

Original Research Article

Assessment of household dietary diversity and its associated factors among the households of Amritsar district: a descriptive cross-sectional study

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ABSTRACT

Background: Dietary diversity (DD) refers to the range of foods consumed over a specific period, ensuring adequate nutrient intake for optimal health and development. It's a critical component of a healthy diet and is widely recognized as such. Dietary diversity is a qualitative measure of food consumption, which indicates household access to a variety of foods and is proxy for nutrient adequacy of the individual's diet. It is described as the number of different food or food groups consumed over a given reference period.

Methods: This cross-sectional study was done in rural areas and urban slums of district Amritsar. A 24-hour recall evaluated the HDDS amongst 300 households equally distributed in rural and urban areas. HDDS consisted of 12 food groups which were marked 0 or 1 depending upon the consumption of various food items in the past 24 hours and the total score was calculated. Data was compiled and analyzed using Epi Info, CDC USA. For nominal, categorical and ordinal data, frequencies and proportions were calculated. For continuous data, mean±standard deviation, median (IQR) were calculated whichever relevant depending upon the distribution of data.

Results: Mean household dietary diversity score in rural areas was a little higher i.e. 8.96 versus urban areas where it was 8.82.

Conclusions: In both rural and urban areas (100%) ate 6 food groups viz. cereals and millets, vegetables, milk and milk products, oil and butter, sugar/honey/jaggery and tea/coffee.

Keywords: Dietary diversity, HDDS

INTRODUCTION

Household dietary diversity has emerged as a critical indicator of food security and nutritional adequacy in recent years. It refers to the variety of foods consumed across and within food groups over a given period, typically reflecting the nutritional quality of the diet and the household's access to a range of foods. Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods, and is also a proxy for nutrient adequacy of the diet of individuals.¹ As global concerns about malnutrition and

food insecurity continue to grow, understanding the factors influencing dietary diversity at the household level has become increasingly important for policymakers, researchers, and health professionals alike.

Household dietary diversity is a valuable proxy indicator. It correlates with positive outcomes such as healthier birth weights, improved child growth metrics and better haemoglobin levels. It can be assessed at both household and individual levels, allowing for analysis of food security at multiple scales. The household dietary diversity score (HDDS) is calculated using the following

12 food groups: cereals; root and tubers; vegetables; fruits; meat and poultry; eggs; fish and seafood; pulses, legumes, nuts; milk and milk products; oils and fats; sugar and honey; miscellaneous items. This categorization enables a comprehensive evaluation of dietary variety across different food types.²

In developing nations like India, non-communicable diseases (NCDs) are becoming increasingly prevalent, accounting for over 60% of all deaths. Research indicates that poor dietary habits and insufficient physical activity are primary factors in the increasing prevalence of heart disease, diabetes, and hypertension. A diverse diet is crucial for maintaining good health and may help prevent many NCDs.³

The significance of dietary diversity extends beyond mere caloric intake. A diverse diet is essential for providing the full spectrum of macro- and micronutrients necessary for optimal health and development. This is particularly crucial in developing countries, where micronutrient deficiencies, often referred to as “hidden hunger”, remain prevalent despite overall improvements in food availability.

A 1 percent increase in dietary diversity correlates with a 1 percent rise in per capita consumption, a 0.7 percent rise in total per capita caloric availability, a 0.5 percent rise in household per capita daily caloric availability from staples, and a 1.4 percent rise in household per capita daily caloric availability from non-staples. These correlations hold true in both rural and urban areas and across different seasons, regardless of the method used to assess these associations, or when dietary diversity is measured by the number of unique food groups consumed. There is a connection between dietary diversity and food access at the individual level, although this connection is notably weaker than that between dietary diversity and food access. The strength of the relationship between dietary diversity and caloric availability at the household level grows with the mean level of caloric availability. Therefore, dietary diversity appears to be a promising indicator for measuring food security and monitoring changes and impact, especially when measurement resources are limited.⁴

However, achieving and maintaining dietary diversity at the household level is a complex challenge influenced by a myriad of factors. These include, but are not limited to, socioeconomic status, cultural preferences, agricultural practices, market access, and environmental conditions. Understanding these determinants is crucial for developing effective interventions and policies aimed at improving nutritional outcomes.

This objective of this research was to explore the multifaceted nature of household dietary diversity, focusing on its determinants, measurement methodologies, and implications for public health and policy. By analyzing data from rural areas and slums of

district Amritsar, India, we sought to identify key factors associated with higher or lower dietary diversity scores. Additionally, we have examined the relationship between dietary diversity and various indicators of nutritional status and overall well-being.

