

# SCHOOL AGE CHILDREN HEALTH AND NUTRITION SURVEY (SCANS) PUNJAB 2020





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## Message from Dr. Yasmeen Rashid

Ensuring good child health and nutrition is a national priority. Global and national research have targeted the health of children under five years due to significantly high mortality and morbidity in this age group, but there has been limited effort and global prioritization to understand the roots of dietary practices and patterns, especially among the school-age children. Present-day developments have brought researchers focus on malnutrition trends and general health outcomes amongst adolescents specially those older than 15 years of age.

Pakistan is the second highest country with out of school children. This exists due to unavailability of schools, access issues, and due to disparities based on geography, gender, and socio-economic status. Socio-economic status, customs, inaccessibility, and financial issues has also left millions of adolescent girls out of schools.

COVID-19 pandemic has also underscored the important issue of persistent burdens of illiteracy, childhood stunting, wasting and widespread micronutrient deficiencies. COVID-19 pandemic specifically had a profound impact on peoples' health, and on our societies which has also been felt around the world. The numbers of lives lost, and the amount of ill health and suffering caused by SARS-CoV-2 infections are almost incomprehensible. Health and education systems have been stretched to their limits - and still are at the time of writing - resulting in disruption to essential health and education services. A progress assessment was required to recalibrate our response on field.

The Aga Khan University was fortunate to undertake this survey in collaboration with Ministry of Health, Punjab, PSPU, and TVI, to gather valuable health and nutritional information about school aged children residing in Punjab's population. It collected information about feeding practices, food intake, food knowledge, behavior and attitudes, anthropometric measurements, and biochemical assessment of blood samples from school aged children. Another feature of the survey is that it probed nutrition-sensitive indicators related to water and sanitation, food security, and micronutrients.

This survey reflects the hard work and dedication of hundreds of field staff and collaborators who made it possible to achieve the required samples and data from every district of Punjab, Pakistan, including the insecure areas. As a Minister I am happy to see the support provided by several donors, partners, and their leads. I am honored to say that this extensive work will work as a game changer and assist in the formation of integrated health interventions for school aged children to improve their health and nutritional needs. I look forward to moving these policies to impactful action on ground



Dr. Yasmeen Rashid  
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## Message from Prof. Gaffar Billoo

SCANS (School-age Children and Adolescents Nutritional Survey) was conducted in the province of Punjab. The purpose of the survey was to give an insight into and increase understanding of the relationship between dietary intake, anthropometrics, and health and biochemical outcomes. The targeted population group included children (in-school children and out-of-school children) aged 5 years to 9.9 years and this was conducted in the year 2020. The survey was implemented by the Trust for Vaccines & Immunizations (TVI), and Aga Khan University (Karachi, Pakistan), with close collaboration and support of the Policy and Strategic Planning Unit (PSPU), Ministry of Health, Punjab.

The importance of this survey was critical because, for years, global health measures and policies have prioritized focusing on children under 5 years of age to address the need to reduce mortality in this age group as it was outlined in SDG 3 (newborn and child mortality) and MDG 4. These efforts culminated in neglect of the health needs of children aged 5 years to 9.9 years. It was important to determine their health status so that policies and interventions could be planned, and they could move into the next phase of their life with a healthy lifestyle.

A total of 3915 households were included from Punjab, represented both urban (1339 households) and rural (2576) populations. 92.2% of these children were attending schools. Attending school was found to be related to a decrease in sedentary activities like watching television, but contradictorily it reduced out-of-house playtime of children and they spent most of the time indoors. The important details about the dietary intake of children and their meal composition were also assessed during the survey. The prevalence of underweight, overweight, stunting, and anemia was found to be 17.2%, 8%, 19%, and 34.1% respectively with boys slightly more affected than girls except for anemia which affected both equally. It was found that children with mothers who had better, or higher levels of education consumed more diverse and healthy foods as compared to mothers who had lower levels of education, this combined with a significant prevalence of low levels of education among household heads. The household surveyed in urban areas had increased food security and more food diversity as compared to rural households that lacked food security and food diversity.

The results of the survey not only provided invaluable insights into the nutritional status and dietary intake of participants but also provide information regarding household conditions. The results of this survey carry profound weightage in the planning of future evidence-based policies specially to integrate nutrition, lifestyle, education, and sanitation as essential factors for the betterment of the community. Consequently, this study is a vital tool for addressing health concerns, informing policymakers, and prospective management and resource allocation processes.

For the determination of causative and correlational variables, more comprehensive analysis and research strategies are necessary. Insight is also required to determine the impact of the household head's literacy on the children's general lifestyle and academic experiences. This study establishes the framework for any future work in this field and gives an overview of the circumstances for children aged 5 to 9.9 years in rural and urban Punjab.

However, this study only provides a snapshot of the nutritional and health indicators. We earnestly hope that through analyzing the datasets further, academics will be able to gain a better appreciation of the themes included in the survey. Lastly, we encourage all stakeholders, including people and organizations, to actively engage in utilizing this important data to bring a paradigmatic transformation. We would like to thank the Honorable Minister of Health Dr. Yasmin Rashid and Dr. Shagufta Zareen from PSPU for their unaverred support and Dr. Zulfiqar Bhutta and Dr. Jai Das for their technical support and guidance.



A handwritten signature in black ink that reads "Gaffar Billoo".

Prof. Gaffar Billoo  
Chairman and founding member  
Trust for Vaccines & Immunization

## Message from Prof. Zulfiqar A. Bhutta

Healthy children are a vital part of every prosperous and progressive society. Optimal health in early life and school age is the very foundation of all human capital reflected by physical as well as cognitive, social, emotional and mental health and wellbeing. This survey brings forth crucial information on an age group which has not been a major focus of global programs in recent years. Although we have identified a dire need to work towards a healthy future for school age children in our country, united and collaborative efforts have been few and far between. And such action has to be based on solid population level information which has been a major global and national gap.

Very little is known about the health and nutrition of school-age children in Pakistan, and given the interest in school-based platforms, such information is vital for policy. A large-scale survey such as this was required to lay the foundation of future research which should target interventions aimed towards improving the health and lifestyle of children in the 5 – 10 years' age group. This project was conducted in Punjab, which is the largest province by population in Pakistan. The Aga Khan University collaborated with the Ministries of Health, Punjab, the Mother & Child Care Research Inc. (Canada) and the Trust for Vaccines & Immunization (TVI) to gather vital data on lifestyle and behavioral activities, including dietary habits, nutritional intake, health seeking behavior, physical activity, approach towards education (In-school vs out of school) and the association of the aforementioned outcomes with social determinants of health. Another requisite dimension that was also explored was the relationship between lifestyle and nutrition, and the education level of children. This study not only surveyed the approach of the population towards physical activity, hygiene, healthcare and diet but also collected anthropometric measurements, blood samples for biochemical assessments and assessed vision and dental health. While we did not collect information on food environments, future follow up studies could explore this important issue.

A large proportion of children who are out of school are also victims of poverty, poor nutrition and fragmented healthcare. Very limited evidence exists

on the nutritional status of this group. Therefore, understanding the reason and addressing the factors behind children being out of school is imperative.

The dedication of our field staff and collaborators is commendable; without their effort and energy, unremitting even amidst the Covid-19 pandemic, the rigorous data and sample collection we were able to achieve would not have been possible. As project lead, I am deeply grateful to Dr. Jai Das for ably leading the work, our donors and partners for the valuable support they have provided throughout the entirety of this project. I am especially grateful to Dr. Yasmin Rashid, the honorable health minister of Punjab who took personal interest in this project and provided full support and Dr Shagufta Zareen from the Policy and Strategic Planning unit for taking a keen interest and overseeing the activities. I am positive that this study will act as a catalyst towards future work and will assist in the formation of more holistic and equitable policies and subsequent strategies to address the health and wellbeing of school age children in our country.



Zulfiqar A. Bhutta  
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## ACRONYMS

|       |                                   |
|-------|-----------------------------------|
| AKU   | Aga Khan University               |
| ARI   | Acute Respiratory Infection       |
| BISP  | Benazir Income Support Program    |
| BMI   | Body Mass Index                   |
| DBM   | Burden of malnutrition            |
| DHS   | Demographic and Health Survey     |
| DMU   | Data Management Unit              |
| ERC   | Ethical Review Committee          |
| FFQ   | Food Frequency Questionnaire      |
| FIES  | Food Insecurity Experience Scale  |
| HAZ   | Height of Age z-score             |
| HH    | Household                         |
| LMICs | Low- and middle- income countries |
| MDG's | Millennium Development Goals      |
| MUAC  | Mid-Upper Arm Circumference       |
| NBC   | National Bioethics Committee      |
| NGOs  | Non-government Organizations      |
| NNS   | National Nutrition Survey         |
| PBS   | Pakistan Bureau of Statistics'    |
| PSU   | Primary Sampling Unit             |
| RDA   | Recommended Daily Allowance       |
| SD    | Standard Deviation                |
| TVI   | Trust for Vaccines & Immunization |
| WASH  | Water, Sanitation and Hygiene     |
| WHO   | World Health Organization         |

## INTRODUCTION

Globally, researchers have previously targeted the health of children under five years of age due to the significantly high mortality in this age group and the fact that this was an explicit focus of the Millennium Development Goals (MDGs) and continues to be a target for the Sustainable Development Goals (SDG Goal 3). This over the years has led to unintentional neglect of school-aged children and adolescents (1). Present-day developments have brought researchers focus on malnutrition trends and general health outcomes amongst adolescents specially those older than 15 years of age (2-4). However, there still exists a lack of information, well as a gap in information regarding malnutrition trends, eating habits, food choices and dietary intakes habits amongst school-aged children 5 to 9.9 years of age.

Over the decade, it has been identified that morbidity and mortality trends in children younger than five years of age have sharply decreased when equated to trends in older children aged 5 to 14 years (5). It has been noticed that protein-energy malnutrition and micronutrient deficiency, especially iron, remain an important cause of death through these age-groups and were largely limited to regions with lower socio-demographic index (6). In 2015, nearly 7.2 million deaths were reported in childhood and adolescent population internationally, with 463,000 deaths amongst school-aged (5-9 years) children (6). In the next year, in 2016, 98% of all deaths in children and adolescents aged between 5 to 14 years occurred in low- and middle-income countries (LMICs) with seven countries alone, including Pakistan accounting for 50% of the total number of deaths (5).

The Double Burden of Malnutrition (DBM) a term that refers to the coexistence of both under nutrition and over nutrition in the same population across the life course. 'Across the life course' denotes to the occurrence of under nutrition early in life which contributes to an increased likelihood of developing over nutrition in adulthood (7) The Lancet series on DBM reports this issue to be prevalent in LMICs (8, 9) Pakistan is an LMIC (10) and amongst the countries currently challenging the problem of double burden of malnutrition (DBM). DBM is attributed mainly to transition of diet and dietary habits which, due to rapid urbanization, industrialization, trade expansion and easy access to and abundance of high-calorie foods, is leading to a rise in obesity rates while the issue of undernutrition in the country simultaneously prevails (8, 11). Food insecurity is another concern which affects people in Pakistan, due to rapidly increasing population size, erratic food production and consistently rising food prices. According to National Nutrition Survey (NNS) 2018 (12), approximately 36.9% of the individuals in Pakistan face food insecurity which is a major contributor to poor nutrition amongst children. This not only steeply increases the risk of malnutrition but also adversely impacts education and health (13). This leads to children developing poor dietary habits which are known to contribute towards development of non-communicable diseases into adulthood (14).

The province of Punjab, in Pakistan, had a high prevalence of malnourished children in accordance with the NNS 2018 report, 36.4% children less than five years of age are stunted, 23.5% underweight and 9.9% are overweight and obese. A recent systematic review assessed malnutrition trends amongst children aged 5 to 15 years in Pakistan and reported a pooled

prevalence of anthropometric indices as follows: 23% stunted, 25.1% underweight, 11.4% overweight and 6.9% obese.

It is important that nutritional status and dietary intake of school-aged children 5 to 9.9 years of age be assessed to ensure a healthy transition of children into their second decade of life, and their adulthood. There is also very limited information on the nutritional status of children who are out of school (either dropouts or those who are not enrolled), as these could represent different contextual risks. Therefore, the aim of this survey is to determine nutritional and health status of both in-school and out-of-school children aged 5 to 9.9 years, in the province of Punjab, Pakistan.

## **OBJECTIVE**

The objective of this study was to assess the health, nutrition, and lifestyle of school-aged children 5 to 9.9 years of age in Punjab, Pakistan. The study also assessed the association of health and nutritional status with sociodemographic factors (wealth, food insecurity, maternal education and gender), setting (rural vs. urban), in-school vs. out-of-school, and child health (anemia, nutrition status and dietary intake).

## **METHODOLOGY**

### **Survey design, location, and population**

A cross-sectional multistage complex household survey was conducted on health and nutrition of school-aged children from Punjab, a province of Pakistan.

### **Target population**

All school-aged children (i.e., girls and boys) aged 5 to 9.9 years at the time of the survey who were permanent residents of Punjab, were approached along with their caregivers. If the children were a part of any other nutritional trial, they were excluded from this study. Children with any known co-morbidities were also excluded.

### **Sampling frame**

The Pakistan Bureau of Statistics (PBS) used a sampling frame prepared through the Population and Housing Census 2017. PBS has divided the whole country into small compact areas or enumeration blocks, each comprising 200–250 houses on average, with digitized maps containing prominent landmarks within the boundaries of these blocks. PBS uses these blocks as a sampling frame for drawing representative samples for its surveys/studies.



## Urban areas

Each city/town is divided into enumeration blocks, each of which consists of an average of 200–250 houses with well-defined boundaries recorded in prescribed forms, with maps and physical features within the blocks.

## Rural areas

The rural areas frame consists of enumeration blocks which can be either a whole village or part of a village.

Enumeration blocks are also termed Primary Sampling Units (PSUs). Each urban or rural PSU has well-defined geographical boundaries described on a specified form along with map. The total number of enumeration blocks/PSUs and households recorded during the Population and Housing Census 2017 are given below in **Table 1**.

Table 1: Sampling frame

| Province/ region       | Number of blocks |              |                | Number of households |                   |                   |
|------------------------|------------------|--------------|----------------|----------------------|-------------------|-------------------|
|                        | Rural            | Urban        | Total          | Rural                | Urban             | Total             |
| KP                     | 18356            | 3221         | 21,577         | 3,269,636            | 741,014           | 4,010,650         |
| Punjab                 | 60048            | 26958        | 87,006         | 10,714,102           | 6,389,733         | 17,103,835        |
| Sindh                  | 17223            | 21916        | 39,139         | 4,185,828            | 4,399,782         | 8,585,610         |
| Baluchistan            | 8386             | 1826         | 10,212         | 1,301,212            | 474,725           | 1,775,937         |
| FATA (now KPK-NMD)     | 4184             | 43           | 4,227          | 542,255              | 16,124            | 558,379           |
| ICT                    | 787              | 727          | 1,514          | 165,246              | 170,936           | 336,182           |
| <b>Total</b>           | <b>108984</b>    | <b>54691</b> | <b>163,675</b> | <b>20,178,279</b>    | <b>12,192,314</b> | <b>32,370,593</b> |
| Azad Jammu and Kashmir | 3496             | 526          | 4,022          | 524,067              | 116,098           | 640,165           |
| Gilgit Baltistan       | 1098             | 148          | 1,246          | 161,299              | 35,127            | 196,426           |
| <b>Total</b>           | <b>4594</b>      | <b>674</b>   | <b>5,268</b>   | <b>685,366</b>       | <b>151,225</b>    | <b>836,591</b>    |
| <b>Grand Total</b>     | <b>113578</b>    | <b>55365</b> | <b>168,943</b> | <b>20,863,645</b>    | <b>12,343,539</b> | <b>33,207,184</b> |

*\*According to the Constitution of Pakistan, Pakistan constitutes four provinces (including KP-NMD), and ICT, whereas GB and AJK are independent territories. Therefore, whenever estimates or results of Pakistan are prepared, GB and AJK are never covered. These territories are treated separately, and their results/reports are published separately. Similarly, Pakistan estimates will not cover AJK and GB.*

## Stratification Plan

Urban and rural parts of administrative districts were considered urban and rural domains respectively according to the notifications issued by the respective provincial local government departments.

## Sample Size Estimation

The sample size was estimated using the previous Demographic and Health Survey (DHS) (15) and National Nutrition Survey (NNS) (12) response rates, precision, confidence, and design effect. It was assumed that the response rate was 90%, 95% confidence Interval, 7% precision, 2% design effect and extrapolated provincial prevalence of low BMI (defined as BMI-for-age less than 2 SD) in 5 to 9 years as 23.1% for Punjab (NNS data). The total minimum sample size required was calculated to be approximately 308 in the smallest division of Punjab, enabling us to estimate the

BMI. prevalence estimates  $\pm$  5% with 95% confidence for each division. Multiplying this by population fractions (relative to total province population) yields self-weighted division-level samples as displayed in **Table 2**. Sums across divisions yields required at the province level for Punjab.

Table 2. Sample Size (Total Sample)

|                       | Total population | %        | Ratio relative to lowest province | SS multiplied | Total SSUs (individuals) | Total EBs  |
|-----------------------|------------------|----------|-----------------------------------|---------------|--------------------------|------------|
| <b>Punjab</b>         | 110,012,442      |          |                                   |               |                          |            |
| Rawalpindi            | 10,007,821       | 9.09699  | 1.356002                          | 406.8007      | 326                      | 17         |
| Sargodha              | 8,181,499        | 7.436885 | 1.108546                          | 332.5639      | 266                      | 14         |
| Gujranwala            | 16,123,984       | 14.65651 | 2.184707                          | 655.4122      | 525                      | 27         |
| Lahore                | 19,398,081       | 17.63262 | 2.628329                          | 788.4986      | 632                      | 32         |
| Faisalabad            | 14,177,081       | 12.8868  | 1.920913                          | 576.274       | 462                      | 24         |
| Sahiwal               | 7,380,386        | 6.708683 | 1                                 | 300           | 240                      | 13         |
| Bahawalpur            | 11,464,031       | 10.42067 | 1.55331                           | 465.9931      | 373                      | 19         |
| Dera Ghazi (D.G) Khan | 11,014,398       | 10.01196 | 1.492388                          | 447.7163      | 359                      | 18         |
| Multan                | 12,265,161       | 11.14889 | 1.661859                          | 498.5577      | 399                      | 20         |
|                       | 110,012,442      | 100      |                                   | 4471.817      | <b>3582</b>              | <b>190</b> |

### Selection of Households and Subjects

Probability-proportional-to-size selection was done within district level and with urban/rural adjustments. Multistage sampling was done to select enumeration blocks from which 20 households were randomly selected. Households that refused to participate were replaced with the next house in the randomization process. For households that had more than one child aged 5 to 9.9 years, the Kish grid method was applied to select one child per household (16).

### Components of Data Collection

Data was captured on the following components of health and nutrition:

#### Demographic and socioeconomic indicators of households

Information on sex, ethnicity, religion, level of education, marital status and occupation of the head of the household, number of family members, ownership of the house, number of rooms used for sleeping, household construction materials, toilet facilities, sources of drinking water, household assets and land ownership were collected as key indicators of socioeconomic status. Information was also collected on water, sanitation, and hygiene (WASH) and social safety nets. Household information was captured from the head of the household or any knowledgeable member of the household (aged 18 years or more) who was available at the time of interview.

