**Original Research Article**

**Household Food Insecurity and its Associated Factors in Punjab**

**ABSTRACT**

|  |
| --- |
| **Aims:** This study was conducted to assess the household food security status and food consumption patterns of families in Punjab, India, and to determine the impact of socio-economic characteristics on their household food security status.**Study Design:** A cross-sectional study was conducted using a stratified random sampling design.**Place and Duration of Study:** The study took place in the state of Punjab, located in the north-western region of India. To ensure statewide coverage, three agro-climatic regions were selected: the Central Plain region, the South-Western region, and the Sub-Mountain Undulating region. Data were collected from January to December 2021.**Methodology:** A total of 480 families were randomly selected from the three regions using stratified random sampling. Data on socio-economic characteristics were collected through personal interviews using a pre-structured schedule. The USDA 18-item Food Security Module was employed to assess household food security status.**Results:** The findings revealed that 77% of the surveyed households were food insecure, with 61% belonging to the upper-lower socio-economic class. Employment rates were 50% for females and 98% for males, with most employed in elementary occupations. Significant associations were observed between household food security and variables such as family size, family type, income, socio-economic class, food expenditure, and food consumption patterns.**Conclusions:** The study highlights the critical role of socio-economic factors in determining household food security and underscores the need for stronger, long-term government interventions to address food insecurity among underprivileged groups in Punjab. |

*Keywords:* *Food security; food insecurity; food consumption; food expenditure; socio-economic class.*

1. **INTRODUCTION**

India is the second most populated country in the world having the population equivalent to 17.7 per cent of the total world population (https://www.worldometers.info). The nation despite being successful in various fields (agriculture, technology, research, medical, etc.) is still facing and tackling multiple issues and problems pertaining to unemployment, poverty, hunger, illiteracy, hygiene and sanitation, education system, primary health care system, etc. However, the major problem faced by India is having the highest number of malnourished children in the world. In the 2021 Global Hunger Index, India ranks 101st with GHI score of 27.5. India’s child stunting (34.7%) and wasting (17.3%) rate was also extremely high in terms of its public health significance. According to the National Family Health Survey (NFHS) 2019-21, the 5th in the series India has seen no significant improvement in health and nutritional status among the population. The latest data shows, 7.7% of children are severely wasted, 19.3% are wasted and 35.5% are stunted. At the same time, 3.4% children are overweight. In Punjab prevalence of stunting, wasting and severely wasting and underweight among children (under 5 years) were 24.5, 10.6, 3.7 and 16.9 per cent respectively. Malnutrition is the most consequential outcome of food insecurity and has an abundance of economic and health implications. For a healthy life food is a necessity and essential for nourishment. An appropriate food intake, in terms of quality and quantity gives a healthy life. In India one of the major developmental objectives is to attain food security. Food security subsists, when all people, at all times have equal access (physical and economical) to sufficient, safe, nutritious and healthy food which would meet their daily dietary needs and food choices to live an active and healthy life. Food security can be assessed at various levels, i.e., individual, household, regional, national and global. Along with availability of food, purchasing power also affects the household food security. Even though sufficient food is available at National and Global level but poverty still prevails to be a serious problems affecting food security at household level. Household food security is said to be achieved when the concept of food security is effectively implemented at family level including individual within household as the main concern to be affected (Food and Agriculture Organization, 2001). A number of studies have identified that a primary risk factor of food insecurity is socio economic status of the household. India held 71st position with an overall score of 57.2 points on the Global Food Security (GFS) Index 2021 of 113 countries. India ranked 80th in affordability (50.2 score), 74th in quality and safety (59.1 score), 29th in availability (65.7score) and 40th in Natural resources and resilience (52.8 score) (Economist Impact, 2021). Many programmes such as Eat Right India Movement, POSHAN Abhiyan, Food Fortification, National Food Security Act, 2013, Integrated Child Development Services (ICDS) Scheme, National Innovations in Climate Resilient Agriculture (NICRA) have been initiated by Government of India till date in a vision to eradicate food insecurity, poverty, and its consequences. Despite this, India continues to suffer from malnutrition, poverty, and hunger. Various studies have been carried out to quantify food insecurity on a global level; however, the literature on India is limited. In order to formulate measures to address this epochal issue, there aren't enough studies on the scope of the problem. Taking all of this into account, the current study was designed to document the prevalence of food insecurity at the household level in Punjab, as well as the variables that contribute to its existence.

1. **METHODOLOGY**
2. **Locale of the study**

The study was conducted in the state of Punjab, located in the north-western region of India. Punjab has an area of 50,362 km2 and is bordered by the Indian states of Himachal Pradesh, Haryana, Rajasthan and Jammu & Kashmir. Most of the area of Punjab lies in a highly fertile plain with extensive irrigation canal system in place. To cover the entire state of Punjab, three different agro-climatic regions, i.e., Central Plain region, South-Western region and Sub-Mountain Undulating region were selected for this study.

1. **Sampling procedure and sample size**

Multistage random sampling technique was used to select the sample for the study.In the first stage, three districts of Punjab namely Ludhiana, Bathinda and Nawanshahr (SBS Nagar) falling within each of the three agro-climatic regions (central plain, south-western and sub-mountain undulating respectively) were selected. In the second stage, 6 blocks (2 blocks from each selected district) were randomly chosen. In the final stage, 80 households from each block were selected for the study.Thus, a sample of 480 households spreading over 3 agro-climatic regions were selected for the study.

