeks, did you or any household members have to eat a limited variety of foods due to a lack of resources?	296 (77.7)	33 (8.7)	39 (10.2)	13 (3.4)
4. In the past 4 weeks, did you or any household members have to eat some foods that you/they really did not want to eat because of a lack of resources to obtain other types of food?	303 (79.5)	30 (7.9)	39 (10.2)	9 (2.4)
5. In the past 4 weeks, did you or any household members have to eat a smaller meal than you/they felt you/they needed because there was not enough food?	338 (88.7)	17 (4.5)	21 (5.5)	5 (1.3)
6. In the past 4 weeks, did you or any household members have to eat fewer meals in a day because there was not enough food?	344 (90.1)	14 (3.7)	20 (5.2)	3 (0.8)
7. In the past 4 weeks, was there ever no food of any kind to eat in your household because of lack of resources to get food?	356 (93.4)	16 (4.2)	8 (2.1)	1 (0.3)
8. In the past 4 weeks, did you or any household members go to sleep at night hungry because there was not enough food?	359 (94.2)	14 (3.7)	7 (1.8)	1 (0.3)
9. In the past 4 weeks, did you or any household members go a whole day and night without eating anything because there was not enough food?	367 (96.3)	11 (2.9)	2 (0.5)	1 (0.3)
Food secure		Mildly food insecure	Moderately food insecure	Severely food insecure

three conditions which predicted severity (severe shortage of food, not having food for dinner or not eaten for entire day and night).”

Data analysis

Data that were collected were entered in Microsoft Excel and also transferred to Statistical Package for the Social Sciences (SPSS) (version 20.0) for conducting statistical analysis. Wherever applicable, proportion and mean (standard deviation (SD)) were calculated. The Chi-square test was used to compare sociodemographic variables and different food categories between the food-secure and food-insecure groups, and $P < 0.05$ was considered to be statistically significant.

RESULTS

A total of 381 households were assessed. The mean age of the participants was 39.90 ± 11.14 years, and 86 (22.6%) participants were less than 30 years of age, and only 3.67% were more than 70 years. 90.55% of respondents were housewives, and 15.74% were illiterate. 97.11% owned the house they were residing. The mean family size was 4.97 ± 1.84 . The mean family income in Rs per month was <5000 , $5000-20,000$, and $>20,000$ in 12.59%, 31.49%, and 55.90% of households, respectively. The percentage of monthly family income spent on acquiring food items was $<25\%$, $25-50\%$, $50-75\%$, and $75-100\%$ in 48.55%, 39.37%, 11.54%, and 0.52% of households, respectively.

Table 1 shows that 30.70% of households were worried that they did not have enough food. 27.82% had eaten food that was of limited variety as they lacked the resources to purchase it. 9.71% had eaten fewer meals. The prevalence of household FI was 33.3% (127/381) among the surveyed households, while 8.1% (31/381) had severe FI [Table 2]. The mean HFIS score was 6.85 ± 4.82 . Among FIHs (no. 127) when assessed for different domains, anxiety and uncertainty were found

in 112 (88.18%), insufficient quality in 119 (93.70%), and insufficient quantity in 62 (48.81%) households.

The mean household diversity score was 7.76 ± 1.58 ; among the households with food security, it was 8.14 ± 1.54 , and in FIHs, the score was 7.00 ± 1.38 (MI-FIH 7.4 ± 1.19 , MO-FIH 6.8 ± 1.42 , and SE-FIH 6.51 ± 1.38). When severely, moderately, and mildly FIHs were compared, 32.3%, 18.4%, and 6.45% had not consumed milk and milk products ($X^2 = 38.35$, $P < 0.001$); 19.4%, 12.2%, and 8.5% had not consumed vegetables ($X^2 = 4.78$, $P = 0.18$); 80.6%, 67.35%, and 36.2% had not consumed fruits ($X^2 = 67.55$, $P < 0.001$); and 12.9%, 14.3%, and 2.1% of households, respectively, had diets deficient for oils and fats ($X^2 = 12.14$, $P < 0.001$). Percentage consumption of all food categories except cereals, poultry, sugar or honey, and miscellaneous or junk food was more in MI-FIH as compared to SE-FIH [Figure 1]. A statistically significant difference was found between FSH and FIH for consumption of food categories, such as milk and milk products, fruits, meat, eggs, and junk food ($P < 0.05$). 92.1% of FIHs had not consumed junk food as compared to 75.6% of FSHs [Table 3].