### Household food insecurity and dietary diversity information

Information related to food insecurity and dietary diversity was collected from the head of the household by preference, or any knowledgeable member of the family, using the Food Insecurity Experience Scale (FIES), and Household Dietary Diversity Scale. The FIES is an experience-based metric of the severity of food insecurity, meaning that it relies on people's direct responses to questions regarding access to adequate food. The questions capture self-reported food-related behaviors and experiences associated with increasing difficulties in accessing food due to resource constraints.

### Accurate Age determination of children

Indicators for the assessment of the nutritional status of children, such as stunting (height for age) and underweight (weight for age), require accurate determination of the age of the child. For this reason, special emphasis was put on ascertaining the precise age or date of birth to avoid over- or under-estimation of nutritional indicators. Different sources of information such as birth certificates, school identification and immunization cards and celebration of birthdays in relation to known events calendars with local specificity were used at both stages. In case of non-availability of such documents probing was used for mother/caretaker's recall to determine the exact age by asking the age of any reference child in the family or using events in the household or general events like holidays, religious occasions, weddings, birthdays, crops cultivated in the area or local events etc. in reference to the birth of the child.

### Dietary intake and patterns

Dietary intake patterns were assessed using 24-hour dietary recall questionnaire and semi-quantitative food frequency questionnaire (FFQ) (adapted from Harvard 2012 Youth/ Adolescent FFQ). The 24-hour recall assessed details of products consumed, their ingredients, quantity (using standardized utensils such as cups, spoons, bowls, glasses, etc. as shown in Figure 1), place where the meal was prepared and consumed. For products which were purchased from the market, brand names were captured and information on their nutritional value (as percentage of nutrients) was observed. Where this was not possible, the name of the product was taken without ingredients. If children were given extra supplementation, their intake was evaluated, and details were added for analysis. The semi-quantitative FFQ assessed the frequency of food groups (dairy, grains, meat, fruits, vegetables, fast/junk food, and beverages including water and other sugar-sweetened beverages) consumed and the place they were consumed per day or week. The 24-hour dietary recall and semi-quantitative FFQ can be accessed in the Appendix as Supplementary **Table 1 and 2** respectively.

Figure 1: Standardized utensils used to assess amount of food consumed



### Child Health

Data on general child health was captured by asking about the frequency of fever, headache, diarrhea, cough, stomachache, backache, etc. in the past six months. Data was also collected on child meal patterns, schooling, lifestyle and physical activity, sleep, and on child mental and dental health.

### Anthropometric measurements

Height/length, weight and MUAC measurements were obtained to determine nutrition status of all target age groups. For weight measurements were taken in light clothing and without shoes using a Seca 213 U electronic scale (Hamburg, Germany). Weight measurements were taken to the nearest 0.1 kg (**Figure 2**). Length and height measurements were evaluated using height boards (3 slab) to the nearest 0.1 cm. The standard MUAC tape was used to the nearest 0.1 cm to measure the mid-upper arm circumference. All instruments were calibrated daily by the team leaders before leaving for data collection. All measurements were conducted independently by two study personnel. When the two measurements differed by more than the acceptable cut-offs, a third measure was taken immediately by the team leader and recorded using standardized procedures.

Figure 2: Anthropometric measurements



Blood sample collection and processing

Venous blood samples were taken by trained phlebotomists following standard WHO techniques for phlebotomy and safe injection practices. Hemoglobin levels were tested in the field using HemoCue machines (Angelholm, Sweden) (**Figure 3**).

Figure 3: Blood Sampling



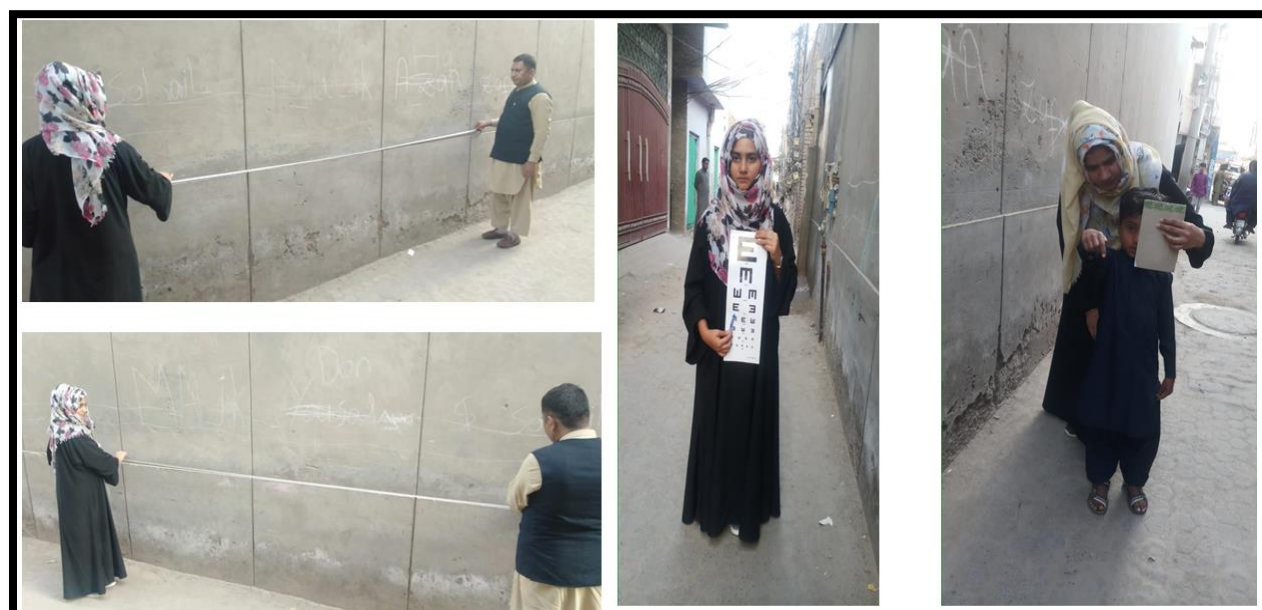
Vision testing

Vision of each eye of the child was checked using the vision charts which were kept at 20 feet from the child. The child was asked to read at a standard distance and the eye vision was assigned



by how far the child could read the lines on the chart. One eye was covered with a paper/card while the other eye was tested (**Figure 4**).

Figure 4: Vision Testing



### Data Collection Tool

We used a structured questionnaire to conduct the interviews. The contents of the questionnaire were finalized in consultation with members of the technical committees at AKU. The modules in the quantitative questionnaire are listed in **Table 3**.

Table 3: Modules of Data Collection Tool

| Module   | Description                                       |
|--|---|
| <b>A: Household Identification and Demographic Information</b> | Household identification & consent                |
|  | Members' information                              |
|  | Socio economic status of household                |
|  | Handwashing                                       |
| <b>B: Household Dietary Diversity and Source Assessment</b>    | Household food insecurity experience scale        |
|  | Food consumption                                  |
|  | Household dietary diversity and source assessment |
| <b>C: Child General Health</b>                                 | Child health                                      |
|  | Dental hygiene                                    |
|  | Meal patterns                                     |
|  | Schooling   |
|  | Lifestyle & physical activity                     |
|  | Sleep   |
| <b>D: Semi-Quantitative Food Frequency</b>                     | Beverages   |
|  | Dairy   |
|  | Fast food/junk food/snacks                        |
|  | Meats & alternatives                              |
|  | Grains  |
|  | Fruits and vegetables                             |
|  | Other   |
| 24-hour dietary recall   |   |
| <b>E: Respondent And Child's Physical Information</b>          | Respondent and child's physical information       |



| Module  | Description                                       |
|---|---|
|   | Child and mother anthropometric assessment        |
| <b>F: Nutritional Iron Status Assessment Of Participant</b> | Nutritional iron status assessment of participant |

## Recruitment and Training of Staff

Data collection was carried out by field staff in districts of Punjab. Women comprised more than 90% of the staff. The quantitative survey involved three components: data collection at household level, anthropometric measurements and biochemical sampling. Trainings of data collection staff was conducted in Faisalabad and a refresher training was conducted in Multan by AKU instructors. Field staff was thoroughly trained to conduct interviews for general questionnaire, 24-hour dietary recall and FFQ questionnaire, measure anthropometric indices and assess anemia status.

## Pilot Testing

The questionnaires were piloted on 50 households to assess the feasibility. The main objectives of the pilot were to improve the language of the questionnaire, establish the order of questions, and check accuracy and adequacy of the questionnaire instructions such as “skip” and “go to”. Clarity of instructions to the interviewers, respondents’ discomfort or embarrassment with certain questions, translation of technical terms and the time needed to conduct an interview was also assessed during pilot testing. Further field challenges in the conduct of the survey were also identified as well as needs for logistics arrangements and any other requirements to improve data collection. The questionnaire and application were revised and finalized following the pilot test results and direct observations by survey supervisors. A data analysis plan was developed once pilot data collection was completed.

## Data Collection

The data collection was conducted in two phases due to lockdown secondary to the COVID-19 pandemic. The first round of survey was conducted between February 27th, 2020 to March 22nd, 2020 (80 clusters) and the second round of survey was conducted from September 19th, 2020 to October 22nd, 2020 (110 clusters).

The field staff visited households after school hours to maximize likelihood of finding participants and their mothers at home. Informed written consent was taken from legal guardian and assent from children participating in the study. All participants were informed about the right to refuse or withdraw at any time from the survey without prejudice.

The process for data collection was as follows:

### Acquisition of maps

Before data collection began in any PSU, line-listers acquired maps and locations.

### Line-listing

A fresh line-listing was carried out in each PSU on tablets and data were uploaded to an AKU database.

### List of households

Listing data were downloaded from the AKU database and a list of 20 households in each PSU was generated using an independent program.

### Data collection

In the morning before leaving for data collection, all teams assembled at the field office and held a morning meeting with team leaders and field supervisors. They planned the field activities for the day and discussed solutions to issues or queries they faced in the field. The weighing machines and other instruments were calibrated and recorded in a log sheet by the team leader. All equipment and instruments such as tablets, consent forms, job aids, event calendars etc. were counted and placed in the vehicle before leaving for fieldwork. The team leader had a survey checklist for this purpose and also used it in the field before returning to the office to ensure safe return of all equipment). Team leaders also downloaded a random list of 20 HHs in a PSU/ cluster and proceeded there for data collection with the team of enumerators, and measurers. In the field the team obtained written informed consent, and then administered the questionnaire on survey indicators. Anthropometric measurements were taken from all target groups and recorded using the tablets. This was followed by blood sample collection following established standard operating procedures.

### Daily data upload to AKU server:

All data, with all relevant information were synced daily and uploaded from the field sites to the AKU server and dashboard. The AKU Data Management Unit generated summary reports and returned these to the team leaders for rectification if required.

## **Data Management, Data Transfer and Quality Assessment**

### Software design, data entry, verification and editing

Quantitative data were collected using handheld devices: Samsung tablets running Android 5.1. A customized application was developed using Java on a with MySQL & SQLite backend for data storage. The key features of the data collection application included access control, onscreen consistency and range checks, onscreen tips, quick reports and GPS tracking. Range and consistency check as well as skip patterns were built into the program to minimize entry of erroneous data. Special arrangements were made to enforce referential integrity of the database so that all data tables were related to each other. In locations where tablets could not be used for security reasons, data were collected on paper forms and subsequently entered into the tablets. For 24-hour dietary recall, data was cross-checked by field supervisor at the end of each day. If there were any inconsistencies identified, data collectors were contacted to correct it there and then. For each child, a code was generated by the android application and hence,

anonymity was maintained. All data was kept securely behind fire walls and fully anonymized prior to analysis.

### *Developing mobile-based application and dashboard*

Two Android apps were developed for quantitative data collection, one for household line-listing and one for data collection in all clusters. Web-based RESTful secure API services were also developed in PHP to sync data from mobile devices to the server. Microsoft Windows 2008 Server was used for hosting Apache Webserver and a MySQL database which was securely installed on the AKU network. The database was backed up regularly to avoid accidental data loss. The Data Management Unit also developed a web-based information portal using PHP and Google Charts library to visualize collected data in real time. The portal had a comprehensive dashboard for real-time visualization, providing a snapshot of the activities of different teams and supporting survey data at districts. Access to the dashboard was restricted to authorized personnel at AKU.

The dashboard had the following features:

- Real-time device synchronization status
- Real-time report for line-listing activities at cluster, district, provincial and national level
- Real-time summary of data collection activities in every cluster, including households visited
- and interview status; and
- Daily and cumulative reports on biochemical and water testing sample collection and transportation in each cluster.

The web-based portal was also used to share related information with teams in the field.

### *Data security and archiving*

Data were transferred from each handheld device at the end of each day after synchronization and were transmitted directly to the AKU server. Where internet access was not available in remote locations, the team leader manually exported a copy of the data to a USB stick and saved it on a laptop to avoid data loss.

The data collection application was password protected. Once the interview was saved it could not be edited by data collection staff. Data were encrypted, both on the handheld devices and during transfer, to avoid breaches of confidentiality or release of participants' personal information.

The data were archived and stored in a data repository at AKU in Karachi. Access to the data repository was limited to data management personnel directly involved in the project through their AKU local area network identification with the level of access depending on the role of the user. Data were replicated daily to a remote location as backup. A fail-over/ slave server was maintained to ensure the database could be restored in the event of a disaster that resulted in downtime for the primary server.

## Analysis

Initial analysis included examining frequency distribution of all variables to identify possible errors. Final analyses were performed after data cleaning and satisfactory quality assurance. Sampling weights were added to the data at household and individual level, to account for unequal selection probabilities and non-response. A standard survey module was used to consider the multi-stage survey design including stratification, clustering, and sampling weights. Descriptive statistics for the subjects were estimated and reported as mean ( $\pm$ SD), median, ranges and frequencies as appropriate. Standard errors, confidence intervals and design effect were reported for selected indicators. The analyses estimated results at district level with population subgroups such as age, gender, school status (in-school or out-of-school) and geographical location (urban or rural), and districts of the region.

For bivariate analysis, Student's t-test was used to determine differences between mean values, and chi-squared to determine differences between proportions. To assess dietary intake, the calculation of the total intake of a nutrient was done (See **Table 4** for cut-off values for classification of inadequacy). Using the FFQ data, total individual energy intake, total individual macronutrient intake (carbohydrates, fiber, saturated fat, monounsaturated fat, polyunsaturated fat, cholesterol, and protein), and total individual micronutrient intake (vitamin A, thiamine, riboflavin, niacin, vitamin B6, folate, vitamin B12, vitamin C, calcium, iron, sodium, magnesium, potassium, and zinc) were calculated. A food composition database for Pakistan, MAL-ED, was used to help classify meals into food groups which were then used to assess food security (using Rasch model) and dietary diversity (summing the number of food groups consumed in the household over the 24-hour recall period). Anthropometric indices were used to calculate Body Mass Index (BMI) and according to WHO growth charts, were categorized into stunted (Height-for-age z-score  $<-2$  SD), underweight (Weight-for-age z-score  $<-2$ SD), normal weight (BMI-for-age z-score  $>-2$  to  $<+1$  SD), overweight (BMI-for-age z-score  $>+1$  to  $<+2$  SD) and obese (BMI-for-age z-score  $>+2$  SD). A cut-off of Hb less than 11mg/dL was used to label a child as anemic. Analysis was undertaken using a STATA software version 16.0 (17).

Table 4: Cut-off values for classification of inadequacy

| Nutrient intakes                | Estimated Average Requirement (EAR) |                           |                           |                             |
|---------------------------------|-------------------------------------|---------------------------|---------------------------|-----------------------------|
|                                 | Children 4-8 years-male             | Children 4-8 years-female | Children 9-13 years males | Children 9-13 years females |
| Energy (kcal) <sup>b,RDA</sup>  | 1710                                | 1710                      | 1880                      | 1880                        |
| Protein, (g/kg) <sup>d</sup>    | 0.76                                | 0.76                      | 0.76                      | 0.76                        |
| Fat, % energy <sup>a,AMDR</sup> | 25–35%E                             | 25–35%E                   | 25–35%E                   | 25–35%E                     |
| Carbohydrates, g                | 100                                 | 100                       | 100                       | 100                         |
| Fiber (g) <sup>a,AI</sup>       | 25                                  | 25                        | 31                        | 31                          |
| Calcium, mg <sup>d</sup>        | 800                                 | 800                       | 1100                      | 1100                        |
| Phosphorus (mg) <sup>d</sup>    | 405                                 | 405                       | 1055                      | 1055                        |
| Iron (mg) <sup>d</sup>          | 12.6                                | 12.6                      | 17.8                      | 17.8                        |
| Zinc,(mg) <sup>f</sup>          | 8                                   | 8                         | 9.3                       | 9.3                         |
| Copper (mg) <sup>d</sup>        | 0.34                                | 0.34                      | 0.54                      | 0.54                        |

| Nutrient intakes               | Estimated Average Requirement (EAR) |                           |                           |                             |
|--------------------------------|-------------------------------------|---------------------------|---------------------------|-----------------------------|
|                                | Children 4-8 years-male             | Children 4-8 years-female | Children 9-13 years males | Children 9-13 years females |
| Magnesium (mg) <sup>d</sup>    | 110                                 | 110                       | 200                       | 200                         |
| Potassium (mg) <sup>Al,d</sup> | 2300                                | 2300                      | 2300                      | 2500                        |
| Sodium (mg) <sup>Al,d</sup>    | 1000                                | 1000                      | 1200                      | 1200                        |
| Thiamin (mg)                   | 0.5                                 | 0.5                       | 0.7                       | 0.7                         |
| Riboflavin (mg)                | 0.5                                 | 0.5                       | 0.8                       | 0.8                         |
| Niacin (mg)                    | 6                                   | 6                         | 9                         | 9                           |
| Vitamin A (mg)                 | 275                                 | 275                       | 445                       | 420                         |
| Vitamin B-6 (mg)               | 0.5                                 | 0.5                       | 0.8                       | 0.8                         |
| Vitamin C (mg)                 | 22                                  | 22                        | 39                        | 39                          |
| Vitamin D (µg)                 | 10                                  | 10                        | 10                        | 10                          |
| Vitamin E (mg)                 | 6                                   | 6                         | 9                         | 9                           |
| Folate, total (µg)             | 160                                 | 160                       | 250                       | 250                         |

a. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002/2005). This report can be accessed via [www.nap.edu](http://www.nap.edu)

b. Pakistan Dietary Guidelines for Better Nutrition

d. Food and Nutrition Board, National Academies (<https://www.ncbi.nlm.nih.gov/books/NBK545442/> Dietary Reference Intakes Summary Tables from the latest Dietary Reference Intakes for Sodium and Potassium)

e. US dietary reference intake

f. Calculated by dividing the WHO RNI by the conversion factor.

Al: Adequate Intake; AMDR: Acceptable Macronutrient Distribution Ranges; RDA: Recommended daily allowances

## Quality Assurance and Monitoring

All survey activities were monitored to ensure the quality of data. Quality control was initiated right from the design stage of the questionnaire through to processing and cleaning of data. The questionnaire was developed by AKU after reviewing other standard survey questionnaires. A meeting was held with collaborators during the planning phase to review and approve the survey protocol, methodology and key indicators prior to survey implementation. The tools were then translated into Urdu and translated back to English to ensure quality of translation. The questionnaire was pre-tested in the pilot survey prior to its use in the field. Field activities were monitored, filled forms reviewed and feedback provided to all teams during the pilot survey to further improve the tools. Data were analyzed and presented to collaborators who then granted approval for implementation of the survey field activities. Competent staff was hired for data collection in each district, more than 90% of them female as it was easier for them to enter households and acquire information from the women residing there. All trainings were conducted by trained master trainers under the observation and supervision of experts from AKU. Field staff were trained on administering the questionnaire, interviewing techniques, biological sample collection and processing, and anthropometry.