1. **Construction of the survey instruments**

To accomplish the objectives of the study, the interview schedule was developed which included the questions on the socio-economic and demographic data, monthly expenditure (in INR) on food items and non-food items, food consumption pattern (food frequency questionnaire) and household food security status (US Department of Agriculture’s core Food security Module, 2012) of the selected households in Punjab. To estimate the reliability of the survey instruments, pre-testing was performed on 10 households. Essential changes to the schedule were made based on feedback acquired throughout pre-testing. The pre-testing samples were not included in the study and the information from subjects included in the study was gathered using a modified interview schedule.

1. **Collection of data**
2. **Demographic and socio-economic profile of families**

The data were collected from the families related to the religion (Hindu, Muslim, Sikh and Christian), caste (General, Other Backward and Scheduled Castes/Scheduled Tribes), food habits (vegetarian and non-vegetarian), family type (nuclear or joint), family size (which was divided into small (≤4) and large (>4) based on observed data), number of children, school going children, under five children, type of houses (*kutcha and pucca)*, educational and occupational status of the head of the family, monthly expenditure on food and non-food items, family’s total income and subsidised food and benefits from other government scheme. Modified Kuppuswamy’s socio-economic status scale was used to determine the socio-economic class of the families (Saleem, 2019). In this scale scores provided against employment, educational status of the head of the family and total monthly income of family and were added up. Based on the total scores, socio economic class was classified.

*Expenditure (in INR):*Average monthly expenditure of the selected families on food items, non-food items and intoxicants (in INR) for different socioeconomic categories classified using the Kuppuswamy’s scale.

1. **Food consumption**

Food consumption pattern is defined as the variety or combination of different foods and beverage in a diet and the frequency with which they are habitually consumed. The intake of different food items by the selected families were assessed at different frequency i.e., daily (5), weekly (4), fortnightly (3), monthly (2), occasionally (1) and not consuming (0).

1. **Household food security status of families**

Household food insecurity of the selected families were measured by using US Department of Agriculture’s core Food Security Survey Module (USDA, 2012). It contains 18 questions covering characteristic incidents of food insecurity (quantity of food, quality of food, food anxiety, and coping mechanisms taken by the households to augment food supplies). The sum of insecurity-affirming responses produces a score ranging from 0 to 18, with higher numbers indicating higher food insecurity. The scores were used to determine the level of food insecurity, as categorized on a four-point scale given by USDA (2012) presented in Table 1.

**Table 1. Categorized level of food insecurity by using FSSM (Food Security Survey Module)**

|  |  |  |
| --- | --- | --- |
| S. No.  | Level of food insecurity  | Score |
| 1  | **food security**  | **0–2** |
| 2  | **food insecurity**  | **3–18** |
| a  | food insecurity without the experience of hunger  | 3–7 |
| b  | food insecurity with medium experience of hunger  | 8–12 |
| c  | food insecurity with serious experience of hunger  | 13–18 |

1. **Statistical analysis of data**

The collected data were calculated for mean, standard deviation, standard error, per cent adequacy by using Microsoft Excel, 2013. Software IBM SPSS Inc. (version 16.0.2007) was used for the statistical analysis. Chi square test was applied to find out the association between various variables and household food security status of families. Multiple regression analysis was done to study the combined effect of all the independent variables such as income, socio-economic status, food consumption, food expenditure on the household food security status. Correlation coefficient was also applied for different household variables.

1. **RESULTS**
2. **Socio-economic and demographic characteristics of the selected families**

The data of the study presented in Table 2. revealed that 44 per cent of the selected families belonged to schedule caste followed by 35 per cent from backward caste and 21 per cent from general caste. The data also showed that the selected families belonging to Hindu, Muslim and Sikh religion were 49, 11 and 41 per cent respectively. Majority of the selected families were non-vegetarian (59%) in Punjab. Majority of the selected families (80%) were nuclear and only 20 per cent were joint families. It was further observed that, most of the respondents (57 %) belonged to household with less than 5 members and maximum families (84%) had ≤ 2 children whereas the remaining families (16%) had 3-4 children in Punjab.

Most of the families (72%) had no children under 5 years of age. The data showed 96 per cent of the families in Punjab had ≤ 2 school going children and the remaining families had 3-4 school going children. Most of the families (55%) had their own houses while the remaining lived in the rented houses. Adding to this, majority of the families in Punjab (52%) lived in the *pakka* houses. The study further revealed that most of the families (55%) utilized and benefitted from the Public Distribution System (PDS).

1. **Educational level of the respondents**

Educational status of the respondents showed that 38 per cent females and 15 per cent males were illiterate in the selected families of Punjab. Out of the remaining families, 27 per cent of the females and 13 per cent males were educated only upto primary school. The study further revealed that 22 per cent females and 24 per cent males studied upto senior secondary, and 7 per cent females and 27 per cent males were educated upto high school. A very few respondents were found to have studied above high school, with only 5 per cent females and 15 per cent males educated upto intermediate and only 1 per cent females and 6 per cent males were graduated. This study revealed that most of the respondents were educated only upto high school and very few had the chance to pursue education above the higher secondary.