By contributing to the growing body of literature on this topic, we hope to shed light on the complex interplay between food systems, household decision-making, and nutritional well-being in the context of global food security challenges.

METHODS

This was a descriptive cross-sectional study conducted in rural field practice area of department of community medicine, Government Medical College, Amritsar and urban slums of Amritsar city for a period of one year i.e. 1st April 2021 to 31st March 2022. Households in selected rural/urban areas formulated the study population. Any households which had a minimum family size of two were included after obtaining a written informed consent. Any house found locked on third consecutive visit and those households which obtained pre-cooked meals from elsewhere (tiffin service etc.) on a routine basis (3 days in a week or more) were excluded from the study. The households where no adult family member >18 year of age was present at the time of visit was also excluded. Any households located in the study setting i.e., villages of Majitha block and urban slums of district Amritsar were considered to be sampling unit. A line list of the households in the selected rural field practice areas and urban slums formulated the sampling frame for the study.

Since, this study was a part of a larger study on food insecurity, the sample size was calculated using the formula for single proportion assuming power of study to be 80% i.e.

$$N = \frac{Z_{\alpha/2}^2 (P \times 1 - P)}{d^2}$$

Where $Z_{\alpha/2}$ = critical value of Z (normal distribution at $\alpha/2$) which was 1.96 (for a confidence level of 95% / $\alpha=0.05$).

p = proportion of interest (households with food insecurity) = 77.2%.⁵

d^2 = allowable error i.e. 5% for current study

$$N = \frac{(1.96)^2 (0.772 \times 0.228)}{0.05^2}$$

$N = 270.5 \sim 271$.

Therefore, a total of 300 households (150 from urban and 150 from rural areas) were included in the current study to formulate the required sample size.

Two urban slums and two villages were selected using probability proportionate to size (PPS) and further the required sample size was proportionately divided across the selected villages/urban slums. After selection of the areas, line list of households in each selected areas was obtained from the respective ASHA/ANM. The HH were selected by using systematic random sampling (SRS) where sampling interval (k) was calculated by the following formula:

$$k = \frac{\text{Total households in that area}}{\text{Required sample size of the selected area}}$$

Where for selection of 1st household, a number less than 'k' was selected using random number tables and subsequent households were selected by adding RN (random number) +k+2k+3k..... *k till the allocated sample size was completed.

A house to house visit was made and after applying the inclusion and exclusion criteria, households were included in the study. One to one interview with the HOF was conducted by the investigator and the required information was collected according to the pre-tested, validated and semi-structured questionnaire after obtaining written informed consent. If the HOF was not available, then the person mainly involved in cooking was interviewed or the one maintaining the household economics. Household dietary diversity score was calculated using HDDS which consisted of 12 food groups and which were marked 0 or 1 depending upon the

consumption of various food items in the past 24 hours and the total score was calculated.

Household dietary diversity score: HDDS (0-12)- total number of food groups consumed by members of the household. Values for A through L will be either "0" or "1". Sum (A + B + C + D + E + F + G + H + I + J + K + L). Average HDDS- sum (HDDS)/total number of households.

Prior to the commencement of the study, approval from institutional ethics committee was taken and written informed consent was taken from every head of the family of the household selected. No personal identifier was used to maintain confidentiality at all levels. The data collected was not shared with anyone inside or outside the institution except those involved in research.

Data was compiled and analyzed using Epi Info, CDC USA. The data was presented in tables and graphs whichever relevant/appropriate. For nominal, categorical and ordinal data, frequencies and proportions were calculated. For continuous data, mean±standard deviation, median (IQR) were calculated whichever relevant depending upon the distribution of data. Overall, p value <0.05 was considered statistically significant.

RESULTS

6 food groups were being consumed by all households in both urban and rural areas whereas consumption of meat, chicken and fish was among the least (Table 1).

Table 1: Distribution of households according to consumption of food groups included in their DD according to HDDS.