Steps were taken to ensure quality of data collection. Team leaders managed the daily work of their teams, monitored activities, and reviewed all filled questionnaires for completeness and inconsistencies before leaving the cluster. They were also instructed to calibrate all equipment

daily prior to field activities and were provided with standard weights of 5kg for calibration of the weighing scales. They maintained log sheets in which calibration readings were recorded daily. HemoCue machines for hemoglobin estimation were also regularly calibrated with field-based controls.

### Field based monitoring

Regular monitoring and supervision were performed by the monitoring teams at AKU. AKU monitors and field supervisors who monitored the teams in their respective districts, observed the interviews, sample collection, anthropometry, and conducted repeat interviews where needed. They also did spot checks of data forms and provided guidance and supportive supervision to the field teams through continuous reinforcement of good practices such as good probing and accurate of measurements. The challenges faced by teams were discussed, solutions developed, and feedback provided to team leaders.

### Dashboard monitoring and quality assurance

The dashboard developed by the Data Management Unit (DMU) provided a means for real-time updates and monitoring at each step of the survey. Local experienced staff was taken on board as reviewers to ensure the quality of data collection. They ensured quality assurance by checking for completeness of interviews by going through both the dashboard and daily electronic reports and analyzed the data for plausibility checks and digit preference. The number of attempts to tackle household refusals were also checked on the dashboard, along with the number of family members listed as present in the roster section of the questionnaire and the number of interviews carried out by the teams.

### Feedback process

Regular feedback was provided to district supervisors and team leaders for rectification of data and to improve the performance of their teams. The field supervisors then responded to feedback by improving the quality of data collection or by providing refresher trainings to the field staff when required. There was also an upward feedback process where enumerators and measurers communicated issues and challenges that they faced in the field with their team leader who then took measures to resolve them.

### **Ethical Considerations and maintaining confidentiality**

The survey design, sampling strategy, instruments and analytical plans were reviewed and approved by the AKU Ethical Review Committee (ERC) and the National Bioethics Committee (NBC). Confidentiality of all collected data was assigned high priority at each stage of data handling. The research participants were informed about the purpose, methods and benefits and intended uses of the research. Informed verbal consent was obtained from the research subjects. Respondents were free to stop interviews at any time or skip any questions they did not want to



answer. They had the right to ask questions at any point before, during or after the interview. All interviews were conducted by trained staff and in conditions of privacy. Before participation in the survey, informed consent was taken from the head of household of all selected households. The respondents were informed about their rights. It was ensured that only female interviewers took consent from and interviewed female respondents. Individual names and personal information of respondents were kept confidential and personal identifiers were not used in any form of reporting or dissemination. Datasets were also kept anonymous for analysis. All data files were password-protected, and serum and blood samples were duly secured as per standard procedures.

## RESULTS

### Household Profiles

#### Sample coverage and survey response rate

We sampled a total of 3915 (rural: 2576; urban: 1339) households of Punjab, of which 3895 households were occupied and 3795 households with children 5-9 years of age were interviewed with a response rate was 97.4%. The remaining clusters could not be surveyed due to a lack of requisite security clearances and participant refusal.

The households approached were from the cities of Rawalpindi (n= 356), Sargodha (n= 275), Faisalabad (n= 476), Gujranwala (n= 557), Lahore (n= 663), Sahiwal (n= 262), Multan (n= 425), D.G. Khan (n= 380), Bahawalpur (n= 401). (Table 3). The response rate was greater in the urban areas (97.9%) compared to the rural areas (97.2%) of Punjab. The response rate also varied by cities with highest response rate in Sargodha (98.6%) and Lahore with (98.4%) response rate.

**Table 5.**

Table 5: Number of interviews conducted in Punjab

|            |                                | Punjab |       |       |            |            |        |         |        |           |            |            |          |
|------------|--------------------------------|--------|-------|-------|------------|------------|--------|---------|--------|-----------|------------|------------|----------|
|            |                                | Total  | Rural | Urban | Faisalabad | Gujranwala | Lahore | Sahiwal | Multan | D.G. Khan | Bahawalpur | Rawalpindi | Sargodha |
| Households | <b>Sampled</b>                 | 3915   | 2576  | 1339  | 486        | 585        | 678    | 275     | 447    | 388       | 409        | 367        | 280      |
|            | <b>Occupied</b>                | 3895   | 2563  | 1332  | 484        | 582        | 674    | 269     | 445    | 388       | 408        | 366        | 279      |
|            | <b>Interviewed</b>             | 3795   | 2491  | 1304  | 476        | 557        | 663    | 262     | 425    | 380       | 401        | 356        | 275      |
|            | <b>Household response rate</b> | 97.4   | 97.2  | 97.9  | 98.3       | 95.7       | 98.4   | 97.4    | 95.5   | 97.9      | 98.3       | 97.3       | 98.6     |

#### Characteristics of heads of households

Most households were headed by men (97.7%), and female-headed households constituted only (2.3%) of the sample. Majority of the male household heads were married (93.4%). The mean household size was  $6.0 \pm 2.1$ . In most families, the heads were aged between 30 to 39 years of age (40%) followed by 40 to 49 (37.9%) years of age (**Table 6**).

Among the interviewed households, 97.9% of the population comprised of Muslims, while minorities also included Christians (1.8%) and Hindus (0.2%). Punjabi (65.2%) and Saraiki (20.7%) languages were the most spoken language among all.

A large percentage, 46.1% of all heads of households lacked any formal education. For the rest, 13.6% had a head who had attended primary school, 10.8% middle school, 18.1% secondary school and around 11.3% had acquired higher education. The most common occupations of heads of households were skilled manual labor (30.8%) closely followed by manual labor (26.4%). Around 4.1% of the household heads were unemployed or retired.

Table 6: Characteristics of Household Heads

| Demographics                            | Total              | Rural       | Urban       |
|---|--------------------|-------------|-------------|
|   | % (n)<br>Mean ± SD |             |             |
| <b>Number of households/ children</b>   | 3795               | 2491        | 1304        |
| <b>Mean household size</b>              | 6.0 ± 2.1          | 6.1 ± 2.2   | 5.9 ± 2.0   |
| <b>Sex of household head</b>            |                    |             |             |
| Male                                    | 3707 (97.7)        | 2430 (97.4) | 1277 (98.1) |
| Female                                  | 88 (2.3)           | 61 (2.6)    | 27 (1.9)    |
| <b>Age of household head</b>            |                    |             |             |
| 15-19                                   | 1 (0.0)            | 1 (0.0)     | 0 (0.0)     |
| 20-29                                   | 148 (4.0)          | 107 (4.3)   | 41 (3.4)    |
| 30-39                                   | 1528 (40.0)        | 996 (40.2)  | 532 (39.5)  |
| 40-49                                   | 1454 (37.9)        | 951 (37.9)  | 503 (38.0)  |
| 50-59                                   | 383 (10.2)         | 257 (10.4)  | 126 (9.9)   |
| 60-69                                   | 172 (4.8)          | 105 (4.3)   | 67 (5.8)    |
| 70-79                                   | 83 (2.4)           | 54 (2.2)    | 29 (2.9)    |
| 80+                                     | 26 (0.6)           | 20 (0.6)    | 6 (0.5)     |
| <b>Marital status of household head</b> |                    |             |             |
| Married                                 | 3562 (93.4)        | 2334 (93.7) | 1228 (92.9) |
| Unmarried                               | 14 (0.5)           | 10 (0.4)    | 4 (0.6)     |
| Widowed                                 | 214 (6.0)          | 143 (5.7)   | 71 (6.4)    |
| Divorced/Separated                      | 5 (0.1)            | 4 (0.2)     | 1 (0.1)     |
| <b>Language spoken</b>                  |                    |             |             |
| Punjabi                                 | 2499 (65.2)        | -           | -           |
| Hindko                                  | 14 (0.4)           | -           | -           |
| Saraiki                                 | 768 (20.7)         | -           | -           |
| Urdu                                    | 409 (10.8)         | -           | -           |
| Balochi                                 | 4 (0.1)            | -           | -           |
| Sindhi                                  | 1 (0.0)            | -           | -           |
| Pashto                                  | 75 (2.2)           | -           | -           |
| Kutchi                                  | 1 (0.0)            | -           | -           |
| Gujrati                                 | 1 (0.0)            | -           | -           |

| Demographics                        | Total                  | Rural       | Urban      |
|-------------------------------------|------------------------|-------------|------------|
|                                     | % (n)<br>Mean $\pm$ SD |             |            |
| Dhatki                              | 0 (0.0)                | -           | -          |
| Other                               | 23 (0.6)               | -           | -          |
| <b>Religion</b>                     |                        |             |            |
| Muslim                              | 3703 (97.9)            | -           | -          |
| Christian                           | 76 (1.8)               | -           | -          |
| Hindu                               | 9 (0.2)                | -           | -          |
| Sikh                                | 6 (0.1)                | -           | -          |
| <b>Education of household head</b>  |                        |             |            |
| None                                | 1662 (46.1)            | 1221 (49.9) | 441 (39.4) |
| Primary                             | 530 (13.6)             | 365 (14.3)  | 165 (12.4) |
| Middle                              | 421 (10.8)             | 272 (10.8)  | 149 (10.8) |
| Secondary                           | 716 (18.1)             | 432 (17.0)  | 284 (20.0) |
| Higher                              | 461 (11.3)             | 199 (7.9)   | 262 (17.2) |
| Missing/DK                          | 5 (0.1)                | 2 (0.1)     | 3 (0.2)    |
| <b>Occupation of household head</b> |                        |             |            |
| Housewife                           | 69 (1.8)               | 47 (1.9)    | 22 (1.7)   |
| Professional/Managerial             | 360 (9.5)              | 179 (7.5)   | 181 (13.0) |
| Clerical/Technical                  | 73 (1.9)               | 47 (1.9)    | 26 (1.9)   |
| Sales and services                  | 271 (7.0)              | 132 (5.2)   | 139 (10.3) |
| Skilled manual                      | 1119 (30.8)            | 721 (29.4)  | 398 (33.2) |
| Unskilled manual                    | 1060 (26.4)            | 880 (33.9)  | 180 (13.1) |
| Business                            | 499 (13.3)             | 255 (10.9)  | 244 (17.5) |
| Student                             | 9 (0.2)                | 6 (0.3)     | 3 (0.2)    |
| Unemployed                          | 158 (4.1)              | 106 (4.1)   | 52 (4.2)   |
| Retired                             | 144 (4.1)              | 97 (4.1)    | 47 (4.1)   |
| Teacher                             | 33 (0.8)               | 21 (0.8)    | 12 (0.8)   |

### Housing characteristics

Approximately 99.1% of households indicated that they had an electricity connection in their dwelling. With regard to flooring materials, 78.6% of households had finished flooring, with greater proportion in urban areas (96.9%) compared to rural areas (68.3%). Natural flooring was more prevalent in rural areas (31.7%) compared to urban areas (3.1%) in Punjab (**Table 7**).

Finished roofing was found in almost (95.3%) of dwellings of Punjab. Similar to finished floors, the proportion of finished roofs was higher in urban (98.8%) than in rural homes (93.3%). Likewise, finished exterior walls were more common (95.9%) than rudimentary or natural walls in urban areas of Punjab.

At the regional level, (42.2%) of respondents reported having two rooms and 39.6% utilized one room for sleeping purposes in their households. About 18.2% of the respondents reported using three or more rooms for sleeping of which majority were from urban areas (20.4%) of Punjab.

The majority (72.4%) reported that they cooked within the premises of their home. Outdoor cooking was more common in rural areas (31.1%) of Punjab. LPG/ natural gas (56.9%) and wood (32.6%) were the most commonly used fuels for cooking. Solid fuels were most commonly used in rural areas (64.3%) of Punjab and specifically in cities of Bahawalpur (70.5%) and D.G Khan (61.5%).

Table 7: Housing Characteristics

| Housing Characteristics   | Punjab      |             |             |
|---------------------------|-------------|-------------|-------------|
|                           | Total       | Rural       | Urban       |
| Number of households      | 3795        | 2491        | 1304        |
| Electricity Connection    |             |             |             |
| Yes                       | 3761 (99.1) | 2459 (98.7) | 1302 (99.9) |
| Flooring                  |             |             |             |
| Natural floor             | 855 (21.4)  | 820 (31.7)  | 35 (3.1)    |
| Rudimentary floor         | 0 (0.0)     | 0 (0.0)     | 0 (0.0)     |
| Finished floor            | 2938 (78.6) | 1670 (68.3) | 1268 (96.9) |
| Other                     | 2 (0.0)     | 1 (0.0)     | 1 (0.1)     |
| Roof                      |             |             |             |
| Natural roofing           | 19 (0.4)    | 18 (0.6)    | 1 (0.0)     |
| Rudimentary roofing       | 184 (4.3)   | 167 (6.1)   | 17 (1.1)    |
| Finished roofing          | 3592 (95.3) | 2306 (93.3) | 1286 (98.8) |
| Other                     | 0 (0.0)     | 0 (0.0)     | 0 (0.0)     |
| Exterior walls            |             |             |             |
| Natural walls             | 19 (0.4)    | 18 (0.6)    | 1 (0.0)     |
| Rudimentary walls         | 374 (9.9)   | 321 (13.1)  | 53 (4.1)    |
| Finished walls            | 3402 (89.7) | 2152 (86.2) | 1250 (95.9) |
| Other                     | 0 (0.0)     | 0 (0.0)     | 0 (0.0)     |
| Rooms used for sleeping   |             |             |             |
| 1                         | 1481 (39.6) | 1016 (40.8) | 465 (37.5)  |
| 2                         | 1605 (42.2) | 1046 (42.3) | 559 (42.1)  |
| 3 or more                 | 709 (18.2)  | 429 (17.0)  | 280 (20.4)  |
| Place for cooking         |             |             |             |
| In the house              | 2749 (72.4) | 1661 (67.3) | 1088 (81.6) |
| In a separate building    | 53 (1.4)    | 39 (1.6)    | 14 (1.0)    |
| Outdoors                  | 992 (26.1)  | 790 (31.1)  | 202 (17.3)  |
| Other                     | 1 (0.0)     | 1 (0.1)     | 0 (0.0)     |
| Cooking fuel              |             |             |             |
| LPG/natural gas/biogas    | 2082 (56.9) | 851 (35.7)  | 1231 (94.6) |
| Coal/lignite              | 1 (0.0)     | 1 (0.1)     | 0 (0.0)     |
| Charcoal                  | 5 (0.2)     | 5 (0.3)     | 0 (0.0)     |
| Wood                      | 1249 (32.6) | 1191 (48.5) | 58 (4.3)    |
| Agricultural Crop Residue | 144 (3.4)   | 143 (5.2)   | 1 (0.1)     |
| Animal dung               | 309 (6.9)   | 298 (10.2)  | 11 (0.8)    |
| Other                     | 5 (0.1)     | 2 (0.1)     | 3 (0.2)     |
| Solid fuel for cooking    | 1708 (43.0) | 1638 (64.3) | 70 (5.2)    |

### Household and personal assets

The possession of television (78.8%) and refrigerators (68.3%) was greater than of other assets and this result was consistent throughout the other cities of Punjab. Higher number of households in urban areas owned these assets compared to those residing in rural areas. With regards to assets owned by at least one member of the household, mobile phone ownership was the greatest compared to other assets, with an overall rate of more than 92.6% region wide. This was followed by possession of watches (77.4%) and motorcycles or scooters (66.8%) (**Table 8**).

Agricultural land ownership was highest in Sargodha (25.7%), and Bahawalpur (20.6%) and lowest in Sahiwal with only 10.7%. Ownership of farm animals and/or livestock was the highest in Bahawalpur (38.8%) and Sargodha and least being in Lahore (15.2%). Ownership of a dwelling by a household member was high in all cities of Punjab, ranging from the least in Lahore (79.6%) to the highest in Sargodha (93%).

Table 8: Household and personal assets

| Household and Personal Assets  | Punjab      |             |             |
|--|-------------|-------------|-------------|
|  | Total       | Rural       | Urban       |
| <b>Number of households</b>  | 3795        | 2491        | 1304        |
| <b>Percentage of households that own a:</b>                              |             |             |             |
| Radio  | 227 (5.6)   | 143 (5.3)   | 84 (6.2)    |
| Television   | 2970 (78.8) | 1796 (72.6) | 1174 (89.9) |
| Landline phone   | 492 (13.2)  | 243 (10.3)  | 249 (18.5)  |
| Refrigerator   | 2609 (68.3) | 1527 (61.3) | 1082 (80.7) |
| Air conditioner  | 377 (9.4)   | 147 (5.9)   | 230 (15.7)  |
| Computer/laptop  | 424 (11.0)  | 162 (7.0)   | 262 (17.9)  |
| Internet connection  | 372 (9.5)   | 147 (6.2)   | 225 (15.5)  |
| <b>Percentage of households that owns a:</b>                             |             |             |             |
| Agricultural land  | 709 (17.2)  | 639 (24.1)  | 70 (4.9)    |
| Any livestock  | 1029 (25.9) | 940 (36.5)  | 89 (7.1)    |
| <b>Percentage of households where at least one member owns or has a:</b> |             |             |             |
| Watch  | 2931 (77.4) | 1805 (72.7) | 1126 (85.6) |
| Mobile Phone   | 3509 (92.6) | 2273 (91.3) | 1236 (94.9) |
| Bicycle  | 952 (24.3)  | 583 (22.2)  | 369 (28.2)  |
| Motorcycle or scooter  | 2534 (66.8) | 1599 (63.8) | 935 (72.3)  |
| Animal-drawn cart  | 281 (6.7)   | 237 (8.5)   | 44 (3.4)    |
| Car or truck or bus  | 251 (6.6)   | 119 (5.0)   | 132 (9.3)   |
| Tractor  | 122 (3.0)   | 110 (4.2)   | 12 (0.8)    |
| Boat with a motor  | 16 (0.4)    | 13 (0.4)    | 3 (0.3)     |
| Boat without motor   | 57 (1.3)    | 49 (1.7)    | 8 (0.6)     |
| Bank account   | 1389 (36.9) | 747 (31.3)  | 642 (46.8)  |
| <b>Ownership of dwelling</b>   |             |             |             |
| Own  | 3386 (88.8) | 2336 (93.9) | 1050 (79.7) |

| Household and Personal Assets | Punjab    |           |            |
|-------------------------------|-----------|-----------|------------|
|                               | Total     | Rural     | Urban      |
| Rent                          | 333 (9.6) | 103 (4.5) | 230 (18.7) |
| Other                         | 76 (1.6)  | 52 (1.7)  | 24 (1.6)   |

### Wealth Quintiles

The wealth index is a composite indicator of wealth with households given a score based on the number and type of assets owned. The population was divided into quintiles. Overall, 755 children belonged to the poorest quantiles, 754 to poor, 753 to middle, 755 to rich and 757 belonged to the richest quantiles of Punjab.

### Water, sanitation, and hygiene (WASH)

Lack of safe drinking water and sanitation has negative impacts on human health, with frequent exposure to harmful pathogens causing repeated infection and illness. It affects women and girls disproportionately, due to the time spent collecting water and caring for sick family members

### Drinking water

An improved source of drinking water is defined as any of the following types of supply: piped water (into dwelling, yard or plot, to neighbor, public tap/standpipe); tube well/ borehole, hand pump, protected well, protected spring, rainwater, filtration plant and bottled water. However, it is not necessarily synonymous with safe water. Overall, 96.4% (rural: 96.1%; urban: 96.9%) of the households were using an improved source of drinking water, Most of the cities in Punjab had > 90% access to improved sources.