1. **Occupational status of the respondents**

The data showed that 50 per cent of the female respondents and 98 per cent of the male respondents were employed in Punjab. Further segregating the type of employment, it was found that approximately 23 per cent of the male respondents were elementary workers, 24 per cent being machine operators and 27 per cent craft workers. The remaining male respondents were either skilled agricultural workers (10%), skilled shop workers (9%), clerk (4%) or semi-professionals (2%). This study further indicated that labour was the most pursued occupation of the males.

1. **Monthly income of the family**

The study revealed that majority of the selected families (47%) in Punjab had an income between Rs. 3,908 to 11,707 per month followed by 23 per cent between Rs. 11,708 to 19,515 per month and 20 per cent between Rs. 19,516 to 29,199 per month. A very few families had a monthly income over Rs. 29,199 (4 %) and only 6 per cent earned below Rs. 3,908 per month.

**Table 2. Socio-economic and demographic characteristics of families in Punjab**

|  |  |
| --- | --- |
| Parameters | Punjab (n=480) |
| Religion |  |
| Hindu  | 234 (49) |
| Muslim | 51 (11) |
| Sikh | 195 (41) |
| Caste |  |
| General  | 100 (21) |
| Backward Class | 168 (35) |
| Schedule caste | 212 (44) |
| Food habits |  |
| Vegetarian | 199 (41) |
| Non-vegetarian | 281 (59) |
| Family Type |  |
| Nuclear | 386(80) |
| Joint | 94(20) |
| Total Family Member |  |
| ≤ 4 | 273(57) |
| > 4 | 207(43) |
| Number of Children |  |
| 1 to 2 | 405 (84) |
| 3to 4 | 75 (16) |
| School Going Children |  |
| 1 to 2 | 463 (96) |
| 3to 4 | 17 (4) |
| Under 5 years Children | 135 (28) |
| House |  |
| Rented | 216(45) |
| Owned | 264(55) |
| Type of House |  |
| *Kaccha*  | 230(48) |
| *Pakka* | 250(52) |
| Public Distribution system (PDS) | 266(55) |
| Educational status of females |  |
| UG/PG | 4(1) |
| Intermediate | 25(5) |
| High school | 33(7) |
| Middle school | 106(22) |
| Primary school | 129(27) |
| Illiterate | 183(38) |
| Occupation of females |  |
| Employed | 240(50) |
| Unemployed | 240(50) |
| Educational status of males # |  |
| Graduate  | 28(6) |
| Intermediate or Diploma | 73(15) |
| High School | 131(27) |
| Middle School  | 114(24) |
| Primary school | 61(13) |
| Illiterate | 73(15) |
| Occupation of males # |  |
| Unemployed | 8(2) |
| Elementary occupation | 110(23) |
| Machine operators | 116(24) |
| Craft workers | 129(27) |
| Skilled agricultural workers | 49(10) |
| Skilled & shop workers | 41(9) |
| Clerk | 17(4) |
| Semi professional | 10(2) |
| Monthly Income of Family in (Rs.)# |  |
| 39,033 to 78,062  | 1 |
| 29,200 to 39,032 | 17(4) |
| 19,516 to 29,199 | 98(20) |
| 11,708 to 19,515 | 112(23) |
| 3,908 to 11,707 | 225(47) |
| <=3907 | 27(6) |

#Modified Kuppuswamy’s socioeconomic status scale (2019)

Data in parenthesis expressed as percentage

1. **Socio-economic profile**

Socio-economic class of the families was determined by using the modified Kuppuswamy’s socioeconomic status scale (Saleem, 2019). Three parameters (occupational and educational status of the head of family and monthly income of the family) were used to assess the socio-economic status. Based on the assessment done (Table 3), it was found that majority of the families (61%) in Punjab belonged to the upper lower class followed by the lower middle class (28%) and upper middle class (7%). A very few families belonged to the lower class (4%) and none of the families were in the upper class.

**Table 3. Socio-economic class of the families in Punjab**

|  |  |
| --- | --- |
| Socio-Economic Class # | Punjab (n=480) |
| Upper Middle (II) | 33 (7) |
| Lower Middle (III) | 136 (28) |
| Upper Lower (IV) | 294 (61) |
| Lower (V) | 17 (4) |

#Modified Kuppuswamy’s socioeconomic status scale (2019)

Data in parenthesis expressed as percentage

1. **Expenditure on food items, non-food items and intoxicants**

Average monthly expenditure and the portion of their monthly income spent on food items, non-food items and intoxicants on the basis of socio-economic class is presented in Table 4.

*Upper middle class:*Families in upper middle class spent major portion of their income on non-food items (36%) followed by food items (30%) and 5 per cent on intoxicants.

*Lower middle class:*Families belonging tothe lower middle also spentmore on non-food items (37%) than food items (34%).

*Upper lower class:*Families in upper lower class expend major portion of their income on food items (44%) as compared to non-food items (34%) in Punjab.

*Lower class:*It was observed that families belonging to lower class spent higher portion of their income on food items than non-food items and intoxicants. Around 60 per cent of the income of families in lower class was spent on the food items.