Variable	Urban (n=150)	Rural (n=150)	Total (n=300)	χ ² (p value; df)
Cereals, millets	150 (100)	150 (100)	300 (100)	Not applicable
Vegetables	150 (100)	150 (100)	300 (100)	Not applicable
Milk, milk products	150 (100)	150 (100)	300 (100)	Not applicable
Oil, fat, butter	150 (100)	150 (100)	300 (100)	Not applicable
Sugar, honey, jaggery	150 (100)	150 (100)	300 (100)	Not applicable
Coffee, tea	150 (100)	150 (100)	300 (100)	Not applicable
Roots, tubers	150 (100)	146 (97)	296 (99)	Not applicable
Pulses, beans, nuts	148 (99)	114 (76)	262 (87)	34.83 (0.000; 1)#
Fruits	85 (57)	117 (78)	202 (67)	15.51 (0.000; 1) #
Eggs	22 (15)	35 (23)	57 (19)	3.66 (0.055; 1)
Meat, chicken	14 (9)	29 (19)	43 (14)	6.10 (0.013; 1) #
Fish (fresh/dried)	5 (3)	3 (2)	8 (3)	0.51 (0.473; 1)

(Figures in parenthesis are percentages) (# p<0.05 is considered statistically significant)

The mean household dietary diversity score was 8.96 in rural and 8.82 in urban areas respectively (Figure 1). As far as sociodemographic profile of head of the family (HOF) was concerned, household dietary diversity score was significantly higher in households where HOF was female. Education and occupation of HOF were also

found to be associated with household dietary diversity as shown in Table 2.

Household dietary diversity significantly increased with increase in socioeconomic status of household. Type of family, caste and religion were not found to be associated with dietary diversity (Table 3).

Table 2: Association of HDDS with sociodemographic profile of head of the family (n=300).

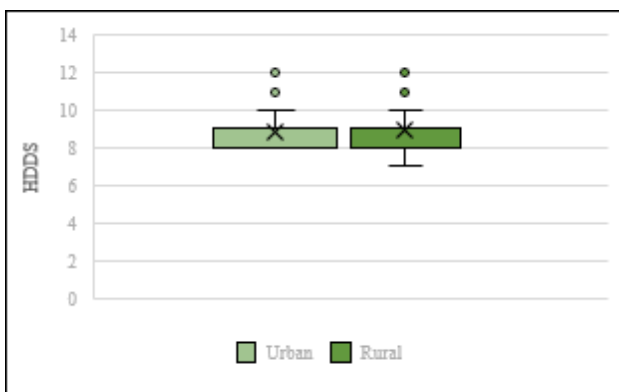
Variables	HDDS (mean±SD)	t value/ f statistic (p value; df)
Age (in years)		
18-30	9.46±1.18	1.91 (0.127; 3, 296)
31-45	8.92±0.98	
46-60	8.95±1.11	
>60	8.77±1.08	
Sex		
Males	8.54±0.86	2.78 (0.002; 298)#
Females	8.97±1.13	
Education		
Up to primary school	8.62±1.15	7.16 (0.000; 3, 296)#
Middle school	8.71±0.81	
High School	9.25±1.08	
Secondary and above	9.08±0.88	
Occupation of HOF		
Businessman/salaried	9.51±1.01	7.28 (0.000; 2, 297)#
Labourer	8.91±1	
Unemployed	8.73±0.95	

(#p<0.05 is considered statistically significant)

Table 3: Association of the sociodemographic profile of the household with dietary diversity (n=300).

Variables	HDDS (Mean±SD)	t value/ f statistic (p value; df)
Religion		
Sikh	8.96±0.99	1.25 (0.104; 298)
Hindu/Christian	8.88±1.27	
Caste		
General	8.81±0.84	0.77 (0.218; 298)
SC/ST/BC/OBC	8.92±1.19	
Type of family		
Nuclear	8.97±1.02	1.63 (0.051; 298)
Joint	8.77±1.23	
Socio-economic status (as per B. G. Prasad's classification)		
Upper	9.07±0.83	5.79 (0.003; 2, 296)#
Middle	9±1.03	
Lower	8.56±1.12	

(#p<0.05 is considered statistically significant)

**Figure 1: Box and whisker plot showing distribution of households according to HDDS (n=300).**
(t=1.09; p=0.136).**Table 4: Association of DD with percentage of household income spent on food (n=300).**

Percentage of income spent on food	HDDS (Mean±SD)	t value/f statistic (p value; df)
≤30%	8.86±1.12	0.16
>30%	8.9±1.1	(0.433; 298)

(#p<0.05 is considered statistically significant)

Households that spent >30% of their income on food had better dietary diversity score (8.9) than those that spent <30% (8.86). However, this variation was statistically insignificant (Table 4). Mean household dietary diversity scores were significantly higher among those who owned/worked in agricultural fields as well as those who maintained a kitchen garden in the house (Table 5).

Table 5: Association of dietary diversity with status of owning/working in agricultural fields and maintaining kitchen garden in the house (n=300).