For improved source of drinking water, 3.8% of the households used hand pumps and 17.1% of the households used water piped into the dwelling (**Table 9**). People reported to receive clear and sweet drinking water at the time of collection.

Table 9: Household use of improved water sources

|              | Use of improved water sources |                    |                   |                      |                  |                       |           |                |                  |           |              |                      |               |               |         |                                    |                      |
|--------------|-------------------------------|--------------------|-------------------|----------------------|------------------|-----------------------|-----------|----------------|------------------|-----------|--------------|----------------------|---------------|---------------|---------|------------------------------------|----------------------|
|              | Piped into dwelling           | Piped to yard/plot | Piped to neighbor | Public tap/standpipe | Filtration plant | Tube well or borehole | Hand pump | Protected Well | Unprotected Well | Rainwater | Tanker truck | Cart with small tank | Surface water | Bottled water | Other   | Improved sources of drinking water | Number of households |
| Punjab       | 674 (17.1)                    | 55 (1.3)           | 32 (1.0)          | 82 (2.3)             | 834 (21.7)       | 1786 (47.7)           | 155 (3.8) | 28 (0.9)       | 8 (0.2)          | 0 (0.0)   | 47 (1.4)     | 13 (0.4)             | 51 (1.5)      | 29 (0.7)      | 1 (0.0) | 3675 (96.4)                        | 3795                 |
| Punjab Rural | 474 (18.3)                    | 47 (1.7)           | 28 (1.3)          | 70 (3.1)             | 338 (13.3)       | 1278 (51.7)           | 142 (5.3) | 23 (1.0)       | 8 (0.4)          | 0 (0.0)   | 35 (1.8)     | 3 (0.2)              | 33 (1.5)      | 11 (0.4)      | 1 (0.1) | 2411 (96.1)                        | 2491                 |
| Punjab Urban | 200 (14.9)                    | 8 (0.7)            | 4 (0.3)           | 12 (0.9)             | 496 (36.6)       | 508 (40.7)            | 13 (1.0)  | 5 (0.7)        | 0 (0.0)          | 0 (0.0)   | 12 (0.7)     | 10 (0.9)             | 18 (1.5)      | 18 (1.1)      | 0 (0.0) | 1264 (96.9)                        | 1304                 |
| Division     |                               |                    |                   |                      |                  |                       |           |                |                  |           |              |                      |               |               |         |                                    |                      |
| Rawalpindi   | 39 (8.2)                      | 0 (0.0)            | 6 (1.9)           | 1 (0.5)              | 37 (11.9)        | 218 (61.4)            | 2 (0.7)   | 25 (6.4)       | 8 (1.9)          | 0 (0.0)   | 10 (3.7)     | 0 (0.0)              | 9 (2.8)       | 1 (0.5)       | 0 (0.0) | 329 (91.5)                         | 356                  |
| Sargodha     | 59 (20.3)                     | 4 (1.0)            | 3 (1.0)           | 0 (0.0)              | 24 (10.5)        | 154 (55.6)            | 16 (5.5)  | 1 (0.4)        | 0 (0.0)          | 0 (0.0)   | 4 (1.5)      | 1 (0.5)              | 7 (2.9)       | 1 (0.4)       | 1 (0.4) | 262 (94.6)                         | 275                  |
| Faisalabad   | 136 (28.3)                    | 13 (2.8)           | 6 (1.4)           | 14 (3.7)             | 65 (12.2)        | 168 (35.7)            | 41 (6.9)  | 0 (0.0)        | 0 (0.0)          | 0 (0.0)   | 10 (1.9)     | 6 (2.2)              | 15 (4.2)      | 2 (0.7)       | 0 (0.0) | 445 (91.8)                         | 476                  |
| Gujranwala   | 57 (12.1)                     | 4 (1.2)            | 0 (0.0)           | 5 (0.7)              | 191 (36.7)       | 283 (47.4)            | 7 (0.7)   | 0 (0.0)        | 0 (0.0)          | 0 (0.0)   | 4 (0.4)      | 0 (0.0)              | 1 (0.1)       | 5 (0.7)       | 0 (0.0) | 552 (99.4)                         | 557                  |
| Lahore       | 43 (5.2)                      | 4 (0.5)            | 0 (0.0)           | 13 (1.3)             | 305 (50.1)       | 234 (34.0)            | 18 (2.5)  | 0 (0.0)        | 0 (0.0)          | 0 (0.0)   | 10 (1.7)     | 6 (0.9)              | 12 (1.4)      | 18 (2.4)      | 0 (0.0) | 635 (95.9)                         | 663                  |
| Sahiwal      | 16 (4.5)                      | 13 (4.3)           | 5 (1.9)           | 8 (4.0)              | 35 (15.9)        | 175 (66.2)            | 10 (3.1)  | 0 (0.0)        | 0 (0.0)          | 0 (0.0)   | 0 (0.0)      | 0 (0.0)              | 0 (0.0)       | 0 (0.0)       | 0 (0.0) | 262 (100.0)                        | 262                  |
| Multan       | 69 (16.4)                     | 4 (0.8)            | 6 (1.7)           | 3 (0.7)              | 85 (19.2)        | 247 (58.8)            | 10 (2.4)  | 0 (0.0)        | 0 (0.0)          | 0 (0.0)   | 0 (0.0)      | 0 (0.0)              | 0 (0.0)       | 1 (0.1)       | 0 (0.0) | 425 (100.0)                        | 425                  |
| D.G. Khan    | 86 (25.3)                     | 9 (1.6)            | 3 (0.6)           | 26 (8.4)             | 38 (8.8)         | 181 (44.4)            | 22 (6.4)  | 1 (0.1)        | 0 (0.0)          | 0 (0.0)   | 9 (2.7)      | 0 (0.0)              | 5 (1.5)       | 0 (0.0)       | 0 (0.0) | 366 (95.7)                         | 380                  |
| Bahawalpur   | 169 (39.7)                    | 4 (0.7)            | 3 (0.7)           | 12 (2.8)             | 54 (14.7)        | 126 (32.5)            | 29 (8.2)  | 1 (0.1)        | 0 (0.0)          | 0 (0.0)   | 0 (0.0)      | 0 (0.0)              | 2 (0.4)       | 1 (0.2)       | 0 (0.0) | 399 (99.6)                         | 401                  |

**Table 10** shows the commonly utilized methods of water treatment reported by the households. Overall, 97% households did not treat water to make it safer, with more than 97.6% of the rural households did not treat their water. Urban households were more likely to use a treatment method. The most frequently employed technique was letting the water stand and settle, followed by boiling the water. The methods used for treating water in Punjab included ( ; boiling: 2.1%; Strain through a cloth: 0.1%; water filter: 0.4%). People using an improved source of drinking water were less likely to treat it.

Table 10: Household water treatment

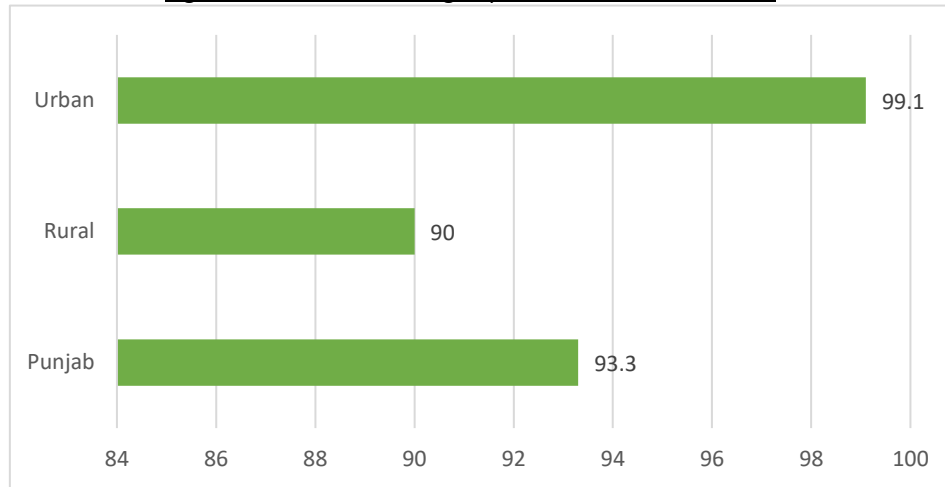
|                 | Water treatment method used in the household |          |                     |                        |                  |                    |                         |               |                      |
|-----------------|--|----------|---------------------|------------------------|------------------|--------------------|-------------------------|---------------|----------------------|
|                 | None   | Boil     | Add bleach/chlorine | Strain through a cloth | Use water filter | Solar disinfection | Let it stand and settle | Other specify | Number of households |
| Punjab          | 3681 (97.0)                                  | 76 (2.1) | 2 (0.0)             | 5 (0.1)                | 16 (0.4)         | 0 (0.0)            | 14 (2.2)                | 1 (0.1)       | 3795                 |
| Punjab Rural    | 2431 (97.6)                                  | 35 (1.6) | 2 (0.0)             | 3 (0.1)                | 8 (0.3)          | 0 (0.0)            | 12 (0.4)                | 0 (0.1)       | 2491                 |
| Punjab Urban    | 1250 (96.1)                                  | 41 (3.0) | 0 (3.8)             | 2 (0.1)                | 8 (0.5)          | 0 (0.0)            | 2 (0.2)                 | 1 (0.1)       | 1304                 |
| <b>Division</b> |  |          |                     |                        |                  |                    |                         |               |                      |
| Rawalpindi      | 343 (96.1)                                   | 13 (3.9) | 0 (3.6)             | 0 (3.9)                | 0 (0.3)          | 0 (0.0)            | 0 (0.9)                 | 0 (0.0)       | 356                  |
| Sargodha        | 270 (98.2)                                   | 4 (1.6)  | 0 (3.8)             | 0 (1.6)                | 1 (0.2)          | 0 (0.0)            | 0 (0.8)                 | 0 (0.0)       | 275                  |
| Faisalabad      | 464 (97.6)                                   | 4 (1.0)  | 2 (0.2)             | 0 (1.0)                | 0 (0.3)          | 0 (0.2)            | 5 (0.9)                 | 1 (0.0)       | 476                  |
| Gujranwala      | 534 (95.6)                                   | 17 (3.3) | 0 (3.7)             | 1 (0.2)                | 5 (1.0)          | 0 (0.0)            | 0 (0.9)                 | 0 (0.2)       | 557                  |
| Lahore          | 636 (96.1)                                   | 22 (3.1) | 0 (3.7)             | 1 (0.1)                | 3 (0.4)          | 0 (0.0)            | 1 (0.3)                 | 0 (0.1)       | 663                  |
| Sahiwal         | 250 (96.5)                                   | 4 (1.5)  | 0 (3.8)             | 0 (1.5)                | 0 (0.3)          | 0 (0.0)            | 8 (2.1)                 | 0 (0.0)       | 262                  |
| Multan          | 416 (97.9)                                   | 5 (1.2)  | 0 (3.8)             | 2 (0.4)                | 2 (0.5)          | 0 (0.0)            | 0 (0.8)                 | 0 (0.4)       | 425                  |
| D.G. Khan       | 372 (98.1)                                   | 2 (0.6)  | 0 (3.9)             | 1 (0.2)                | 5 (1.1)          | 0 (0.0)            | 0 (0.8)                 | 0 (0.2)       | 380                  |
| Bahawalpur      | 396 (98.4)                                   | 5 (1.6)  | 0 (3.8)             | 0 (1.6)                | 0 (0.3)          | 0 (0.0)            | 0 (0.8)                 | 0 (0.0)       | 401                  |

### Sanitation

About 93.3% (Rural; 90% and Urban; 99.1%) of households in Punjab had access to improved sanitation facilities including flushed to piped sewer system, septic tank, pit latrine, ventilated improved latrine and pit latrine with slab. (**Figure 5**).

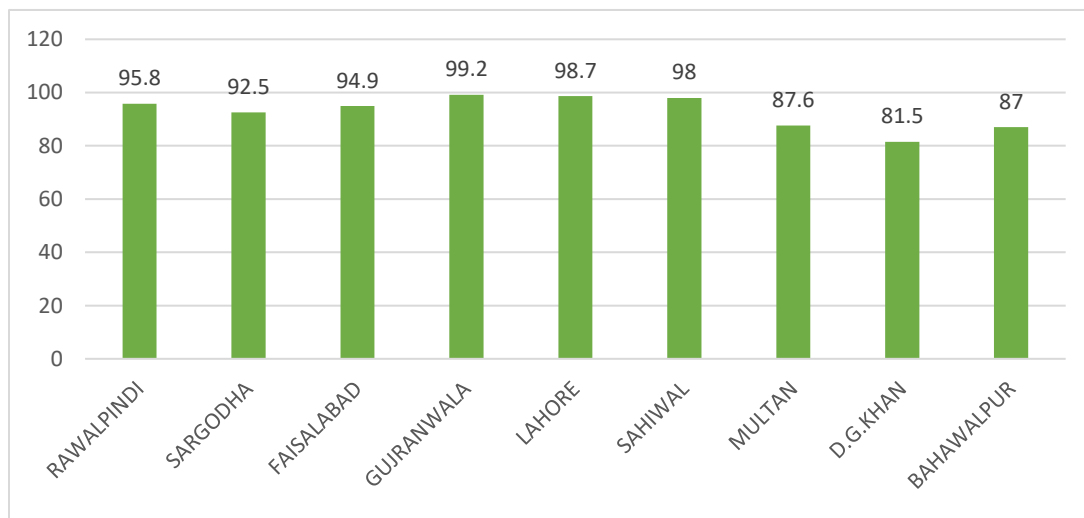


Figure 5: Households using improved sanitation facilities



The percentage of households with access to an improved sanitation facility was greatest in Gujranwala (99.2%) and lowest in D.G. Khan (81.5%). (Figure 6).

Figure 6: Households using improved sanitation facilities by cities



Flushed to sewer system was the most (39.1%) commonly used improved sanitation method. Only 27.8% of rural respondents reported using flush to piped sewer system. More rural respondents reported using flush to septic tank (29.8%).

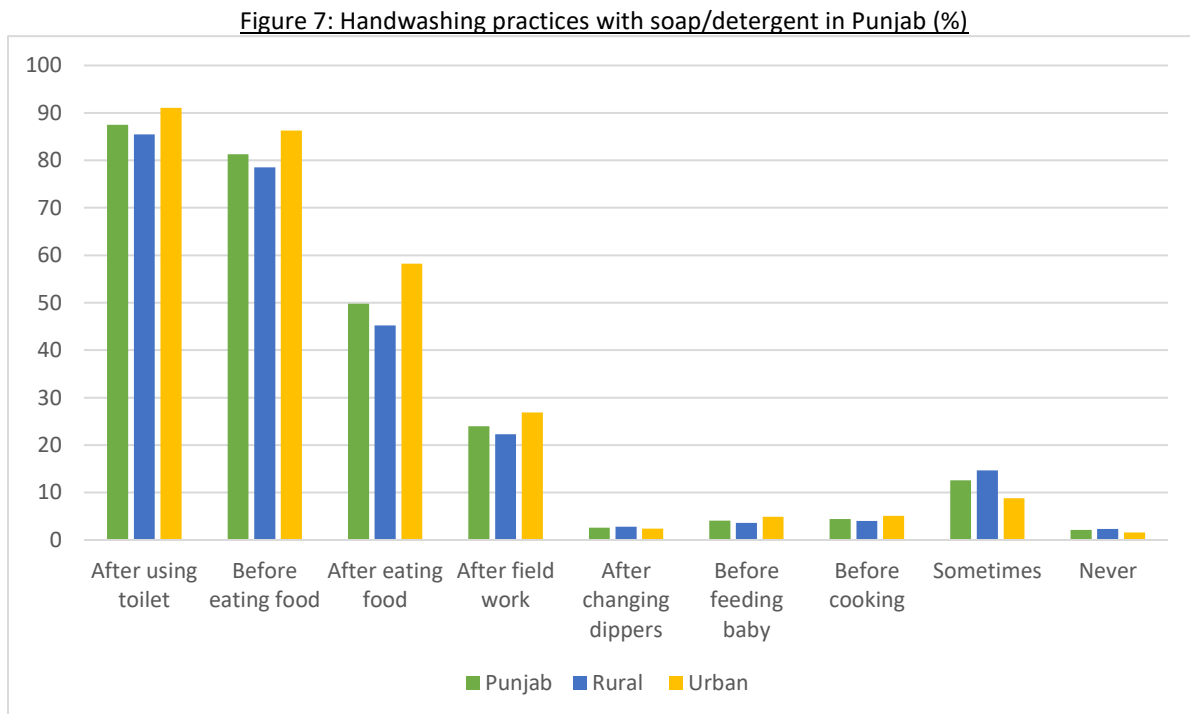
Around 3.2% of households practiced open defecation. This was more common in rural areas (5.1%) than urban (0.1%). Amongst the cities of Punjab, D.G Khan (7.9%) and Bahawalpur (6.9%) had the highest rate of open defecation. (Table 11). Open defecation is particularly harmful for women and girls, as they tend to go out at night, which exposes them to a heightened risk of gender-based violence.