The findings of this study revealed that upper middle-class families spent less portion of their income on food items than lower class families even when the absolute spend was more. It was also observed that approximately 4-6 per cent of the monthly income was spent on intoxicants in all the regions of Punjab surveyed across all the socio-economic groups. This study revealed that consumption pattern was directly linked with the household income and an increase in the household income enabled the families to buy more diverse food items as well as non-food items.

**Table 4. Monthly expenditure of selected families on food Items, non-food items and intoxicants on the basis of socio-economic class in Punjab**

|  |  |  |
| --- | --- | --- |
| Socio-Economic Class |  Expenses (Rs) | Punjab (n=480) |
| Upper Middle   | Food  | 8249.20±314.41 (30) |
| Non-Food  | 9822.90±441.60 (36) |
| Intoxicants  | 1444.20±205.96 (5) |
| Lower Middle | Food  | 6545.90±164.07 (34) |
| Non-Food  | 7073.10±284.53 (37) |
| Intoxicants  | 807.53±51.85 (4) |
| Upper Lower | Food  | 4150.50±80.84 (44) |
| Non-Food  | 3235.40±153.44 (34) |
| Intoxicants  | 531.71±21.81 (6) |
| Lower | Food  | 2168.20±100.40 (60) |
| Non-Food  | 672.71±84.11 (19) |
| Intoxicants  | 198±22.58 (5) |

Values are expressed as mean ± standard deviation

Data in parenthesis expressed as percentage of monthly income

1. **Food Consumption**

Food consumption pattern was observed by using food frequency questionnaire and the study showed (Table 5) that wheat and rice was consumed on a daily basis while maize was consumed either occasionally (36%) or monthly (31%) in most of the selected households in Punjab. Consumption of pulses was not observed on a daily basis. Green gram was consumed most frequently in Punjab, with 35 per cent of the households consuming it on a weekly basis whereas, rajma was consumed least with 31 per cent of the families consuming it occasionally. Milk was consumed daily in all the selected families of Punjab, especially for tea. Families were consuming curd once in a week whereas buttermilk and *panner* were consumed fortnightly and sometimes in a month. Oils like mustard and vegetable oil were consumed daily but the intake of *ghee* was less in all the selected families. *Ghee* was used only for particular recipes and in special occasion. Roots and tubers like onion and potato were consumed daily whereas other vegetables and green leafy vegetables were consumed 3-4 times a week. It was also observed that seasonal vegetables were consumed as per the availability. Banana and Guava were the most preferable fruits consumed by most of the selected families in Punjab. However, overall fruit consumption was found to be low (weekly or on a fortnightly basis). Seasonal fruits were also consumed by all the families in Punjab based on the availability. Consumption of non-veg was found to be low and occasionally. Fish consumption was found to be low as compared to the other livestock. Eggs was also consumed in a month or fortnightly.

The study showed that sugar was consumed on a daily basis whereas jaggery was consumed in a week or fortnightly. Tea was consumed on a daily basis in Punjab. Frequency of alcohol consumption was observed on a monthly or occasionally basis. The results of this study showed that the food items such as staples food (wheat and rice), milk, sugar, oil and condiments were consumed on a daily basis in Punjab, whereas the consumption of fruits, meat and fish was low and less frequent.