Variables	HDDS (Mean±SD)	t value/ f statistic (p value; df)
Whether owning or working in agricultural fields		
Yes	9.2±1.17	3.08
No	8.78±1.04	(0.001; 298)#
Maintaining kitchen garden in the house		
Yes	9.19±1.62	2.04
No	8.81±0.94	(0.005; 298)#

(#p<0.05 is considered statistically significant)

DISCUSSION

Out of the 12 food groups included in the calculation of HDDS, the results indicate that certain food groups, such as cereals, vegetables, milk products, oils, sugars, and beverages, are universally consumed across both urban and rural households. However, significant differences emerge in the consumption of other food groups. Notably, urban households show higher consumption of pulses, beans, and nuts (99% versus 76% in rural areas), while rural households demonstrate higher intake of fruits (78% versus 57% in urban areas) and meat/chicken (19% versus 9% in urban areas). These differences suggest varying dietary patterns and potentially different nutritional challenges between urban and rural populations.

Households that had female HOF had a better mean DD score than the HH in which the HOF was male. Education plays a vital role in employment opportunities, working efficiency, accessing information about health and nutrition, increasing income, and diversity, all of which improve household food supply. Age of HOF did not play a significant role in determining dietary diversity.

India's rapid urbanization has significant implications for dietary habits. As rural men migrate to urban areas for employment, women often take on increased responsibilities both in domestic chores and agricultural decision-making. This shift can affect dietary diversity due to changes in food accessibility, preferences, and cooking practices within households.

Nuclear families fared well in regard to dietary diversity where the mean HDDS was higher than joint families. This association wasn't statistically significant. The study by Gokhale et al showed living in a joint family, not owning a house, and having poorer income levels showed some protective effect against low diet diversity, albeit with varying degrees of significance.⁶

Households that followed Sikhism also had better HDDS than those that followed Hinduism/Christianity. SES of the family played a significant role in determining its dietary diversity where households belonging to upper class had better mean HDDS score versus those

belonging to lower class. A clear gradient is observed in dietary diversity across socioeconomic classes, with upper classes showing higher diversity than lower classes. This highlights the role of economic factors in determining dietary quality. This can be attributed to higher purchasing power among richer households, wherein they were able to afford diverse food items like fruits, vegetables, meat and poultry while the poorer households had to rely on starchy staple food items.⁷

Female-headed households show significantly higher dietary diversity scores compared to male-headed households (8.97±1.13 versus 8.54±0.86, p=0.002). This finding could be attributed to women's potentially greater awareness of nutrition or different priorities in food purchasing and preparation.

There's a significant positive association between education level and dietary diversity. Households with heads educated to high school level or above show higher diversity scores, suggesting that education may play a crucial role in dietary choices and nutritional awareness.

Business owners and salaried individuals show significantly higher dietary diversity scores compared to laborers and unemployed individuals. This may be related to income levels and purchasing power.

Households that spent more than 30% of their income on food had a better dietary diversity than households that spent <30%. This variation wasn't statistically significant. Shanmathy et al conducted a study in Salem and Namakkal districts to assess the DD Score and its associated factors among households. Importantly, the study identified several factors influencing HDDS, including monthly income, expenditure on food, dietary patterns, and household occupation. These factors collectively underscored their positive association with DDS, emphasizing the role of socio-economic factors in shaping dietary practices. This highlights that the poorer households had to spend more income on food in order to diversify their diet.

Interestingly, households owning or working in agricultural fields and those maintaining kitchen gardens show significantly higher dietary diversity scores. This suggests that direct involvement in food production may positively influence dietary variety, possibly through increased access to diverse food items or greater awareness of nutritional needs.⁸

The study by Mohammed and Mulat focused on the role of home-garden production in improving women's dietary diversity in Boru Meda Kebele, Ethiopia. The authors emphasize the importance of nutrition sensitive agriculture (NSA) as a strategy to combat malnutrition and micronutrient deficiencies by enhancing the availability of nutrient-dense foods and promoting dietary diversity.⁹ A study conducted by Krithika et al in Tiruvallur and Coimbatore districts during December 2022, involving 270 rural household heads showed a

notable decline in dietary diversity among the households surveyed. Moreover, the study highlighted that promoting kitchen gardens, particularly among economically disadvantaged households, could potentially ameliorate food security issues.¹⁰ Although the IYCF guidelines, having 8 food groups, are available to measure dietary diversity of children, this study used the FAO method (having 12 food groups) to measure DD for HH (HDDS), which is a limitation of the study.

CONCLUSION

The household dietary diversity was somewhat similar in rural and urban areas (median =9) but more variation in range was observed which was 8 to 12 in urban and 7 to 12 in rural households.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee (letter no.3369/D-26/2020)

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