Table 11: Household sanitation facilities

|                 | Types of sanitation facilities |                      |                              |                         |  |                                 |                       |                                   |                   |                           |         |                              | Number of households |
|-----------------|--------------------------------|----------------------|------------------------------|-------------------------|--|---------------------------------|-----------------------|-----------------------------------|-------------------|---------------------------|---------|------------------------------|----------------------|
|                 | Flush to piped sewer system    | Flush to septic tank | Flush to soakage pit latrine | Flush to somewhere else | Flush to unknown place/Not sure/DK where | Ventilated improved PIT latrine | PIT latrine with slab | PIT latrine without slab/open pit | Composting toilet | No facility/bush/field/OD | Other   | Improved sanitation facility |                      |
| Punjab          | 1450 (39.1)                    | 1025 (26.9)          | 367 (9.9)                    | 46 (1.3)                | 8 (0.3)                                  | 96 (2.4)                        | 565 (14.7)            | 91 (2.1)                          | 3 (0.1)           | 144 (3.2)                 | 0 (0.0) | 3511 (93.3)                  | 3795                 |
| Punjab Rural    | 655 (27.8)                     | 770 (29.8)           | 276 (11.7)                   | 40 (1.8)                | 7 (0.4)                                  | 74 (2.9)                        | 435 (17.3)            | 87 (2.9)                          | 3 (0.1)           | 144 (5.1)                 | 0 (0.0) | 2217 (90.0)                  | 2491                 |
| Punjab Urban    | 795 (59.1)                     | 255 (21.8)           | 91 (6.7)                     | 6 (0.3)                 | 1 (0.1)                                  | 22 (1.5)                        | 130 (10.0)            | 4 (0.5)                           | 0 (0.5)           | 0 (0.1)                   | 0 (0.0) | 1294 (99.1)                  | 1304                 |
| <b>Division</b> |                                |                      |                              |                         |  |                                 |                       |                                   |                   |                           |         |                              |                      |
| Rawalpindi      | 173 (46.2)                     | 26 (9.1)             | 76 (21.9)                    | 1 (0.2)                 | 3 (1.1)                                  | 5 (1.6)                         | 58 (15.9)             | 8 (2.3)                           | 2 (0.4)           | 4 (1.3)                   | 0 (0.0) | 341 (95.8)                   | 356                  |
| Sargodha        | 64 (23.6)                      | 67 (22.2)            | 57 (21.1)                    | 1 (0.4)                 | 0 (8.6)                                  | 4 (1.6)                         | 62 (24.0)             | 6 (2.1)                           | 0 (0.4)           | 14 (5.0)                  | 0 (0.0) | 254 (92.5)                   | 275                  |
| Faisalabad      | 127 (28.3)                     | 290 (62.0)           | 15 (2.6)                     | 2 (0.3)                 | 0 (9.9)                                  | 1 (0.2)                         | 9 (1.8)               | 13 (2.0)                          | 0 (0.4)           | 19 (2.8)                  | 0 (0.0) | 442 (94.9)                   | 476                  |
| Gujranwala      | 262 (49.3)                     | 114 (22.2)           | 39 (5.8)                     | 0 (22.2)                | 0 (9.6)                                  | 17 (2.7)                        | 119 (19.3)            | 3 (0.4)                           | 0 (0.4)           | 3 (0.3)                   | 0 (0.0) | 551 (99.2)                   | 557                  |
| Lahore          | 287 (44.9)                     | 168 (22.6)           | 53 (7.2)                     | 0 (22.6)                | 1 (0.3)                                  | 7 (1.1)                         | 137 (22.7)            | 3 (0.3)                           | 0 (0.4)           | 7 (0.9)                   | 0 (0.0) | 653 (98.7)                   | 663                  |
| Sahiwal         | 88 (38.9)                      | 157 (55.5)           | 5 (1.5)                      | 1 (0.6)                 | 1 (0.2)                                  | 2 (0.9)                         | 3 (1.1)               | 1 (0.1)                           | 0 (0.4)           | 4 (1.2)                   | 0 (0.0) | 256 (98.0)                   | 262                  |
| Multan          | 223 (51.4)                     | 76 (18.8)            | 13 (3.8)                     | 19 (5.5)                | 2 (0.4)                                  | 20 (5.2)                        | 31 (8.1)              | 5 (1.3)                           | 0 (0.4)           | 36 (5.6)                  | 0 (0.0) | 365 (87.6)                   | 425                  |
| D.G. Khan       | 129 (32.1)                     | 113 (31.0)           | 24 (5.6)                     | 22 (5.0)                | 0 (9.5)                                  | 6 (1.6)                         | 38 (11.3)             | 22 (5.3)                          | 1 (0.4)           | 25 (7.9)                  | 0 (0.0) | 310 (81.5)                   | 380                  |
| Bahawalpur      | 97 (26.3)                      | 14 (2.7)             | 85 (23.6)                    | 0 (2.7)                 | 1 (0.2)                                  | 34 (7.9)                        | 108 (26.3)            | 30 (6.1)                          | 0 (0.4)           | 32 (6.9)                  | 0 (0.0) | 339 (87.0)                   | 401                  |

### Handwashing practices

Handwashing practices with soap and water at five critical times (before preparing food; before eating; before feeding a child; after handling faeces or diapers; after defecating or using the latrine) and the availability of soap at handwashing places observed were assessed. In Punjab, 87.5% (rural: 85.5%; urban: 91.1%) of the women reported washing hands with soap/detergent after using toilet. Likewise, 81.3% women usually washed hands before eating food and 49.8% women reported hand washing practice after eating food. Only 2.6% women washed her hand after changing diapers or after cleaning the baby and only 4.4% women washed hands before cooking. The handwashing practices in rural and urban areas was more or less similar (**Figure 7**).



At regional level 98.4% (rural: 98.6%; urban: 98.2%) of the households had no specific place for washing hands in their dwelling, plot or yard. Around 88.8% of the households in Punjab had water and soap for handwashing. Apart from water, 6.9% of the households had no cleaning agent to wash hands. This was more prevalent in rural areas (9.3%) compared to urban areas (2.7%) of Punjab (**Table 12**).

Table 12: Availability of water and soap for handwashing

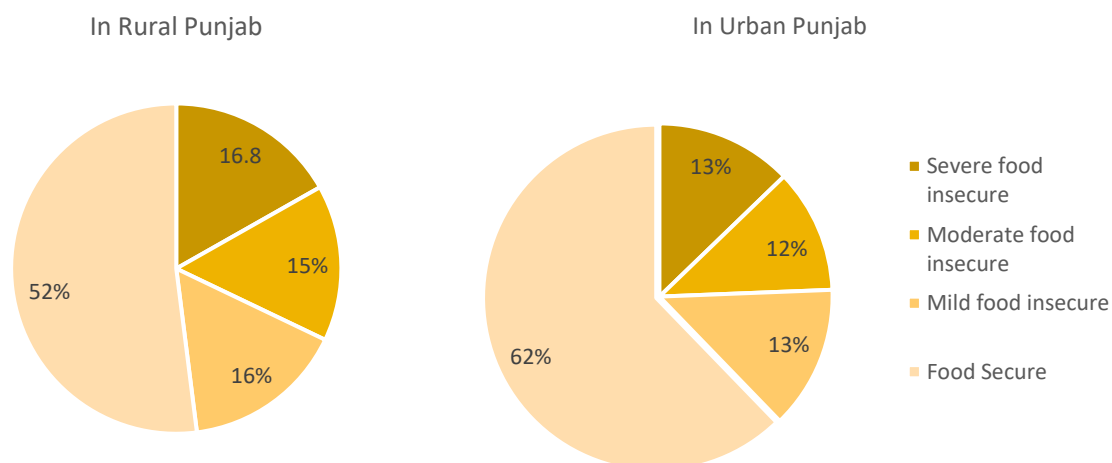
|            | Where place for handwashing was observed | With no specific place for handwashing in the dwelling, yard, or plot | Number of households | Place for handwashing observed       |  |   |  |  |   |  | Number of households where place for handwashing was observed or with no specific place for handwashing |
|------------|--|---|----------------------|--------------------------------------|--|---|--|--|---|--|---|
|            |  |   |                      | Water is available and: Soap present | Water is available and: No soap: Ash, mud, or sand present | Water is available and: No soap: No other cleansing agent present | Water is not available and: Soap present | Water is not available and: No soap: Ash, mud, or sand present | Water is not available and: No soap: No other cleansing agent present | No specific place for handwashing in the dwelling, yard, or plot |   |
| Province   |  |   |                      |                                      |  |   |  |  |   |  |   |
| Punjab     | 3795 (67.2)                              | 3741 (98.4)   | 3795                 | 3331 (88.8)                          | 11 (0.3)   | 269 (6.9)   | 61 (1.9)                                 | 1 (0.0)  | 68 (1.9)  | 4 (0.1)  | 3745  |
| Rural      | 2491 (43.0)                              | 2460 (98.6)   | 2491                 | 2101 (85.0)                          | 11 (0.4)   | 236 (9.3)   | 49 (2.5)                                 | 1 (0.0)  | 62 (2.8)  | 3 (0.1)  | 2463  |
| Urban      | 1304 (24.2)                              | 1281 (98.2)   | 1304                 | 1230 (95.8)                          | 0 (95.8)   | 33 (2.7)  | 12 (1.0)                                 | 0 (11.1)   | 6 (0.5)   | 1 (0.1)  | 1282  |
| Division   |  |   |                      |                                      |  |   |  |  |   |  |   |
| Rawalpindi | 356 (8.6)                                | 332 (92.5)  | 356                  | 263 (79.7)                           | 0 (79.7)   | 19 (5.3)  | 33 (10.0)                                | 0 (9.4)  | 17 (5.0)  | 0 (1.8)  | 332   |
| Sargodha   | 275 (5.5)                                | 267 (97.3)  | 275                  | 222 (83.4)                           | 0 (83.4)   | 30 (11.3)   | 5 (1.9)                                  | 0 (8.9)  | 10 (3.2)  | 1 (0.2)  | 268   |
| Faisalabad | 476 (8.1)                                | 473 (99.5)  | 476                  | 434 (92.6)                           | 3 (0.5)  | 33 (6.4)  | 3 (0.3)                                  | 0 (9.3)  | 0 (6.4)   | 1 (0.2)  | 474   |
| Gujranwala | 557 (9.9)                                | 553 (99.6)  | 557                  | 540 (98.3)                           | 0 (98.3)   | 12 (1.6)  | 0 (0.0)                                  | 0 (9.9)  | 1 (0.2)   | 0 (2.7)  | 553   |
| Lahore     | 663 (9.1)                                | 654 (99.0)  | 663                  | 611 (94.0)                           | 0 (94.0)   | 42 (5.8)  | 0 (0.0)                                  | 0 (9.4)  | 1 (0.2)   | 0 (2.7)  | 654   |
| Sahiwal    | 262 (5.6)                                | 258 (98.8)  | 262                  | 232 (91.0)                           | 0 (91.0)   | 25 (8.7)  | 1 (0.2)                                  | 0 (9.1)  | 0 (8.7)   | 0 (2.6)  | 258   |
| Multan     | 425 (7.3)                                | 423 (99.7)  | 425                  | 377 (90.4)                           | 1 (0.1)  | 26 (5.6)  | 7 (1.4)                                  | 0 (9.3)  | 12 (2.1)  | 2 (0.3)  | 425   |
| D.G. Khan  | 380 (7.1)                                | 380 (100.0)   | 380                  | 324 (82.6)                           | 5 (1.6)  | 40 (11.7)   | 2 (0.7)                                  | 0 (8.9)  | 9 (3.4)   | 0 (2.6)  | 380   |
| Bahawalpur | 401 (6.2)                                | 401 (100.0)   | 401                  | 328 (81.2)                           | 2 (0.4)  | 42 (10.5)   | 10 (3.1)                                 | 1 (0.3)  | 18 (4.6)  | 0 (2.4)  | 401   |

## Household Food Security

About 55.7% of the surveyed households were food secured, 15.4% faced severe food insecurity, 14% faced moderate and 15% faced mild food insecurity (**Table 13**). Household food insecurity was greater amongst children from rural areas (16.8% severe food insecurity, 52% food secure) as compared to urban (13% severe food insecurity, 62% food secure) (**Figure 8**). More than half of all the cities across Punjab, except Rawalpindi, Sargodha, Gujranwala, and Lahore had less 50% food security. Rawalpindi had the highest food security (78.6%).

Majority of the households (95.8%) had no external financial support from the government or from other entities. Only 3.5% of the households surveyed were supported by the Benazir Income Support Program (BISP) by the government.

**Figure 8: Food insecurity status of households in urban and rural areas of Punjab**



**Table 13: Food insecurity status of households in Punjab**

|            | Food Insecurity Status<br>% (n) |                        |                    |             |
|------------|---------------------------------|------------------------|--------------------|-------------|
|            | Severe food insecure            | Moderate food insecure | Mild food insecure | Food Secure |
| Punjab     | 588 (15.4)                      | 532 (14.0)             | 573 (15.0)         | 2087 (55.7) |
| Division   |                                 |                        |                    |             |
| Rawalpindi | 32 (10.3)                       | 11 (2.6)               | 30 (8.6)           | 282 (78.6)  |
| Sargodha   | 31 (12.5)                       | 22 (7.9)               | 35 (12.8)          | 187 (66.8)  |
| Faisalabad | 54 (12.4)                       | 131 (29.2)             | 94 (19.3)          | 194 (39.2)  |
| Gujranwala | 71 (13.8)                       | 44 (8.4)               | 62 (11.1)          | 377 (66.7)  |
| Lahore     | 70 (10.5)                       | 76 (10.8)              | 115 (16.9)         | 402 (61.8)  |
| Sahiwal    | 51 (18.1)                       | 68 (23.4)              | 39 (17.1)          | 104 (41.4)  |
| Multan     | 91 (20.1)                       | 59 (14.8)              | 73 (17.7)          | 201 (47.4)  |
| D.G. Khan  | 83 (21.4)                       | 76 (21.4)              | 57 (15.8)          | 164 (41.4)  |
| Bahawalpur | 105 (23.7)                      | 45 (11.0)              | 68 (17.4)          | 176 (47.9)  |

## Household Dietary Diversity

Among the surveyed households with school-age children, 8.4% of the households had lowest dietary diversity (consumption of  $\leq 3$  food groups), 24.9% had medium dietary diversity (consumption of 4–5 food groups) and 66.7% had high dietary diversity (consumption of  $\geq 6$  food groups). The distribution of households with lowest dietary diversity was similar across both rural and urban households, however, high dietary diversity was more common in households in urban areas (72.7%) compared to rural areas (63.3%). Almost all households from all the included cities in Punjab had more than 50% high dietary diversity, except Sahiwal (46.1%) and Bahawalpur (49.3%) (**Table 14**).

**Table 14: Household dietary diversity of Punjab**

|               | Household Dietary Diversity<br>% (n)             |  |  |
|---------------|--|--|--|
|               | Lowest dietary diversity ( $\leq 3$ food groups) | Medium dietary diversity (4 and 5 food groups) | High dietary diversity ( $\geq 6$ food groups) |
| Punjab        | 317 (8.4)  | 939 (24.9)                                     | 2539 (66.7)                                    |
| Punjab Rural  | 224 (9.1)  | 688 (27.7)                                     | 1579 (63.3)                                    |
| Punjab Urban  | 93 (7.3)   | 251 (20.0)                                     | 960 (72.7)                                     |
| Division Name |  |  |  |
| Rawalpindi    | 21 (6.7)   | 59 (16.4)                                      | 276 (76.9)                                     |
| Sargodha      | 17 (6.9)   | 57 (22.1)                                      | 201 (71.0)                                     |
| Faisalabad    | 39 (8.0)   | 123 (28.3)                                     | 314 (63.7)                                     |
| Gujranwala    | 28 (5.5)   | 100 (16.7)                                     | 429 (77.8)                                     |
| Lahore        | 68 (10.7)  | 133 (21.1)                                     | 462 (68.2)                                     |
| Sahiwal       | 44 (17.2)  | 99 (36.8)                                      | 119 (46.1)                                     |
| Multan        | 36 (7.9)   | 125 (30.0)                                     | 264 (62.0)                                     |
| D.G. Khan     | 13 (3.2)   | 92 (23.8)                                      | 275 (73.1)                                     |
| Bahawalpur    | 51 (12.7)  | 151 (38.0)                                     | 199 (49.3)                                     |

## **Child Profile**

### Sample characteristics

**Table 15** provides the background characteristics for sampled children aged 5-9 months at regional and district levels. Overall sample included 3795 children of which 2491 (43%) participants were from rural and 1304 (24.2%) of the participants were from urban Punjab. Of the total sample, 50.4% were boys and 49.6% were girls. The mean of the included participants was  $7.5 \pm 1.5$  years. Of the total sample, most children were from Lahore 17.5%, and the least from Sahiwal 6.9%.

Table 15: Child characteristics

|                 | % (n)<br>Mean ± SD |
|-----------------|--------------------|
| Punjab          | 3795 (67.2)        |
| Punjab Rural    | 2491 (43.0)        |
| Punjab Urban    | 1304 (24.2)        |
| <b>Division</b> |                    |
| Rawalpindi      | 356 (9.4)          |
| Sargodha        | 275 (7.2)          |
| Faisalabad      | 476 (12.5)         |
| Gujranwala      | 557 (14.6)         |
| Lahore          | 663 (17.5)         |
| Sahiwal         | 262 (6.9)          |
| Multan          | 425 (11.2)         |
| D.G. Khan       | 380 (10.0)         |
| Bahawalpur      | 401 (10.6)         |
| <b>Gender</b>   | 5952               |
| Male            | 3032 (50.4)        |
| Female          | 2920 (49.6)        |
| <b>Mean age</b> | 7.5 ± 1.5          |
| <b>Age</b>      |                    |
| 5 Years         | 920 (15.4)         |
| 6 Years         | 1313 (22.4)        |
| 7 Years         | 1349 (22.6)        |
| 8 Years         | 1322 (22.1)        |
| 9 Years         | 1048 (17.5)        |

### Schooling

In Punjab 92.2% of the children were currently attending schools and only 1.5% of the children had missed school for a month in last year. The major reason of not attending school regularly included no interest in studies (21.2%), unpaid housework and household chores (5.8%) each.

About 46.8% children went to public school, 43.9% went to private school, while the rest of students also studied from Trusts/non-government organizations (NGOs) (1.7%) and Madrassa (religious schools) (0.3%). The main language of instruction in schools of Punjab was Urdu (75.9%), and English (16.8%).

The survey showed that the average time of commute to schools ranged from less than a minute to maximum 29 minutes. It took about less a minute to 19.1% of children to get to/from school, while it took 10 to 19 minutes to 54.4% of children to get to/from school, and it took 20 to 29 minutes to 14.6% to get to/from school (**Table 16**).



Table 16: Schooling among children aged 5-9 years' old

| Schooling  | % (n)       |
|--|-------------|
|  | 3795        |
| <b>Ever attended school</b>  |             |
| Yes  | 3500 (92.7) |
| No   | 295 (7.3)   |
| <b>Reasons for never attending school:</b>   |             |
| Domestic household chores unpaid   | 4 (1.8)     |
| Child work for household unpaid  | 2 (0.8)     |
| Child work for cash or food  | 4 (1.5)     |
| Early girl marriage  | 2 (0.5)     |
| No girl school/no female teacher available   | 5 (1.5)     |
| No boarding school available   | 12 (3.7)    |
| Not interested   | 150 (50.7)  |
| Not applicable   | 32 (12.3)   |
| Other  | 91 (29.6)   |
| <b>Type of school child attended:</b>  |             |
| Private  | 1654 (43.9) |
| Public.  | 1771 (46.8) |
| Madrassa   | 12 (0.3)    |
| Trust (NGO)  | 60 (1.7)    |
| Other specify  | 3 (0.1)     |
| <b>Currently attend school</b>   |             |
| Yes  | 3482 (92.2) |
| No   | 18 (0.5)    |
| <b>Missed school for at least 1 month in last year</b>                                     |             |
| Yes  | 52 (1.5)    |
| No   | 3448 (91.3) |
| <b>Main reason for not attending school regularly</b>                                      |             |
| Domestic household chores unpaid   | 3 (5.8)     |
| Child work for household unpaid  | 3 (5.8)     |
| No girl school/no female teacher available   | 0 (0.0)     |
| No boarding school available   | 0 (0.0)     |
| Not interested   | 11 (21.2)   |
| Not applicable   | 1 (1.9)     |
| Other  | 34 (65.4)   |
| <b>Language of instruction at school</b>   |             |
| English  | 657 (16.8)  |
| Urdu   | 2840 (75.9) |
| Sindhi   | 0 (0.0)     |
| Other  | 3 (0.1)     |
| <b>During school year, # of days/week did child walk/ride bicycle to &amp; from school</b> |             |
| 0 days   | 793 (20.4)  |
| 1-2 days   | 25 (0.7)    |
| 3-4 days   | 94 (2.4)    |
| 5-6 days   | 2588 (69.2) |

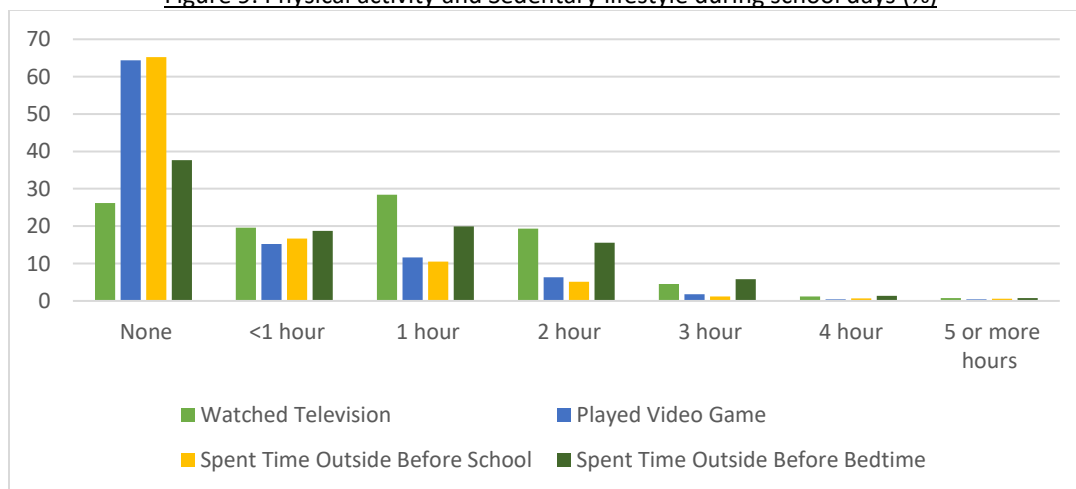
| Schooling  | % (n)       |
|--|-------------|
| <b>During school year, Commute time of school (to get/from school)</b> |             |
| Less than 1 minute   | 698 (19.1)  |
| 10-29 minutes  | 2087 (54.4) |
| 30-49 minutes  | 545 (14.6)  |
| 50 or more minutes   | 170 (4.7)   |

### *Physical Activity and Sedentary Lifestyle among Children in School*

On a school day, 26.2% of the children did not watch television, while 19.6% watched television for less than an hour, 28.4% watched for an hour, and 19.3% of the children watched television for two hours. More than half of the surveyed children (64.4%) did not play video/computer/tablets/mobile phone games or used a computer during the school days. About 15.2% of the children played games for less than an hour and 11.6% children played games for an hour on a school day (**Figure 9**).