The mean number of family members among FSH and FIHs was 5.16 ± 1.93 and 4.61 ± 1.60 , respectively, and this difference was found to be statistically significant ($t = 2.75$, $P < 0.001$). Among FIHs, 36.2% were Hindus, head of the family of 40.15% of households were laborers by occupation, 17.32% were illiterate, and 78.74% of households had a monthly family income of less than Rs 20,000. The difference among the two groups was found to be statistically significant for religion ($P < 0.001$), occupation ($P < 0.001$), literacy ($P < 0.001$), and monthly income ($P < 0.001$) [Table 4].

DISCUSSION

Food, a basic necessity for one and all, is essential for his or her sustenance. A healthy life is the outcome of adequate food

intake. The present study aimed to assess FI at the household level in a rural area of Jammu District, Union Territory (UT) of Jammu and Kashmir.

The household FI prevalence in the present study was 33.3%, and these results were lower than those reported by Gopichandran V (74.6%),^[8] Chinnakali P (77.2%),^[9] Tomayko EJ (61%),^[10] Mukhopadhyay DK (52.8%),^[11] and Agarwal S (51%).^[12] However, Mohamadpour M^[2] reported a lower rate of FI at 24.9% from a study conducted among palm plantation households in Malaysia. The authors pointed out that subsistence agriculture is difficult for people in palm plantations as there is less availability of land, and also, the markets are far off, leading to poor accessibility. The varied results of FI prevalence are likely due to different methods of assessment, sociocultural factors, and use of dietary staples based on climate and geography.

The results of the present study have revealed that FIHs had a large family size and low family income. 18.11% of FIHs were spending >50% of monthly income to acquire food items. Chinnakali P^[9] reported that despite spending half of the monthly earnings on purchasing food items FI still was high. Due to economic constraints, households that are food insecure are likely to procure food of not only low quality but also less quantity. Household income was found to be an important determinant of FI in various studies, both in developing and developed countries.^[13-16] Chinnakali P^[9] also reported that low income per capita per month was a significant independent predictor of FI. FIHs

in the present study reported anxiety and uncertainty in 29.4% of respondents and insufficiency in quality in 31.2% and insufficient intake of food in 16.3% of households. Coates *et al.*^[17] also found that insufficient quantity or quality, uncertainty, and lack of acceptability are common experiences shared by FIHs.

Dietary diversity scores offer a quick and simple assessment of the macro- and micronutrients in the diet and their adequacy. In the present study, it was found that the mean household diversity score was 7.76 ± 1.58 with a score of 8.14 ± 1.54 in FCHs and 6.15 ± 1.38 in severely FIHs. Mukherjee A^[18] reported lower median dietary diversity scores of 6.28 ± 1.3 among participants in a study conducted in West Bengal. Gokhale D^[19] reported a still lower mean dietary diversity of 3.6 ± 1.3 among pregnant women from Pune. A literature review showed that the severity of FI was associated significantly with low diversity in diet among marginalized households in rural Bangladesh.^[20] Antwi J *et al.*^[21] reported that FI at the household level was a predictor of the type of diverse diet that was consumed by primary school children in Ghana.

Diet diversity scores in the present study have been found to be better off than most of the studies quoted above. Among the reasons for this are the use of indigenous food, presence of

Table 2: Prevalence of household food insecurity in the surveyed households

Variable	No (381)	Percentage
Food secure	254	66.7
Mildly food insecure	47	12.3
Moderately food insecure	49	12.9
Severely food insecure	31	8.1

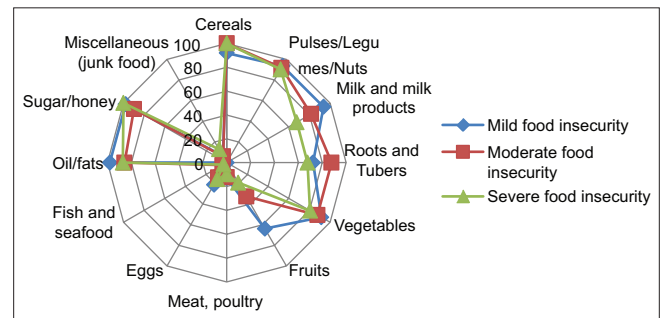


Figure 1: Household dietary diversity among households with mild, moderate, and severe food insecurity