**Table 5. Average consumption of foods items of selected families in different regions of Punjab**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Food Items | Daily | Weekly | Fortnightly | Monthly | Occasionally | Not Consuming |
| Cereals |  |  |  |  |  |  |
| Wheat  | 480 (100) | - | - | - | - | - |
| Rice  | 480 (100) | - | - | - | - | - |
| Maize  | - | 65 (13.54) | 45 (9.38) | 147 (30.63) | 172 (35.83) | 51 (10.63) |
| Pulses |  |  |  |  |  |  |
| Green gram  | - | 168 (35) | 196 (40.83) | 116 (24.17) | - | - |
| Black gram  | - | 108 (22.5) | 140 (29.17) | 141 (29.38) | 91 (18.96) | - |
| Bengal gram  | - | 17 (3.54) | 117 (24.38) | 249 (51.88) | 97 (20.21) | - |
| Lentil  | - | 63 (13.13) | 126 (26.25) | 156 (32.5) | 135 (28.13) | - |
| Chik pea | - | 97 (20.21) | 147 (30.63) | 194 (40.42) | 42 (8.75) | - |
| Rajma  | - | 43 (8.96) | 113 (23.54) | 176 (36.67) | 148 (30.83) | - |
| Milk and Milk products |  |  |  |  |  |  |
| Curd  | 75 (15.63) | 167 (34.79) | 166 (34.58) | 62 (12.92) | 10 (2.08) |  |
| Butter milk | 40 (8.33) | 96 (20) | 117 (24.38) | 146 (30.42) | 81 (16.88) |  |
| Milk  | 480 (100) | - | - | - | - | - |
| Paneer  | - | 130 (27.08) | 151 (31.46) | 123 (25.63) | 76 (15.83) | - |
| Fats and Oils |  |  |  |  |  |  |
| Ghee  | 75 (15.63) | 83 (17.29) | 152 (31.67) | 106 (22.08) | 64 (13.33) | - |
| Oil  | 480 (100) | - | - | - | - | - |
| Green leafy vegetables | 71 (14.79) | 156 (32.5) | 171 (35.63) | 39 (8.13) | 43 (8.96) | - |
| Roots and Tubers | 375 (78.13) | 56 (11.67) | 49 (10.21) | - | - | - |
| Other vegetables | 123 (25.63) | 172 (35.83) | 128 (26.67) | 57 (11.88) | - | - |
| Fruits |  |  |  |  |  |  |
| Banana  | - | 162 (33.75) | 175 (36.46) | 125 (26.04) | 18 (3.75) | - |
| Guava  | 82 (17.08) | 105 (21.88) | 168 (35) | 90 (18.75) | 35 (7.29) | - |
| Apples  | - | 45 (9.38) | 119 (24.79) | 157 (32.71) | 159 (33.13) | - |
| Oranges  | 38 (7.92) | 94 (19.58) | 146 (30.42) | 106 (22.08) | 96 (20) | - |
| Others  | 7 (1.46) | 182 (37.92) | 117 (24.38) | 111 (23.13) | 63 (13.13) | - |
| Non-Veg |  |  |  |  |  |  |
| Chicken  | - | 63 (13.13) | 103 (21.46) | 97 (20.21) | 17 (3.54) | 200 (41.67) |
| Mutton  | - | 58 (12.08) | 91 (18.96) | 103 (21.46) | 24 (5) | 204 (42.5) |
| Fish  | - | 0 (0) | 72 (15) | 76 (15.83) | 114 (23.75) | 218 (45.42) |
| Eggs | - | 112 (23.33) | 98 (20.42) | 69 (14.38) | 1 (0.21) | 200 (41.67) |
| Sugars |  |  |  |  |  |  |
| Jaggery  | 48 (10) | 170 (35.42) | 155 (32.29) | 62 (12.92) | 45 (9.38) | - |
| Sugar  | 480 (100) | - | - | - | - | - |
| Alcohol  | - | 65 (13.54) | 59 (12.29) | 129 (26.88) | 146 (30.42) | 81 (16.88) |
| Beverages |  |  |  |  |  |  |
| Tea  | 480 (100) | - | - | - | - | - |
| Coffee  | - | 7 (1.46) | 81 (16.88) | 123 (25.63) | 158 (32.92) | 111 (23.13) |

Data in parenthesis expressed as percentage

1. **Household food security status**
2. **Distribution of the selected families on the basis of affirmative responses for the eighteen (18) household food security statements**

The per cent distribution of the families based on the affirmative responses for different statements of USDA food security core module is presented in Table 6. The statements were divided into two stages: adult stage and child stage (<18 years of age). In the adult stage, 80 per cent of the selected families were worried that the food would run out, 75 per cent felt that they couldn’t afford the balanced meals, 78 per cent believed that they had to cut the size of the meals or skip meals and 77 per cent felt that they had to eat less than their appetite. Less than 30 per cent adults lost their weight (especially mothers) due to non-availability of food and remained without food for the whole day. Almost 40 per cent adults in the household did not eat food even when hungry.

**Table 6 Distribution of the selected families in Punjab on the basis of affirmative responses for the eighteen (18) household food security statements (n=480)**

|  |  |  |
| --- | --- | --- |
| S.No. | Statements\* | Punjab |
| AD 1 | You were worried that food would run out. | 384 (80) |
| AD 2 | Food bought did not last. | 313 (65) |
| AD 3 | Could not afford balanced meals. | 360 (75) |
| AD 4 | Cut the size of meals or skip meals. | 376 (78) |
|  | If yes to statement 4, how often did this happen? | 211 (44) |
| AD 5 | You ate less than the appetite. | 371 (77) |
| AD 6 | You did not eat when hungry. | 189 (39) |
| AD 7 | You lost weight due to no food. | 123 (26) |
| AD 8 | You did not eat whole day. | 138 (29) |
|  | If yes to statement 8, how often did this happen? | 139 (29) |
| CH 1 | You relied on low-cost food to feed your children. | 322 (67) |
| CH 2 | You could not feed your children a balanced meal. | 300 (63) |
| CH 3 | Your children were not eating enough. | 202 (42) |
| CH 4 | You cut the size of children’s meal. | 115 (24) |
| CH 5 | Your children did not eat when hungry. | 0 (0) |
| CH 6 | Your children did not eat for the whole day. | 0 (0) |
| CH 7 | Your children skipped a meal. | 119 (25) |
|  | If yes to statement 7, how often did this happen? | 17 (4) |

Data in parenthesis expressed as percentage (Based on affirmative responses)

\*18-items US Department of Agriculture’s core Food security Module (2012)

Data regarding the per cent distribution of the selected families based on statements (child stage) revealed that approximately 60 per cent children were not consuming balanced meal and relied on low-cost foods. There was not enough food for children in 42 per cent of the families. One fourth of the families had to cut the size of the meal for their children or skip their meals, however, only 4 per cent skipped the meal only once or twice in a month. It was also observed that no child had to skip the meal when hungry or did not eat for the whole day.

1. **Household food security among selected families**

Table 7. revealed that most of the selected families (77%) were food insecure in Punjab as compared to food secure families which were only 23 per cent. Food insecure families were again classified as food insecure without, medium and severe experience of hunger. 24 per cent of the selected families were food insecure without experience of hunger and severe experience of hunger whereas 29 per cent were food insecure with medium experience of hunger in Punjab.