A sum of 65.2% children did not go outside before going to school, while 16.7% of children spent less than an hour and 10.5% children spent an hour outside before going to school. Approximately 37% of the children did not play outside the house on a school day before going to bed, while 18.7% of children played for less than an hour, and 19.9% children played for an hour before going to bed.

**Figure 9: Physical activity and Sedentary lifestyle during school days (%)**

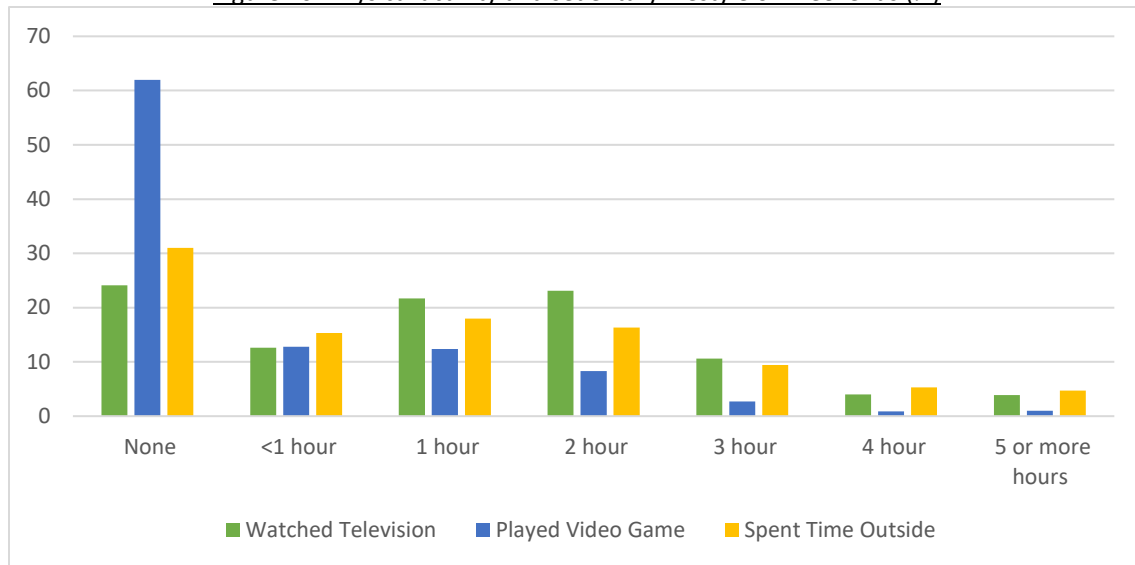


On a weekend, 24.1% of the children did not watch television, while 12.6% watched television for less than an hour, 21.7% watched for an hour, and 23.1% of the children watched television for two hours. Sixty-two percent of the children did not play video/computer/tablets/mobile phone games or used a computer on weekends. About 12.8% of the children played games and used computer (not for schoolwork) for less than an hour and 12.4% children played games for an hour on a weekend. Thirty-one percent of the children did not spent time outside on a

weekend, while 15.3% children spent less than an hour and 18% children spent an hour outside on a weekend (**Figure 10**).

The survey showed that the children were physically less active as about 54.9% of the children reported no physical activity of at least 60 minutes/day in last seven days. Only 6.4% children reported one day of physical activity of at least 60 minutes in the last seven days.

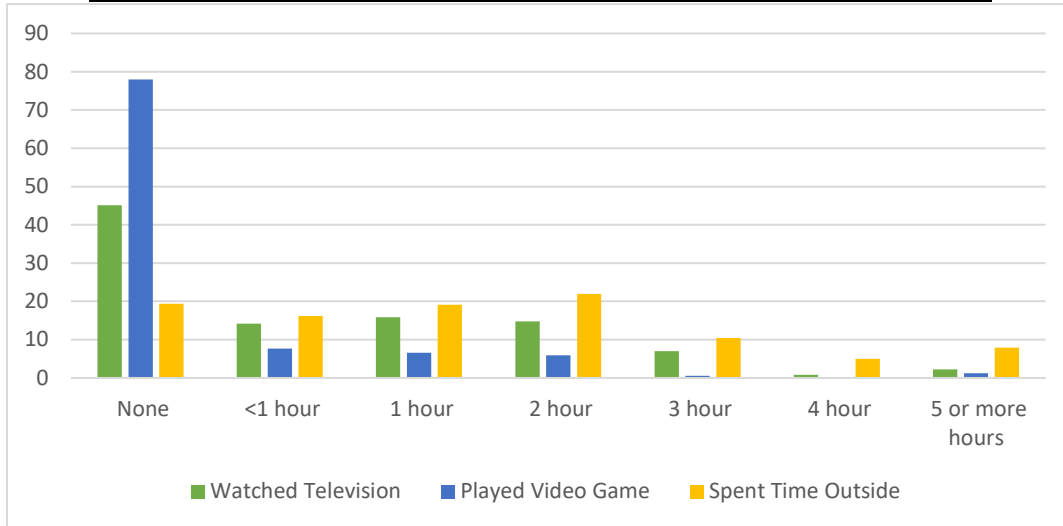
Figure 10: Physical activity and sedentary lifestyle on weekends (%)



*Physical Activity and Sedentary Lifestyles among Children Out of School*

Among the children who are out of school, 45.1% of the children did not watched television. Only 14.2% of the children watched television for less than an hour, 15.9% watched for an hour and 14.8% watched for at least two hours. Seventy-eight percent of the children did not play video games. Only 7.7% children played video games for less than an hour and 5.9% of the children played for at least two hours. Majority of the children who were out of school spent their time outside. About 7.9% of the children spent their time outside for five hours or more. (**Figure 11**).

**Figure 11 Physical activity and sedentary lifestyles among children out of school (%)**



### Nutrition Status

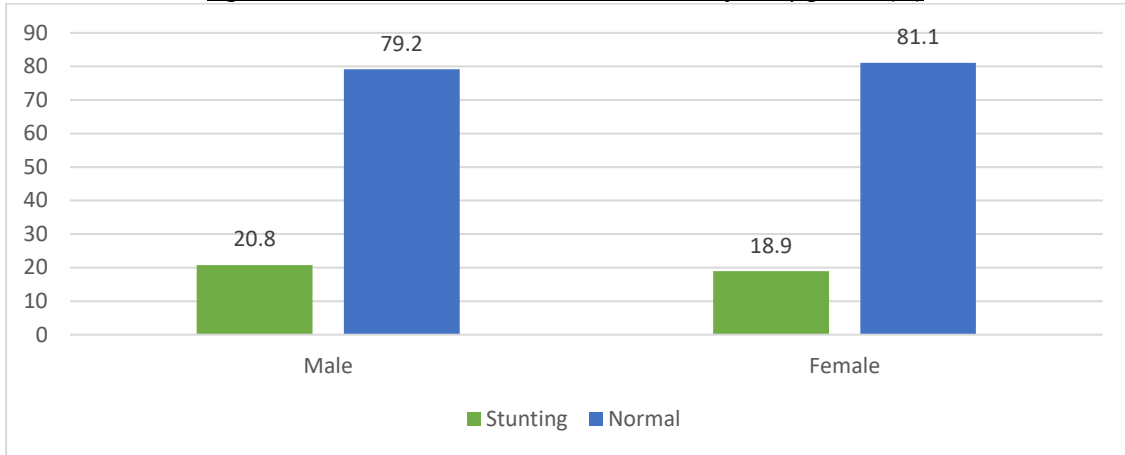
Malnutrition refers to deficiencies, excesses, or imbalances in a person’s intake of energy and/or nutrients. The term malnutrition covers two broad groups of conditions. One is undernutrition, which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies. The other is overweight and obesity. The nutrition status of children reflects the overall health of the population and offers a window to its future.

WHO Child Growth Reference Standards were used to assess the nutritional status of children. Each of the three nutrition status indicators – height-for-age (stunting), weight-for-height (wasting and overweight) and weight-for-age (underweight) – are expressed in standard deviation units (z-scores) from the median of the reference population.

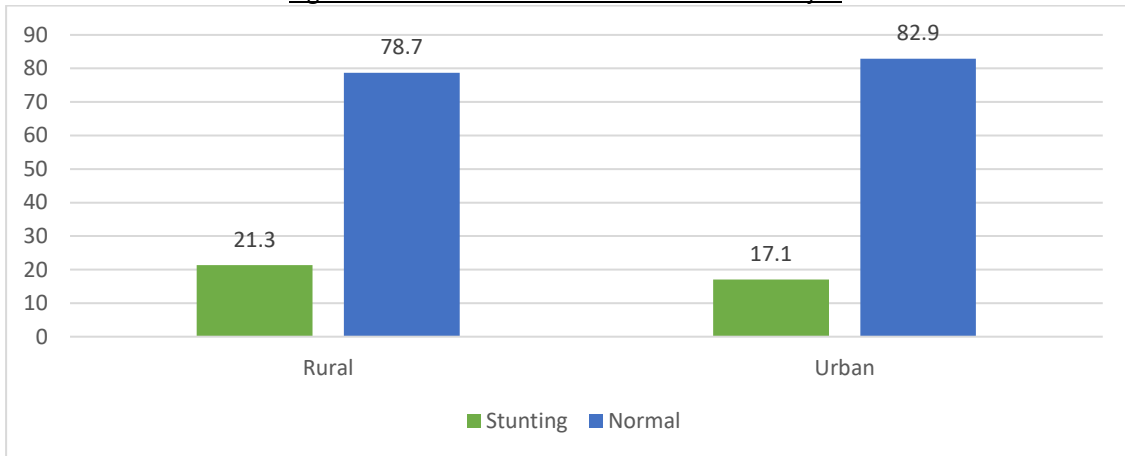
### *Stunting*

The survey reveals that the stunting prevalence (exceeding minus two standard deviations) in Punjab was 19.9% with a slightly higher prevalence in boys (20.8%) than girls (18.9%) (**Figure 12**). The prevalence was higher in rural (21.3%) than in urban areas (17.1%) (**Figure 13**). Stunting was highest (25.3%) amongst those aged nine years of age (**Table 17**). In contrast to other districts of Punjab, Gujranwala had highest prevalence of stunted children which was 23.6%.

**Figure 12: Prevalence of stunted children in Punjab- by gender (%)**



**Figure 13: Prevalence of stunted children in Punjab**



**Table 17: Nutrition status of children – stunting**

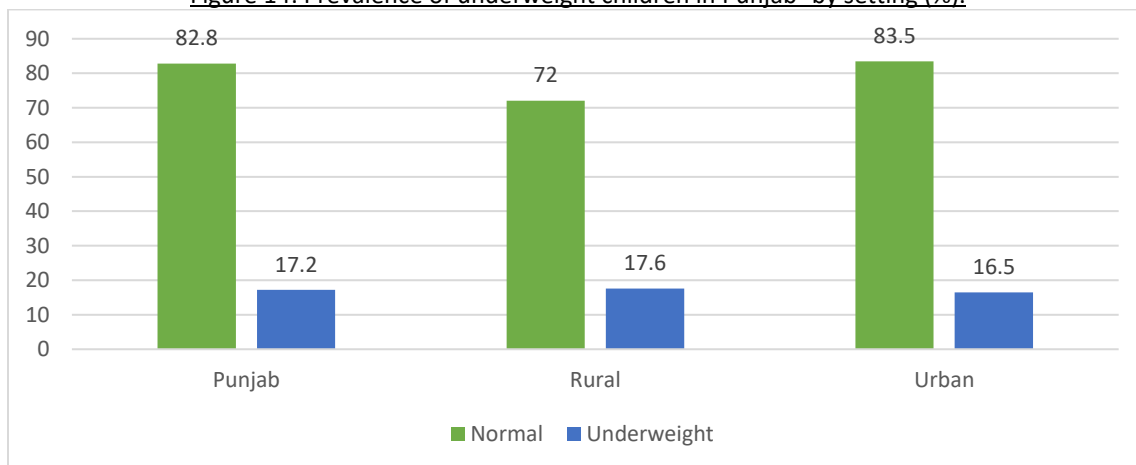
|            | Height for age<br>% (n)  |                         |
|------------|--------------------------|-------------------------|
|            | Normal<br>( $\geq 2SD$ ) | Stunting<br>( $< 2SD$ ) |
| Punjab     | 4004 (80.1)              | 957 (19.9)              |
| Division   |                          |                         |
| Rawalpindi | 356 (77.4)               | 96 (22.6)               |
| Sargodha   | 288 (81.6)               | 64 (18.4)               |
| Faisalabad | 538 (79.5)               | 132 (20.5)              |
| Gujranwala | 530 (76.4)               | 155 (23.6)              |
| Lahore     | 693 (82.6)               | 146 (17.4)              |
| Sahiwal    | 264 (77.5)               | 81 (22.5)               |
| Multan     | 466 (81.5)               | 105 (18.5)              |
| D.G. Khan  | 440 (82.8)               | 92 (17.2)               |
| Bahawalpur | 429 (83.0)               | 86 (17.0)               |
| Gender     |                          |                         |
| Male       | 2029 (79.2%)             | 514 (20.8%)             |
| Female     | 1975 (81.1%)             | 443 (18.9%)             |

|         | Height for age<br>% (n)  |                         |
|---------|--------------------------|-------------------------|
|         | Normal<br>( $\geq 2SD$ ) | Stunting<br>( $< 2SD$ ) |
| Age     |                          |                         |
| 5 Years | 729 (81.5%)              | 163 (18.5%)             |
| 6 Years | 889 (81.0%)              | 204 (19.0%)             |
| 7 Years | 897 (81.3%)              | 184 (18.7%)             |
| 8 Years | 834 (81.5%)              | 193 (18.5%)             |
| 9 Years | 655 (74.7%)              | 213 (25.3%)             |

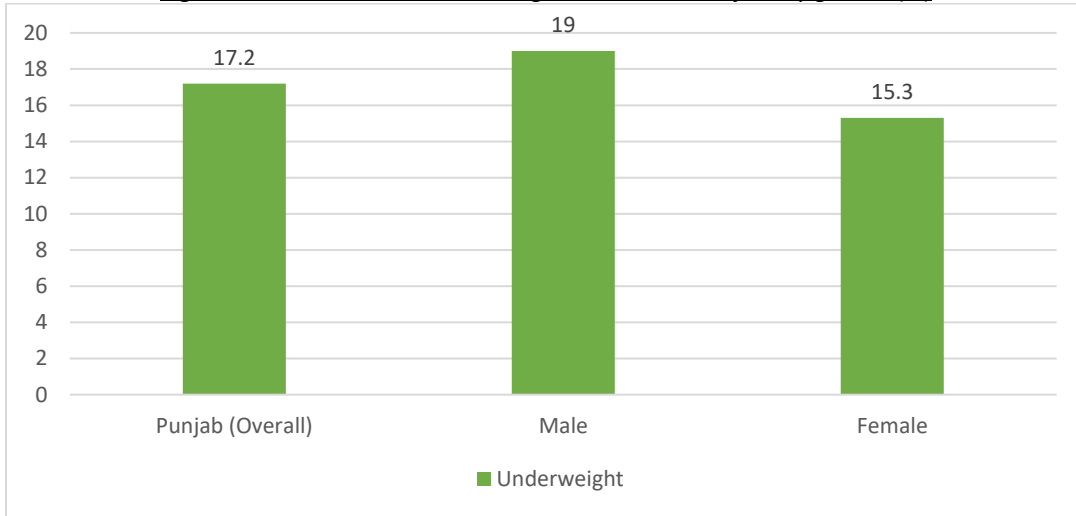
### Underweight

Underweight prevalence (exceeding minus two standard deviations) in Punjab was 17.2% (**Figure 14**) with slightly higher prevalence amongst boys (19%) than girls (15.3%) (**Figure 15**). Underweight prevalence was highest amongst children aged 5 years (18.1%) compared to children of other age groups. Underweight prevalence was highest in Multan (24.7%) and least in Faisalabad (9.6%) (**Table 18**)

Figure 14: Prevalence of underweight children in Punjab- by setting (%).



**Figure 15: Prevalence of underweight children in Punjab- by gender (%)**



**Table 18: Nutrition status of children – underweight**

|                 | BMI-for-age z-score<br>% (n) |                       |
|-----------------|------------------------------|-----------------------|
|                 | Underweight<br>(- <2SD)      | Normal<br>(-2<BAZ<+1) |
| Punjab          | 864 (17.2)                   | 3677 (74.8)           |
| <b>Division</b> |                              |                       |
| Rawalpindi      | 68 (15.3)                    | 350 (78.3)            |
| Sargodha        | 80 (22.0)                    | 242 (70.0)            |
| Faisalabad      | 68 (9.6)                     | 549 (82.0)            |
| Gujranwala      | 123 (16.9)                   | 481 (70.9)            |
| Lahore          | 161 (19.8)                   | 597 (70.2)            |
| Sahiwal         | 49 (14.6)                    | 271 (79.0)            |
| Multan          | 138 (24.7)                   | 395 (68.8)            |
| D.G. Khan       | 110 (19.4)                   | 374 (73.5)            |
| Bahawalpur      | 67 (13.2)                    | 418 (81.7)            |
| <b>Gender</b>   |                              |                       |
| Male            | 489 (19.0%)                  | 1811 (72.0%)          |
| Female          | 375 (15.3%)                  | 1866 (77.6%)          |
| <b>Age</b>      |                              |                       |
| 5 Years         | 160 (18.1%)                  | 664 (74.3%)           |
| 6 Years         | 189 (16.9%)                  | 825 (76.5%)           |
| 7 Years         | 186 (16.8%)                  | 808 (76.0%)           |
| 8 Years         | 176 (17.1%)                  | 743 (73.0%)           |
| 9 Years         | 153 (17.2%)                  | 637 (73.7%)           |

**Overweight/Obesity**

The overweight/obesity prevalence among children 5-9 years was 8.0% with slightly higher prevalence amongst boys (9.0%) than girls (7.1%) (**Figure 16**). Prevalence was slightly higher in



urban areas (8.9%) than in rural areas (7.6%) (**Figure 17**). When looking at the age distribution, overweight/obesity prevalence was highest amongst children aged 8 years of age (9.9%) and lowest amongst those aged six years of age (6.7%). Overweight prevalence was found to be highest in Gujranwala (12.3%) and least in Bahawalpur (5.1%). (**Table 19**).