Table 3: Household dietary diversity and its association with food insecurity

Food category	Food secure (254)		Food Insecure (127)		χ^2	P
	Yes n (%)	No n (%)	Yes n (%)	No n (%)		
Cereals	250 (98.4)	4 (1.6)	126 (99.2)	1 (0.8)	0.405	0.52
Pulses/legumes/nuts	226 (89)	28 (11)	117 (92.1)	10 (7.9)	0.935	0.33
Milk and milk products	245 (96.5)	9 (3.5)	105 (82.7)	22 (17.3)	21.58	<0.001*
Roots and tubers	209 (82.3)	45 (17.7)	98 (77.2)	29 (22.8)	1.41	0.23
Vegetables	234 (92.1)	20 (7.9)	111 (87.4)	16 (12.6)	2.20	0.13
Fruits	196 (77.2)	58 (22.8)	52 (40.9)	75 (59.1)	48.88	<0.001*
Meat/poultry	66 (26)	188 (74)	15 (11.8)	112 (88.2)	10.16	<0.001*
Eggs	84 (33.1)	170 (66.9)	22 (17.3)	105 (82.7)	10.45	<0.001*
Fish and seafood	14 (5.5)	240 (94.5)	3 (2.4)	124 (97.6)	1.97	0.16
Oils/fats	244 (96.1)	10 (3.9)	115 (90.6)	12 (9.4)	4.72	0.30
Sugar/honey	249 (98)	5 (2.0)	121 (95.3)	6 (4.7)	2.29	0.13
Miscellaneous/junk food	62 (24.4)	192 (75.6)	10 (7.9)	117 (92.1)	15.10	<0.001*

*P<0.05 statistically significant

Table 4: Sociodemographic variables and their association with food insecurity

Variable	Food secure (254) n (%)	Food insecure (127) n (%)	χ^2	P
Type of family			0.64	0.42
Nuclear	137 (53.930)	74 (58.26)		
Joint	117 (46.06)	53 (41.73)		
Religion			64.82	<0.001*
Hindu	45 (17.71)	46 (36.22)		
Sikh and others	209 (82.28)	81 (63.77)		
Occupation of head of family			47.23	<0.001*
Labor	31 (12.20)	51 (40.15)		
Service	97 (38.18)	18 (14.17)		
Business	35 (13.77)	17 (13.38)		
Others	91 (35.82)	41 (32.00)		
Education of head of family			14.91	<0.001*
Illiterate	20 (7.87)	22 (17.32)		
Primary and middle	41 (16.14)	28 (22.04)		
Secondary	121 (47.63)	58 (45.66)		
Higher secondary and above	72 (28.34)	19 (14.96)		
Family income per month			91.25	<0.001*
Up to Rs 20000	69 (27.16)	100 (78.74)		
More than Rs 20000	185 (72.83)	27 (21.25)		

*P<0.05 statistically significant

farm space, and low prices of food items in rural areas. A study by Vijaya Bhaskar AV *et al.*^[22] concluded that interventions should be specific to the geographical region for improving household diet diversity and suggested measures such as using bio-fortified crops, diversifying crops, and conducting camps for animal health. Results have shown that the intake of junk food among FCHs was 25% in comparison with about 8% among FIHs, and these results are consistent with those reported by Bezerra IN *et al.*^[23] For other food items, a statistically significant association was found for milk and milk products, fruits, meats, and eggs among FCH and FIH. Some authors have reported that the overall nutrition quality of diet improves as the diversity of diet increases.^[24,25]

This community-based study is the first of its kind conducted in the rural population of the Jammu region. As food fads, food preference and gender discrimination in food allocation, were not considered in the study so this is a limitation of the present study. Another limitation is the recall bias of the respondent, which might have resulted in under- or overreporting. As this study was conducted over a span of 3 months, seasonal variation of diet diversity could not be assessed; also, as the study was conducted in a single village of R.S. Pura Block of Jammu District, the results cannot be generalized.

CONCLUSION

FI among rural households in Jammu was 33.3% and was significantly associated with occupation, literacy, family monthly income, and dietary diversity. The mean dietary diversity score was 7.76 ± 1.58 . In rural households to ameliorate the issue of food security, there is a necessity to ensure a sustainable and innovative agricultural system and