**Table 7 Household food security among families in Punjab**

|  |  |
| --- | --- |
| Category\*  | Punjab (n=480) |
| Food Security  | 110 (23) |
| Food Insecurity  | 370 (77) |
| Food Insecurity without the experience of hunger  | 114 (24) |
| Food Insecurity with medium experience of hunger | 142 (29) |
| Food Insecurity with severe experience of hunger | 114 (24) |

Values in parenthesis expressed as percentage

\*18-items US Department of Agriculture’s core Food security Module (2012)

1. **Relationship between different explanatory variables and their association with household food security status of families in Punjab: Statistical analysis**
2. **Association between family size and their household food security status**

Association of family type and size with household food security status of families is presented in the Table 8. Families were classified as small (≤ 4 family members) and large (> 4 family members) based on the number of family members. The data recorded in this study revealed that small families (82%) were more food insecure as compared to the large families (70%). Food insecurity with experience of severe hunger (FISSH) was observed to be more in smaller families (34%) than larger families (26%). A significant association (*P<0.01*) was observed between the family size and the household food security status. The results in this study revealed that food security was more prevalent in the larger families as compared to smaller families and an increase in the family size impacted the household food security status positively. A significant association (*P<0.01*) was also observed between the family type and the household food security status where joint families were more food secure as compared to the nuclear families. Food insecurity among the nuclear families in Punjab was observed to be 79 per cent as compared to 69 per cent for the joint families. Food insecurity with severe experience of hunger in Punjab for the nuclear and joint families was found to be 27 and 11 per cent respectively (more in nuclear families compared to the joint families).

**Table 8 Association of family type and size with their household food security and insecurity level in Punjab**

|  |  |  |
| --- | --- | --- |
| Food Security status | Family Type | Family Size |
| **Nuclear****(n1=386)** | **Joint****(n2=94)** | **Small****(n1=273)** | **Large****(n2=207)** |
| Food Security | 81 (20.98) | 29 (30.85) | 48(18) | 62(30) |
| Food Insecurity | 305 (79.02) | 65 (69.15) | 225(82) | 145(70) |
| Food Insecurity without the experience of hunger | 95 (24.61) | 19 (20.21) | 65(29) | 49(34) |
| Food Insecurity with medium experience of hunger | 106 (27.46) | 36 (38.3) | 83(37) | 59(41) |
| Food Insecurity with severe experience of hunger | 104 (26.94) | 10 (10.64) | 77(34) | 37(26) |
| Chi square value | **15.289\* (*P<.002*)** | **13.295\* (*P<.004*)** |

\*Significant at 1% level

Data in parenthesis expressed as percentage

Family size: Small (≤4); Large (>4)

1. **Different explanatory household variables and household food security level**

Multiple regression analysis was done to identify the impact of different explanatory variables on the household food security status of the selected families in Punjab. The results, as shown in Table 9. revealed that a significant (*P<0.01*) impact of socio-economic class, food consumption, income and food expenditure was observed on the household food security status. The coefficient of multiple determination (R2) showed that a 60 per cent (0.606) impact was observed on the household food security by the explanatory variables. Direct association has been observed between the income and food security status of the families. Income can be seen as the primary driver which impacts other household variables such as food consumption and food expenditure directly as well as socioeconomic status of the families. An increase in the income improves the purchasing power of the family, thus increasing accessibility to the variety of food items, which in turn increases food expenditure and food consumption. An increase in food consumption and food expenditure has a positive impact on the food security status of the families. An increase in the socioeconomic status was perceived to have a positive impact on the household food security status and vice versa.

**Table 9 Equation of multiple regression analysis: step-wise contribution of different explanatory household variables to the household food security status in Punjab**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |  Variables  | B | p value | R2 |
|   | **Constant** | 2.737 | 0.000 | 0.606\* |
| X1 | Socio-economic class | 0.639 | 0.000 |  |
| X2 | Food consumption | 0.016 | 0.000 |  |
| X3 | Income | 9780 | 0.000 |  |
| X4 | Food expenditure | 0 | 0.001 |  |

\*Significant at 1% level

1. **Correlation between different explanatory household variables**

Different household variables (income, socio-economic class, food expenditure, food consumption and food security status) were examined and the correlation between them was studied, which is represented in the Table 10. The result showed a positive and significant correlation (significant at 1% level) between all the variables.

**Table 10 Correlation between different explanatory household variables of selected families in Punjab**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Socio-economic/ demographic variables | Income | Socio-economic class | Food expenditure | Food consumption | Food security status |
| Income | **-** |  |  |  |  |
| Socio-economic class | 0.738\* | - |  |  |  |
| Food expenditure | 0.873\* | 0.681\* | - |  |  |
| Food consumption | 0.498\* | 0.569\* | 0.493\* | - |  |
| Food security status | 0.764\* | 0.489\* | 0.709\* | 0.353\* | - |

\*Significant at 1% level

1. **DISCUSSION**

Food is a basic necessity which is essential for sustenance. Food security subsists, when all people, at all times have equal access (physical and economical) to sufficient, safe, nutritious and healthy food which would meet their daily dietary needs and food choices to live an active and healthy life. The present study assesses the household food security status in Punjab and it was observed that most of the selected families (77%) were food insecure. The findings of this study were closely related to the study covered by Chinnakali et al., (2014) which showed that approximately three-fourth of the families were food insecure. This study, however, contradicts with the findings of Joshi et al., (2019) and Rautela et al., (2020) where majority of the subjects were found to be food secure in Delhi and Chennai.