Figure 16: Prevalence of overweight/obese children in Punjab- by gender (%)



Figure 17: Prevalence of overweight/obese children in Punjab- by setting (%)

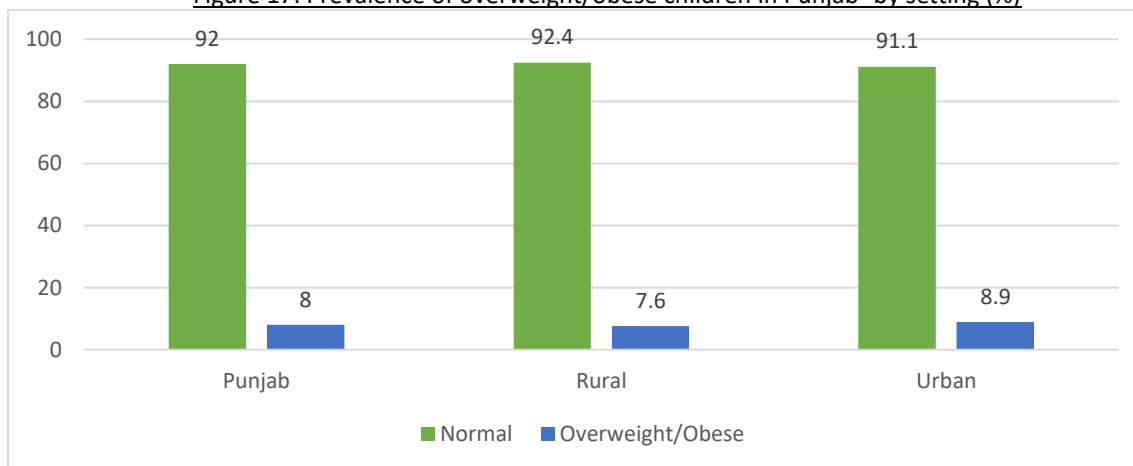


Table 19: Nutrition status of children – overweight/obesity

|            | BMI-for-age z-score<br>% (n) |                               |
|------------|------------------------------|-------------------------------|
|            | Normal<br>(-2<BAZ<+1)        | Overweight / Obese<br>(+ 1SD) |
| Punjab     | 3677 (74.8)                  | 384 (8.0)                     |
| Division   |                              |                               |
| Rawalpindi | 350 (78.3)                   | 30 (6.4)                      |
| Sargodha   | 242 (70.0)                   | 26 (8.0)                      |
| Faisalabad | 549 (82.0)                   | 51 (8.4)                      |
| Gujranwala | 481 (70.9)                   | 76 (12.3)                     |
| Lahore     | 597 (70.2)                   | 75 (10.0)                     |

|            | BMI-for-age z-score<br>% (n) |                               |
|------------|------------------------------|-------------------------------|
|            | Normal<br>(-2<BAZ<+1)        | Overweight / Obese<br>(+ 1SD) |
| Sahiwal    | 271 (79.0)                   | 20 (6.4)                      |
| Multan     | 395 (68.8)                   | 36 (6.4)                      |
| D.G.Khan   | 374 (73.5)                   | 44 (7.2)                      |
| Bahawalpur | 418 (81.7)                   | 26 (5.1)                      |
| Gender     |                              |                               |
| Male       | 1811 (72.0%)                 | 215 (9.0%)                    |
| Female     | 1866 (77.6%)                 | 169 (7.1%)                    |
| Age        |                              |                               |
| 5 Years    | 664 (74.3%)                  | 67 (7.6%)                     |
| 6 Years    | 825 (76.5%)                  | 68 (6.7%)                     |
| 7 Years    | 808 (76.0%)                  | 80 (7.2%)                     |
| 8 Years    | 743 (73.0%)                  | 95 (9.9%)                     |
| 9 Years    | 637 (73.7%)                  | 74 (9.1%)                     |

### Anemia

We assessed the anemia status of children aged 5-9 years using the field spot hemoglobin test using HemoCue equipment. The results revealed that 34.1% of the children were anemic (hemoglobin concentration <11 g/dl). Anemia prevalence was approximately equal among boys than girls (34%). Rural areas of Punjab had the higher prevalence of anemia (68%) compared to urban areas (32%) of Punjab (**Figure 18**). Anemia was found to be most prevalent among children aged nine years (74.5%) and the highest frequency of anemia was in the city of Gujranwala (76.3%) (**Table 20**).

Figure 18: Anemia prevalence in urban and rural areas of Punjab

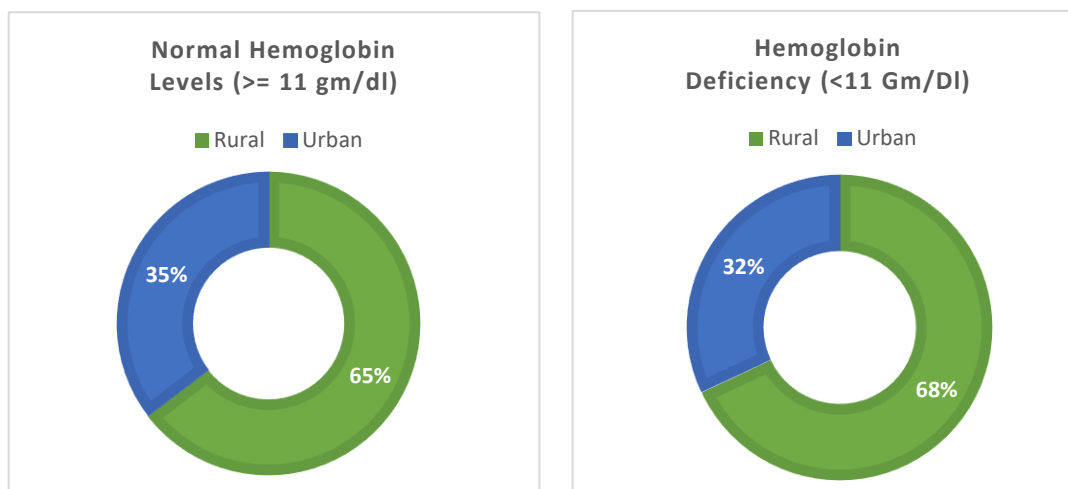


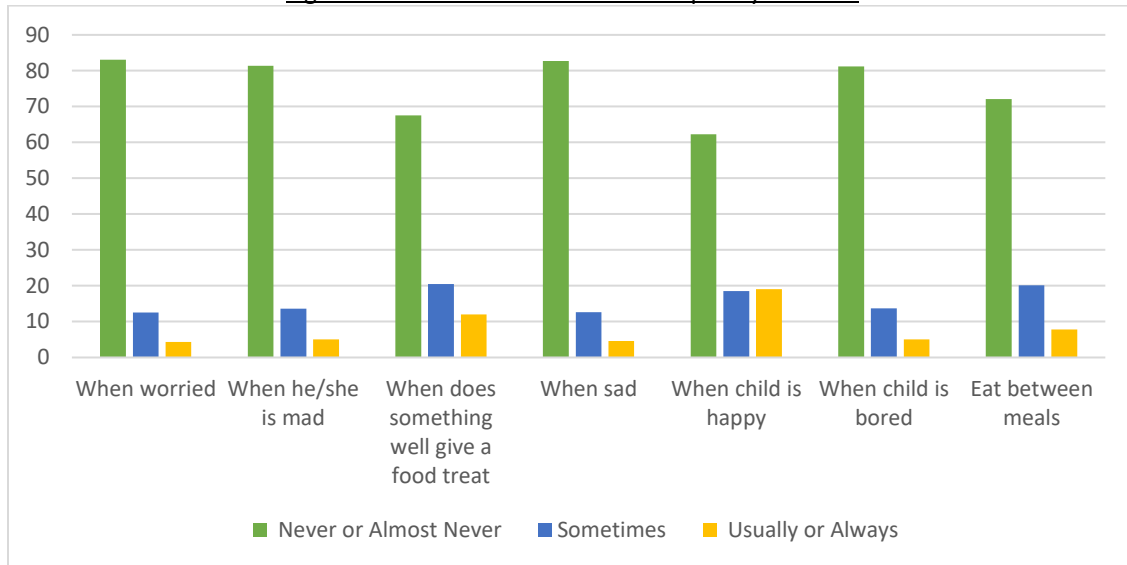
Table 20: Hemoglobin levels of children 5-9 years of age

|            | Hemoglobin Levels<br>% (n) |                      |
|------------|----------------------------|----------------------|
|            | Deficiency (<11 gm/dL)     | Normal (>= 11 gm/dL) |
| Punjab     | 1203 (34.1)                | 2299 (65.9)          |
| Division   |                            |                      |
| Rawalpindi | 92 (26.9)                  | 239 (73.1)           |
| Sargodha   | 83 (32.4)                  | 180 (67.6)           |
| Faisalabad | 186 (45.7)                 | 215 (54.3)           |
| Gujranwala | 131 (23.7)                 | 414 (76.3)           |
| Lahore     | 230 (36.6)                 | 401 (63.4)           |
| Sahiwal    | 96 (37.4)                  | 138 (62.6)           |
| Multan     | 143 (42.2)                 | 209 (57.8)           |
| D.G. Khan  | 148 (40.2)                 | 228 (59.8)           |
| Bahawalpur | 94 (26.6)                  | 275 (73.4)           |
| Gender     |                            |                      |
| Male       | 615 (34.0%)                | 1168 (66.0%)         |
| Female     | 588 (34.1%)                | 1131 (65.9%)         |
| Age        |                            |                      |
| 5 Years    | 250 (41.2%)                | 355 (58.8%)          |
| 6 Years    | 313 (40.1%)                | 472 (59.9%)          |
| 7 Years    | 263 (34.0%)                | 519 (66.0%)          |
| 8 Years    | 224 (28.9%)                | 509 (71.1%)          |
| 9 Years    | 153 (25.5%)                | 444 (74.5%)          |

### Child Meal Pattern

On a school day, about 77.5% of the children had breakfast every day, while 1.9% of the children never had breakfast. When not in school, 79.2% of the children had breakfast every day, while 1.5% children never had breakfast. Almost seventy-four percent of the children never had lunch from outside and 47.3% of the children had a habit of having food on the table, while 7.6% of the children never had food on the table and 26.6% had food on the floor every day. Forty-two percent of the children never had food in front of the television/mobile/tablet or any electronic device. Occasions of increased frequency of eating among school-aged children is given in **Figure 19**.

Figure 19: Occasions of increased frequency in meals



Semi Quantitative Food Frequency

The results of semi-quantitative FFQ showed that school age children had very low intake of fruits, vegetables, meat and its alternatives which included red meat, poultry, seafood, and eggs. Grains were consumed more frequently in form of white bread, whole wheat bread, cereals, starchy foods, pulses, and legumes compared to other food groups. Water consumption was 30.6 ± 14.5 times per week. These practices were consistent across rural and urban dwellers (**Table 21**).

Consumption of dairy products were found to be less frequent in district of Sahiwal, the average consumption of fast foods or snacks was found to be high in the district of Faisalabad and Multan. Consumption of meat and its alternatives was low across all the surveyed districts of Punjab. Grains consumption was higher in district of Lahore and Faisalabad compared to other districts of Punjab. Beverage consumption (excluding water) was found to be high in district Sargodha and Sahiwal.

Table 21: Food group consumption average numbers of time/week

|   | Punjab      |             |             |             |             |             |             |             |             |             |             |             |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|   | Total       | Rural       | Urban       | Rawalpindi  | Sargodha    | Faisalabad  | Gujranwala  | Lahore      | Sahiwal     | Multan      | D.G. Khan   | Bahawalpur  |
| Number of children 5-9 Years            | 5952        | 2491        | 1304        | 356         | 275         | 476         | 557         | 663         | 262         | 425         | 380         | 401         |
| Dairy                                   | 22.7 ± 16.2 | 22.1 ± 15.4 | 23.0 ± 15.7 | 20.4 ± 16.3 | 24.6 ± 16.4 | 21.4 ± 15.1 | 25.6 ± 15.9 | 24.1 ± 14.0 | 17.1 ± 13.4 | 20.0 ± 11.7 | 19.0 ± 12.9 | 28.3 ± 16.7 |
| Full fat or semi-skimmed dairy products | 6.8 ± 8.8   | 6.2 ± 8.5   | 6.4 ± 8.4   | 6.4 ± 9.6   | 6.4 ± 7.6   | 5.6 ± 7.0   | 7.9 ± 7.7   | 7.4 ± 6.8   | 4.8 ± 7.5   | 5.5 ± 6.9   | 4.9 ± 6.5   | 6.0 ± 13.9  |
| Whole milk cheese                       | 0.0 ± 0.5   | 0.0 ± 0.4   | 0.0 ± 0.5   | 0.0 ± 0.4   | 0.0 ± 0.0   | 0.1 ± 0.5   | 0.0 ± 0.2   | 0.1 ± 0.6   | 0.0 ± 0.0   | 0.0 ± 0.0   | 0.2 ± 0.0   | 0.1 ± 1.0   |
| Hard fats                               | 15.9 ± 12.4 | 15.9 ± 11.8 | 16.5 ± 12.0 | 14.0 ± 12.9 | 18.2 ± 12.7 | 15.7 ± 12.1 | 17.6 ± 12.3 | 16.6 ± 11.2 | 12.4 ± 9.9  | 14.5 ± 9.7  | 14.1 ± 9.8  | 22.3 ± 9.1  |
| Fast Food/Junk Food/Snacks              | 17.9 ± 8.9  | 15.8 ± 7.8  | 17.1 ± 7.4  | 14.3 ± 7.9  | 14.1 ± 7.5  | 18.3 ± 7.8  | 16.4 ± 7.8  | 15.6 ± 7.2  | 14.8 ± 7.3  | 18.2 ± 6.3  | 17.9 ± 6.8  | 15.8 ± 8.1  |
| French fries/chips                      | 5.2 ± 3.4   | 5.1 ± 3.4   | 5.0 ± 3.4   | 4.5 ± 3.5   | 4.4 ± 3.3   | 5.9 ± 3.7   | 4.8 ± 3.5   | 4.4 ± 3.1   | 4.9 ± 3.6   | 6.1 ± 2.6   | 5.9 ± 2.5   | 4.7 ± 3.5   |
| Fried food                              | 1.5 ± 2.3   | 1.1 ± 1.7   | 1.7 ± 2.3   | 1.2 ± 2.0   | 1.0 ± 1.7   | 0.9 ± 1.5   | 1.6 ± 2.2   | 1.8 ± 2.3   | 0.9 ± 1.8   | 1.3 ± 1.7   | 1.3 ± 1.7   | 1.4 ± 2.5   |
| Bakery                                  | 4.2 ± 2.5   | 3.7 ± 2.3   | 4.1 ± 2.2   | 3.3 ± 2.4   | 3.6 ± 2.3   | 4.3 ± 2.0   | 4.0 ± 2.5   | 3.7 ± 2.1   | 3.5 ± 2.3   | 4.1 ± 2.0   | 4.0 ± 1.7   | 4.0 ± 2.3   |
| Chocolate/candy                         | 6.9 ± 4.2   | 5.9 ± 3.6   | 6.3 ± 3.5   | 5.3 ± 3.5   | 5.2 ± 3.3   | 7.3 ± 3.6   | 6.1 ± 3.5   | 5.6 ± 3.4   | 5.5 ± 3.3   | 6.7 ± 3.2   | 6.6 ± 3.7   | 5.7 ± 3.4   |
| Meats & Alternatives                    | 4.1 ± 3.5   | 3.7 ± 3.0   | 4.8 ± 3.3   | 4.5 ± 3.1   | 4.3 ± 3.4   | 3.5 ± 2.7   | 4.5 ± 3.3   | 4.5 ± 3.0   | 3.6 ± 3.4   | 3.9 ± 2.8   | 4.0 ± 2.9   | 3.8 ± 3.4   |
| Red meat                                | 0.7 ± 1.4   | 0.5 ± 1.2   | 0.8 ± 1.4   | 0.9 ± 1.5   | 0.9 ± 1.5   | 0.3 ± 0.6   | 0.7 ± 1.3   | 0.7 ± 0.9   | 0.4 ± 1.3   | 0.4 ± 1.0   | 0.4 ± 1.1   | 0.8 ± 1.6   |
| Poultry                                 | 1.1 ± 1.4   | 1.1 ± 1.3   | 1.4 ± 1.5   | 1.2 ± 1.3   | 1.2 ± 1.4   | 0.9 ± 1.1   | 1.4 ± 1.7   | 1.4 ± 1.4   | 1.2 ± 1.5   | 1.1 ± 1.3   | 1.1 ± 1.3   | 1.3 ± 1.4   |
| Fish & seafood                          | 0.3 ± 0.9   | 0.1 ± 0.5   | 0.2 ± 0.7   | 0.2 ± 0.7   | 0.2 ± 0.5   | 0.2 ± 0.6   | 0.2 ± 0.6   | 0.2 ± 0.6   | 0.1 ± 0.4   | 0.1 ± 0.4   | 0.1 ± 0.5   | 0.1 ± 0.5   |
| Eggs                                    | 1.9 ± 1.7   | 2.0 ± 1.6   | 2.4 ± 1.6   | 2.2 ± 1.6   | 2.0 ± 1.5   | 2.2 ± 1.7   | 2.2 ± 1.6   | 2.2 ± 1.4   | 1.9 ± 1.6   | 2.3 ± 1.6   | 2.3 ± 1.6   | 1.6 ± 1.6   |
| GRAINS                                  | 29.7 ± 16.6 | 27.3 ± 13.2 | 29.6 ± 13.4 | 29.3 ± 15.3 | 29.1 ± 12.4 | 29.9 ± 12.7 | 26.8 ± 15.6 | 30.5 ± 11.6 | 29.1 ± 14.3 | 26.9 ± 10.3 | 27.0 ± 9.1  | 23.8 ± 11.8 |
| White bread                             | 2.7 ± 6.6   | 1.5 ± 5.3   | 3.0 ± 6.6   | 2.8 ± 6.8   | 1.4 ± 4.7   | 2.1 ± 6.1   | 2.5 ± 5.4   | 3.1 ± 6.8   | 3.3 ± 7.8   | 1.1 ± 3.5   | 0.7 ± 3.4   | 0.8 ± 3.9   |
| Whole wheat bread                       | 17.0 ± 7.2  | 17.6 ± 6.4  | 17.3 ± 6.8  | 17.0 ± 7.0  | 17.9 ± 5.7  | 19.0 ± 4.5  | 14.4 ± 8.0  | 18.4 ± 5.9  | 17.2 ± 6.7  | 18.5 ± 5.4  | 19.2 ± 4.4  | 16.9 ± 6.1  |
| Breakfast cereals                       | 4.1 ± 9.7   | 3.5 ± 8.5   | 3.8 ± 8.3   | 4.3 ± 9.5   | 4.0 ± 8.9   | 5.0 ± 8.5   | 3.7 ± 8.7   | 3.0 ± 7.5   | 4.1 ± 8.7   | 2.9 ± 7.1   | 2.9 ± 7.4   | 2.2 ± 6.8   |
| Other grains                            | 1.0 ± 4.0   | 0.4 ± 2.6   | 0.5 ± 2.6   | 0.9 ± 3.6   | 0.6 ± 3.0   | 0.4 ± 1.7   | 0.6 ± 3.4   | 0.3 ± 2.4   | 0.2 ± 1.1   | 0.3 ± 1.9   | 0.2 ± 1.7   | 0.2 ± 1.5   |