strengthen public distribution system, intersectoral coordination, and skill development for employment generation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Merson MH, Black RE, Mills AJ. International Public Health, Diseases, Programmes, Systems and Policies. 2nd ed. Sadbury Massachusetts: Jones and Barlett Publishers; 2006. p. 188-90.
- Mohamadpour M, Sharif ZM, Keysami MA. Food insecurity, health and nutritional status among sample of palm-plantation households in Malaysia. *J Health Popul Nutr* 2012;30:291-302.
- FAO, IFAD, UNICEF, WFP and WHO. 2022. The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO. Available from: <https://doi.org/10.4060/cc0639en>.
- Global Food Security Index, Rankings and trends September 2022. Available from: <https://impact.economist.com/sustainability/project/food-security-index/Index>. [Last accessed on 2023 Apr 10].
- Bhuyan B, Sahoo BK, Suar D. Food insecurity dynamics in India: A synthetic panel approach. *Soc Sci Humanit Open* 2020;2:100029.
- Swindale A, Blinsky P. Household Dietary Diversity Score (HDDS) for measurement of household food access: Indicator Guide (v. 2). Washington, D.C.: FHI 360/FANTA; 2006.
- Coates J, Swindale A, Bilinsky P. Household food insecurity access scale (HFIAS) for measurement of household food access: Indicator Guide (v. 3). Washington, D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development; 2007.
- Gopichandran V, Claudius P, Baby LS, Felinda A, Mohan VR. Household food security in urban Tamil Nadu: A survey in Vellore. *Natl Med J India* 2010;23:278-80.
- Chinnakali P, Upadhyay RP, Shokeen D, Singh K, Kaur M, Singh AK, *et al.* Prevalence of household-level food insecurity and its determinants in an urban resettlement colony in North India. *J Health Popul Nutr* 2014;32:227-36.

10. Tomayko EJ, Mosso KL, Cronin KA, Carmichael L, Kim KM, Tassy Parker T, *et al.* Household food insecurity and dietary patterns in rural and urban American Indian families with young children. *BMC Public Health* 2017;17:611.
11. Mukhopadhyay DK, Mukhopadhyay S, Biswas AB. Enduring starvation in silent population: A study on prevalence and factors contributing to household food security in the tribal population in Bankura, West Bengal. *Indian J Public Health* 2010;54:92-7.
12. Agarwal S, Sethi V, Gupta P, Jha M, Agnihotri A, Nord M. Experiential household food security in an urban underserved slum of North India. *Food Sec* 2009;1:239-50.
13. Susilowati D, Karyadi D. Malnutrition and poverty alleviation. *Asia Pac J Clin Nutr* 2002;11(S1):S323-30.
14. Bhattacharya J, Currie J, Haider S. Poverty, food insecurity, and nutritional outcomes in children and adults. *J Health Econ* 2004;23:839-62.
15. Olson CM, Rauschenbach BS, Frongillo EA Jr, Kendall A. Factors contributing to household food insecurity in a rural upstate New York county. Madison, WI: Institute for Research on Poverty; 1996. p. 26. (Discussion paper no. 1107-96).
16. Kinsey JD. Food and families' socioeconomic status. *J Nutr* 1994;124(Suppl 9):1878S-85S.
17. Coates J, Frongillo EA, Rogers BL, Webb P, Wilde PE, Houser R. Commonalities in the experience of household food insecurity across cultures: What are measures missing? *J Nutr* 2006;136:1438S-48S.
18. Mukherjee A, Paul S, Saha I, Som TK, Ghose G. Dietary diversity and its determinants: A community-based study among adult population of Durgapur, West Bengal. *Med J DY Patil Vidyapeeth* 2018;11:296-301.
19. Gokhale D, Rao S. Socio-economic and socio-demographic determinants of diet diversity among rural pregnant women from Pune, India. *BMC Nutr* 2022;8:54.
20. Ali M, Raihan MJ, Siddiqua TJ, Haque MA, Farzana FD, Ahmed SMT, *et al.* Factors associated with low and medium household dietary diversity compared with high dietary diversity among marginalised households in rural Bangladesh: Findings from a Suchana baseline survey. *BMJ Open* 2022;12:e062143. doi: 10.1136/bmjopen-2022-062143.
21. Antwi J, Quaidoo E, Ohemeng A, Bannerman B. Household food insecurity is associated with child's dietary diversity score among primary school children in two districts in Ghana. *Food and Nutrition Research* 2022;66:7715. Available from: <http://dx.doi.org/10.29219/fnr.v66.7715>. [Last accessed on 2023 Oct 02].
22. Vijaya Bhaskar AV, Nithya DJ, Raju S, Bhavani RV. Establishing integrated agriculture-nutrition programmes to diversify household food and diets in rural India. *Food Sec* 2017;9:981-99.
23. Bezerra IN, Sichieri R. Household food diversity and nutritional status among adults in Brazil. *Int J Behav Nutr Phys Act* 2011;8:22.
24. Hatloy A, Torheim LE, Oshaug A. Food variety –A good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. *Eur J Clin Nutr* 1998;52:8918.
25. Ogle BM, Hung PH, Tuyet HT. Significance of wild vegetables in micronutrient intakes of women in Vietnam: An analysis of food variety. *Asia Pac J Clin Nutr* 2001;10:2130.