The findings of the present study contradict the results reported by Ihabi et al., (2013) which showed a decrease in the household food security status with the increase in the family size (increase in 1 member in the family was associated with 77% increase in the odds of that family being food insecure). An increase in the family size reduces the adverse consequences of food insecurity if other household members are able to contribute to the total household income (Oluwatayo, 2009). Khalid et al., (2012) also observed that joint family systems were positively impacting the rural household food security in Punjab, Pakistan. Similar observation was also made by Khalid et al., (2010) that households with joint family system were 5.287 times more likely to be food secure as compared to the households with nuclear family system in Faisalabad of Pakistan. The probability of household’s food security increased with the increase in the income (a rise of Rs 100 in the household income increased it by 0.03) as per the research done by Sidhu et al., (2008) which aligns with the results of this study. The data of the present study also revealed that majority of the households (80%) were nuclear in nature which aligned with the research carried out by Mehta et al., (2013).

An increase in food consumption and food expenditure has a positive impact on the food security status of the families, same had been noted in the research conducted by Isanka et al., (2007). A significant association at 95 per cent level between socioeconomic status and household food security had been observed in the study done in the rural Puducherry by Nagappa et al., (2020) which was similar to the findings of this study. An increase in the socioeconomic status was perceived to have a positive impact on the household food security status and vice versa.

The findings of this study can be closely related to Engel’s law which states that an increase in the income of the family is directly related to the increase in the total amount of food expenditure, even though proportion of income which is spent on food decreases (Corporatefinanceinstitute.com, 2021). A positive and significant association was observed in the research conducted by Minchin, (2021) between food security and other household variables such as food consumption, food expenditure and income, similar to the results of the present study. Similar to the findings of Mehta et al., (2013) and Mukherjee and Chaturvedi, (2017), the present study revealed that most of the families in Punjab were non-vegetarians (59%). This study also observed that majority of the families in rural Punjab were Hindu (49%) as most of the families were migrated from Uttar Pradesh and Bihar which contradicts the findings of Kaur et al., (2017) which stated that majority of the families were Sikh followed by Hindus in Punjab. It was further observed that, most of the respondents (57 %) belonged to household with less than 5 members which was also presented in the study carried out by Mukherjee and Chaturvedi, (2017). Around 52 per cent of the respondents interviewed in the current study lived in pucca houses which was also observed by Rana et al., (2020) which showed majority of the families in Ludhiana (Punjab) lived in pucca houses.

Educational status of the respondents examined in the current study revealed that most of the respondents were educated only upto high school and very few had the chance to pursue education above the higher secondary which was also reported in the study carried out by Kaur et al., (2017). This study further indicated that labour was the most pursued occupation of the male respondents and females were mostly housewives which was similar to the findings of the research conducted by Kaur et al., (2017).

Socio-economic class of the families determined by using the modified Kuppuswamy’s socioeconomic status scale (Saleem, 2019) revealed that majority of the families (61%) in Punjab belonged to the upper lower class and most of them (47%) had a monthly income between Rs. 3,908 to 11,707. Similar observations were also made by Kaur et al., (2017) which showed majority of the respondents were from low socio-economic status households which earned less that Rs. 10,000 per month. The findings of this study were also consistent with research carried out by Mehta et al., (2013).

This study revealed that consumption pattern was directly linked with the household income and an increase in the household income enabled the families to buy more diverse food items as well as non-food items. Similar findings have also been reported by Sibhatu and Qaim, (2018) and Sidhu et al., (2008). The results of this study presented that the food items such as staples, milk, sugar, oil and condiments were consumed on a daily basis in all the regions of Punjab, whereas the consumption of fruits, meat and fish was low and less frequent. Same inference was also published by the study conducted by Singh and Aggarwal, (2020) and Mahapatra et al., (2021). Consumption pattern of food items was largely dependent on the income of the families and an increase in income influenced the diet diversity.

The findings of this study were similar to the study carried out by Nagappa et al., (2020), which showed only 4 per cent of children had to skip meal or eat less due to lack food. Gulliford et al., (2006) also stated a similar observation with regards to the children in the household skipping meal or eating less due to insufficient food, however, it also showed a significant lower number of families who were worried or felt food insecure in contrast to the results of this study.

1. **SUGGESTIONS**

Action is imperative at all levels - local, national, and global - to end hunger and malnourishment and ensure food security for all. To meet these present and emerging future challenges requires that investments in food security are sustained - from innovation in climate-resilient crop yields to investing in programs to assist the most vulnerable.

**REFERENCES**

Anonymous. (2021). World Population. <https://www.worldometers.info/>.

Global Hunger Index. (2021). One decade to zero hunger linking health and sustainable food systems. https://[www.globalhungerindex.org](http://www.globalhungerindex.org).

National Family Health Survey (NFHS) (2019-2021). International Institute for Population Sciences, Ministry of Health and Family Welfare, Government of India.

Food and Agriculture Organization. (2001). The State of food insecurity in the world. Rome: United Nations. <https://www.fao.org>.

Economist Impact. (2021). Global food security index 2021: Transforming food systems after COVID-19. Economist Intelligence Unit. https://impact.economist.com/sustainability/project/food-security-index

United States Department of Agriculture. (2012). U.S. household food security survey module: Three-stage design, with screeners. Economic Research Service. https://www.ers.usda.gov/media/8271/hh2012.pdf

Saleem, S.M. (2019). Modified Kuppuswamy socioeconomic scale updated for the year 2019. Indian Journal of Forensic and Community Medicine, 6(1), 1-3.

Chinnakali, P., Upadhyay, R. P., Shokeen, D., Singh, K., Kaur, M., Singh, A. K., Goswami, A., Yadav, K., & Pandav, C. S. (2014). Prevalence of household-level food insecurity and its determinants in an urban resettlement colony in north India. Journal of Health, Population, and Nutrition, 32(2), 227-36.

Joshi, A., Arora, A., Amadi-Mgbenka, C., Mittal, N., Sharma, S., Malhotra, B., Grover, A., Misra, A., & Loomba, M. (2019). Burden of household food insecurity in urban slum settings. PLoS ONE, 14(4), 02144-02161.

Rautela, G., Ali, M. K., Prabhakaran, D., Narayan, K. V., Tandon, N., Mohan, V., & Jaacks, L. M. (2020). Prevalence and correlates of household food insecurity in Delhi and Chennai, India. Food Security, 12(2), 391–404. <https://doi.org/10.1007/s12571-020-01010-z>

Ihab, A. N., Rohana, A. J., Manan, W.W., Suriati, W. W., Zalilah, M. S., & Rusli, A. M. (2013). Nutritional outcomes related to household food insecurity among mothers in rural Malaysia. Journal of Health, Population, and Nutrition, 31(4), 480-89.

Oluwatayo, I.B. (2009). Towards assuring households’ food security in rural Nigeria: Have cooperatives got any place. International Journal of Agricultural Economics and Rural Development, 2(1), 52-61.

Khalid, B. M., Schilizzi, S., & Pandit, R. (2012). The determinants of rural household food security in the Punjab, Pakistan. Economic Analysis, 1784, 2016–141882.

Khalid, B. M., Naeem, M. K., & Niazi, S. A. K. (2010). Rural and peri-urban food security: A case of district Faisalabad of Pakistan. World Applied Sciences Journal, 9, 403–411.

Sidhu, R. S., Kaur, I., & Vatta, K. (2008). Food and nutritional insecurity and its determinants in food surplus areas: The case study of Punjab state. Agricultural Economics Research Review, 21(1), 91–98.

Mehta, B., Grover, K., & Kaur, R. (2013). Nutritional contribution of mid day meal to dietary intake of school children in Ludhiana district of Punjab. Nutrition & Food Sciences, 3(1), 183.

Isanaka, S., Mora-Plazas, M., Lopez-Arana, S., Baylin, A., & Villamor, E. (2007). Food insecurity is highly prevalent and predicts underweight but not overweight in adults and school children from Bogota, Colombia. The Journal of Nutrition, 137(12), 2747–2755.

Nagappa, B., Rehman, T., Marimuthu, Y., Priyan, S., Sarveswaran, G., & Kumar, S. G. (2020). Prevalence of food insecurity at household level and its associated factors in rural Puducherry: A cross-sectional study. Indian Journal of Community Medicine, 45, 303–306.

Anonymous. (2021). Engel's law. <https://Corporatefinanceinstitute.com>.

Minchin, J. (2021). Income more important than good land when it comes to food security. <https://www.newfoodmagazine.com/news/144350/food-security-5/>

Mukherjee, R., & Chaturvedi, S. (2017). A study of the dietary habits of school children in Pune city, Maharashtra, India. International Journal of Community Medicine and Public Health, 4(2), 593–597.

Kaur, S., Bains, K., & Kaur, H. (2017). Assessment of stunting and malnutrition among school-going children from three cultural regions of Punjab, India. Indian Journal of Ecology, 44, 77–98.

Rana, S. K., R. Saluja, and G. S. Ghotra. (2020). Geographical Differentials and Household Characteristics among Wealth Quintile: A Cross-Sectional Study of District Ludhiana, Punjab. Bi-Annual IJBMR, 10, 7.

Sibhatu, K. T., & Qaim, M. (2018). Farm production diversity and dietary quality: Linkages and measurement issues. Food Security, 10, 47–59. <https://doi.org/10.1007/s12571-017-0762-3>

Singh, P., & Aggarwal, M. (2020). Mid-day meal programme: Perception of beneficiaries and teachers of a school in Delhi. Plant Archives, 20, 439–445.

Mahapatra, S., Parker, M.E., Dave, N., Zobrist, S.C., Arul, D.S., King. A., Arvind, B.A., & Sachdeva, R. (2021). Micronutrient-fortified rice improves haemoglobin, anaemia prevalence and cognitive performance among schoolchildren in Gujarat, India: a case-control study. International Journal of Food Science and Nutrition, 72,690-703.

Gulliford, M.C., Nunes, C., & Rocke, B. (2006). The 18 Household Food Security Survey items provide valid food security classifications for adults and children in the Caribbean. BMC Public Health, 6(1),1-8.