|                                  | Punjab      |             |             |             |             |             |             |             |             |             |             |             |
|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                  | Total       | Rural       | Urban       | Rawalpindi  | Sargodha    | Faisalabad  | Gujranwala  | Lahore      | Sahiwal     | Multan      | D.G. Khan   | Bahawalpur  |
| Starchy foods                    | 2.4 ± 2.1   | 1.8 ± 1.8   | 2.5 ± 2.1   | 2.0 ± 2.0   | 2.1 ± 1.9   | 1.6 ± 1.6   | 2.8 ± 2.0   | 2.6 ± 1.9   | 1.8 ± 1.8   | 1.5 ± 1.7   | 1.5 ± 1.9   | 1.8 ± 2.0   |
| Pulses/legumes                   | 2.5 ± 1.7   | 2.4 ± 1.7   | 2.6 ± 1.6   | 2.3 ± 1.6   | 3.1 ± 1.1   | 1.8 ± 1.7   | 2.7 ± 1.6   | 3.0 ± 1.2   | 2.5 ± 1.7   | 2.5 ± 1.5   | 2.4 ± 1.6   | 1.9 ± 1.7   |
| Fruits & Vegetables              | 13.8 ± 8.5  | 12.1 ± 7.3  | 14.3 ± 8.2  | 14.5 ± 8.2  | 14.4 ± 7.1  | 10.0 ± 7.3  | 14.6 ± 8.2  | 15.7 ± 7.0  | 11.2 ± 6.0  | 11.4 ± 6.8  | 11.7 ± 6.7  | 11.0 ± 7.6  |
| Green leafy Vegetables           | 1.9 ± 1.7   | 1.6 ± 1.6   | 2.0 ± 1.7   | 2.0 ± 1.7   | 2.3 ± 1.6   | 1.4 ± 1.6   | 2.1 ± 1.7   | 2.6 ± 1.5   | 1.5 ± 1.6   | 1.1 ± 1.3   | 1.2 ± 1.3   | 1.1 ± 1.5   |
| Other Vegetables                 | 1.9 ± 1.7   | 1.6 ± 1.5   | 1.9 ± 1.6   | 1.8 ± 1.6   | 2.3 ± 1.6   | 1.2 ± 1.3   | 2.2 ± 1.7   | 2.4 ± 1.6   | 1.7 ± 1.4   | 1.2 ± 1.3   | 1.2 ± 1.1   | 1.3 ± 1.4   |
| Vitamin A rich fruits/vegetables | 2.7 ± 2.8   | 2.1 ± 2.2   | 2.6 ± 2.4   | 2.7 ± 2.4   | 2.5 ± 2.2   | 2.0 ± 2.2   | 2.7 ± 2.5   | 2.8 ± 2.3   | 1.6 ± 2.1   | 2.1 ± 2.0   | 1.9 ± 1.9   | 1.8 ± 1.9   |
| Roots and tubers                 | 2.4 ± 1.7   | 2.3 ± 1.6   | 2.3 ± 1.6   | 2.1 ± 1.6   | 2.8 ± 1.3   | 1.7 ± 1.7   | 2.2 ± 1.7   | 2.6 ± 1.4   | 2.4 ± 1.5   | 2.4 ± 1.5   | 2.5 ± 1.5   | 2.3 ± 1.6   |
| Fresh fruit                      | 4.1 ± 3.7   | 4.0 ± 3.6   | 4.7 ± 3.7   | 4.7 ± 3.8   | 4.0 ± 3.3   | 3.4 ± 3.5   | 4.7 ± 4.0   | 4.7 ± 3.1   | 3.6 ± 3.4   | 4.2 ± 3.7   | 4.7 ± 3.6   | 3.6 ± 3.4   |
| Fruit juices                     | 0.8 ± 2.6   | 0.5 ± 2.1   | 0.8 ± 2.7   | 1.2 ± 3.2   | 0.6 ± 2.0   | 0.3 ± 0.9   | 0.7 ± 2.5   | 0.7 ± 2.3   | 0.3 ± 1.6   | 0.4 ± 1.9   | 0.3 ± 1.2   | 0.8 ± 3.2   |
| Beverages                        | 40.7 ± 17.0 | 36.2 ± 13.4 | 35.4 ± 13.7 | 31.5 ± 12.0 | 40.5 ± 13.6 | 31.1 ± 13.3 | 32.3 ± 13.3 | 39.3 ± 12.5 | 40.7 ± 12.8 | 38.5 ± 12.5 | 38.7 ± 11.0 | 34.5 ± 13.3 |
| Beverages without water          | 10.1 ± 7.9  | 8.9 ± 7.5   | 8.1 ± 6.4   | 9.9 ± 7.0   | 9.6 ± 5.4   | 8.5 ± 6.9   | 8.0 ± 6.4   | 7.1 ± 5.1   | 8.0 ± 6.1   | 8.1 ± 7.3   | 7.5 ± 5.2   | 12.0 ± 12.0 |
| Sodas                            | 1.9 ± 4.4   | 1.8 ± 4.6   | 1.9 ± 3.4   | 1.3 ± 2.6   | 1.4 ± 2.6   | 1.4 ± 2.7   | 2.5 ± 3.9   | 1.7 ± 2.9   | 1.2 ± 3.1   | 2.0 ± 4.6   | 1.8 ± 3.5   | 3.4 ± 9.3   |
| Black Tea & coffee               | 0.8 ± 3.1   | 0.4 ± 2.1   | 0.4 ± 2.4   | 1.0 ± 3.4   | 0.7 ± 2.4   | 0.0 ± 0.3   | 0.3 ± 1.8   | 0.2 ± 1.2   | 0.3 ± 1.5   | 0.2 ± 1.3   | 0.1 ± 0.7   | 1.3 ± 3.7   |
| Milk tea                         | 7.3 ± 5.3   | 6.7 ± 5.3   | 5.7 ± 4.5   | 7.6 ± 5.0   | 7.6 ± 4.5   | 7.0 ± 6.2   | 5.2 ± 4.2   | 5.3 ± 3.9   | 6.6 ± 5.3   | 5.9 ± 5.0   | 5.6 ± 4.0   | 7.3 ± 5.3   |
| Water                            | 30.6 ± 14.5 | 27.3 ± 11.9 | 27.3 ± 12.0 | 21.6 ± 10.4 | 30.9 ± 12.4 | 22.7 ± 10.9 | 24.2 ± 11.4 | 32.2 ± 11.0 | 32.7 ± 11.2 | 30.4 ± 10.7 | 31.3 ± 9.9  | 22.5 ± 8.3  |

Among the five wealth quintiles, consumption of fast foods, meat and its alternatives, grains were highest among the richest quintile, while increase consumption of beverages (including water) was found among the households under the poorest wealth quintile (**Table 22**).

Table 22: Food group consumption average numbers of time/week- by wealth quintiles

|   | Punjab                |                 |                 |                 |                 |         |
|---|-----------------------|-----------------|-----------------|-----------------|-----------------|---------|
|   | Mean $\pm$ SD         |                 |                 |                 |                 |         |
|   | Wealth index quintile |                 |                 |                 |                 | p-value |
| Poorest                                 | Poor                  | Middle          | Rich            | Richest         |                 |         |
| Number Of Children 5-9 Years            | 759                   | 759             | 759             | 759             | 759             |         |
| Dairy                                   | 19.9 $\pm$ 13.0       | 20.2 $\pm$ 15.9 | 22.3 $\pm$ 15.6 | 22.6 $\pm$ 15.2 | 26.6 $\pm$ 16.3 | 0.685   |
| Full Fat Or Semi-Skimmed Dairy Products | 4.5 $\pm$ 7.1         | 5.4 $\pm$ 8.4   | 5.9 $\pm$ 8.5   | 6.7 $\pm$ 8.1   | 8.6 $\pm$ 9.4   | 0.015   |
| Whole Milk Cheese                       | 0.0 $\pm$ 0.2         | 0.0 $\pm$ 0.4   | 0.0 $\pm$ 0.4   | 0.0 $\pm$ 0.2   | 0.1 $\pm$ 0.7   | 0.307   |
| Hard Fats                               | 15.5 $\pm$ 10.8       | 14.8 $\pm$ 11.5 | 16.4 $\pm$ 12.2 | 15.9 $\pm$ 12.0 | 18.0 $\pm$ 12.3 | 0.229   |
| Fast Food/Junk Food/Snacks              | 13.6 $\pm$ 7.6        | 15.5 $\pm$ 7.2  | 16.7 $\pm$ 7.6  | 17.0 $\pm$ 7.5  | 18.3 $\pm$ 7.8  | 0       |
| French Fries/Chips                      | 4.8 $\pm$ 3.5         | 5.1 $\pm$ 3.5   | 5.1 $\pm$ 3.4   | 5.2 $\pm$ 3.3   | 5.0 $\pm$ 3.3   | 0.221   |
| Fried Food                              | 0.6 $\pm$ 1.2         | 1.0 $\pm$ 1.6   | 1.2 $\pm$ 1.7   | 1.5 $\pm$ 2.1   | 2.3 $\pm$ 2.5   | 0       |
| Bakery                                  | 3.3 $\pm$ 2.1         | 3.8 $\pm$ 2.2   | 4.0 $\pm$ 2.2   | 4.0 $\pm$ 2.3   | 4.1 $\pm$ 2.4   | 0       |
| Chocolate/Candy                         | 4.8 $\pm$ 3.4         | 5.6 $\pm$ 3.3   | 6.5 $\pm$ 3.5   | 6.4 $\pm$ 3.6   | 6.8 $\pm$ 3.5   | 0       |
| Meats & Alternatives                    | 2.4 $\pm$ 2.2         | 3.1 $\pm$ 2.5   | 4.1 $\pm$ 2.8   | 4.8 $\pm$ 3.2   | 6.0 $\pm$ 3.4   | 0       |
| Red Meat                                | 0.2 $\pm$ 0.8         | 0.4 $\pm$ 1.0   | 0.5 $\pm$ 1.1   | 0.8 $\pm$ 1.4   | 1.1 $\pm$ 1.6   | 0.003   |
| Poultry                                 | 0.6 $\pm$ 0.9         | 0.9 $\pm$ 1.1   | 1.2 $\pm$ 1.4   | 1.4 $\pm$ 1.5   | 1.9 $\pm$ 1.6   | 0       |
| Fish & Seafood                          | 0.1 $\pm$ 0.2         | 0.1 $\pm$ 0.4   | 0.1 $\pm$ 0.6   | 0.2 $\pm$ 0.6   | 0.3 $\pm$ 0.8   | 0.008   |
| Eggs                                    | 1.4 $\pm$ 1.5         | 1.7 $\pm$ 1.6   | 2.2 $\pm$ 1.6   | 2.4 $\pm$ 1.5   | 2.7 $\pm$ 1.5   | 0       |
| Grains                                  | 25.2 $\pm$ 11.3       | 27.3 $\pm$ 12.3 | 28.2 $\pm$ 14.1 | 28.6 $\pm$ 12.8 | 31.1 $\pm$ 15.0 | 0.001   |
| White Bread                             | 0.9 $\pm$ 4.7         | 1.5 $\pm$ 5.0   | 1.9 $\pm$ 6.0   | 2.3 $\pm$ 5.5   | 3.7 $\pm$ 7.3   | 0.015   |
| Whole meal Bread                        | 18.1 $\pm$ 6.1        | 18.0 $\pm$ 6.0  | 17.6 $\pm$ 6.5  | 17.1 $\pm$ 6.8  | 16.8 $\pm$ 7.0  | 0.679   |
| Breakfast Cereals                       | 2.5 $\pm$ 7.1         | 3.4 $\pm$ 8.2   | 3.7 $\pm$ 8.5   | 4.0 $\pm$ 8.7   | 4.2 $\pm$ 9.3   | 0.031   |
| Other Grains                            | 0.2 $\pm$ 1.8         | 0.3 $\pm$ 2.0   | 0.4 $\pm$ 2.6   | 0.4 $\pm$ 2.6   | 0.8 $\pm$ 3.6   | 0.198   |
| Starchy Foods                           | 1.1 $\pm$ 1.4         | 1.6 $\pm$ 1.6   | 1.9 $\pm$ 2.0   | 2.3 $\pm$ 1.9   | 3.0 $\pm$ 2.2   | 0       |
| Pulses/Legumes                          | 2.4 $\pm$ 1.7         | 2.5 $\pm$ 1.7   | 2.5 $\pm$ 1.6   | 2.5 $\pm$ 1.6   | 2.6 $\pm$ 1.6   | 0.233   |
| Fruits & Vegetables                     | 9.0 $\pm$ 6.0         | 11.1 $\pm$ 6.8  | 13.3 $\pm$ 7.6  | 14.5 $\pm$ 8.1  | 16.3 $\pm$ 7.4  | 0       |
| Green Leafy Vegetables                  | 1.3 $\pm$ 1.5         | 1.6 $\pm$ 1.6   | 1.8 $\pm$ 1.7   | 1.9 $\pm$ 1.7   | 2.0 $\pm$ 1.7   | 0       |
| Green Leafy Vegetables                  | 1.3 $\pm$ 1.4         | 1.5 $\pm$ 1.5   | 1.8 $\pm$ 1.6   | 1.9 $\pm$ 1.6   | 2.0 $\pm$ 1.6   | 0.001   |
| Vitamin A Rich Fruits/Vegetables        | 1.5 $\pm$ 1.7         | 2.0 $\pm$ 2.0   | 2.3 $\pm$ 2.3   | 2.6 $\pm$ 2.4   | 2.9 $\pm$ 2.5   | 0       |
| Roots And Tubers                        | 2.3 $\pm$ 1.6         | 2.2 $\pm$ 1.6   | 2.4 $\pm$ 1.6   | 2.3 $\pm$ 1.6   | 2.4 $\pm$ 1.6   | 0.234   |
| Fresh Fruit                             | 2.4 $\pm$ 2.8         | 3.4 $\pm$ 3.5   | 4.4 $\pm$ 3.7   | 4.9 $\pm$ 3.6   | 5.9 $\pm$ 3.5   | 0       |
| Fruit Juices                            | 0.2 $\pm$ 1.4         | 0.4 $\pm$ 1.9   | 0.5 $\pm$ 2.2   | 0.8 $\pm$ 2.7   | 1.1 $\pm$ 2.8   | 0.053   |
| Beverages                               | 36.9 $\pm$ 13.1       | 36.4 $\pm$ 14.4 | 36.1 $\pm$ 13.6 | 34.6 $\pm$ 12.9 | 35.7 $\pm$ 13.4 | 0.413   |
| Beverages Without Water                 | 8.7 $\pm$ 7.2         | 8.4 $\pm$ 7.1   | 8.9 $\pm$ 7.5   | 8.4 $\pm$ 6.9   | 8.7 $\pm$ 6.9   | 0.531   |
| Sodas                                   | 1.1 $\pm$ 4.5         | 1.6 $\pm$ 4.5   | 1.9 $\pm$ 4.5   | 2.0 $\pm$ 3.6   | 2.6 $\pm$ 3.6   | 0.063   |
| Black Tea & Coffee                      | 0.5 $\pm$ 2.2         | 0.5 $\pm$ 2.2   | 0.4 $\pm$ 2.2   | 0.4 $\pm$ 2.3   | 0.3 $\pm$ 2.1   | 0.572   |
| Milk Tea                                | 7.0 $\pm$ 4.9         | 6.4 $\pm$ 5.1   | 6.5 $\pm$ 5.2   | 6.0 $\pm$ 5.1   | 5.8 $\pm$ 4.9   | 0.02    |



|       |             |             |             |             |             |       |
|-------|-------------|-------------|-------------|-------------|-------------|-------|
| Water | 28.3 ± 11.6 | 27.9 ± 12.9 | 27.2 ± 12.1 | 26.1 ± 11.3 | 27.0 ± 11.6 | 0.578 |
|-------|-------------|-------------|-------------|-------------|-------------|-------|

The survey showed greater consumption of dairy products, meat and its alternatives, grains, fruits and vegetables, fast foods, and beverages among children who had ever attended schools. Consumption of fruits and vegetables was found to be significantly greater among anemic children, however, consumption of beverages, and meat and its alternatives were found to be greater among the non-anemic children (**Table 23**).

**Table 23: Food group consumption average numbers of time/week- by had ever attended school and Hb concentration**

|   | Have child ever attended school |             |         | HB level               |                      |         |
|---|---------------------------------|-------------|---------|------------------------|----------------------|---------|
|   | Yes                             | No          | p-value | Deficiency (<11 gm/dL) | Normal (>= 11 gm/dL) | p-value |
| Number Of Children 5-9 Years            | 3500                            | 295         |         | 1203                   | 2299                 |         |
| Dairy                                   | 22.7 ± 15.7                     | 18.2 ± 12.1 | <0.001  | 22.0 ± 15.1            | 22.4 ± 15.5          | 0.509   |
| Full Fat Or Semi-Skimmed Dairy Products | 6.4 ± 8.7                       | 3.7 ± 5.4   | <0.001  | 6.1 ± 8.5              | 6.2 ± 8.3            | 0.728   |
| Whole Milk Cheese                       | 0.0 ± 0.4                       | 0.3 ± 0.0   | 0.001   | 0.0 ± 0.3              | 0.0 ± 0.3            | 0.943   |
| Hard Fats                               | 16.2 ± 11.9                     | 14.5 ± 11.2 | 0.009   | 15.9 ± 11.6            | 16.2 ± 11.9          | 0.543   |
| Fast Food/Junk Food/Snacks              | 16.3 ± 7.8                      | 14.9 ± 7.1  | 0.001   | 16.4 ± 7.5             | 16.0 ± 7.8           | 0.163   |
| French Fries/Chips                      | 5.0 ± 3.4                       | 5.1 ± 3.4   | 0.786   | 5.1 ± 3.3              | 5.0 ± 3.5            | 0.276   |
| Fried Food                              | 1.3 ± 2.0                       | 0.8 ± 1.5   | <0.001  | 1.3 ± 1.9              | 1.3 ± 2.0            | 0.981   |
| Bakery                                  | 3.9 ± 2.3                       | 3.6 ± 2.0   | 0.056   | 3.8 ± 2.2              | 3.8 ± 2.3            | 0.845   |
| Chocolate/Candy                         | 6.1 ± 3.5                       | 5.4 ± 3.6   | 0.001   | 6.2 ± 3.5              | 5.9 ± 3.6            | 0.035   |
| Meats & Alternatives                    | 4.2 ± 3.2                       | 2.9 ± 2.4   | <0.001  | 4.0 ± 3.0              | 4.1 ± 3.1            | 0.485   |
| Red Meat                                | 0.6 ± 1.3                       | 0.3 ± 0.8   | <0.001  | 0.6 ± 1.1              | 0.6 ± 1.3            | 0.217   |
| Poultry                                 | 1.2 ± 1.4                       | 0.8 ± 1.0   | <0.001  | 1.2 ± 1.4              | 1.2 ± 1.4            | 0.656   |
| Fish & Seafood                          | 0.2 ± 0.6                       | 0.1 ± 0.3   | <0.001  | 0.1 ± 0.5              | 0.2 ± 0.5            | 0.339   |
| Eggs                                    | 2.1 ± 1.6                       | 1.7 ± 1.6   | <0.001  | 2.1 ± 1.6              | 2.1 ± 1.6            | 0.605   |
| Grains                                  | 28.3 ± 13.6                     | 25.7 ± 9.7  | <0.001  | 28.2 ± 12.9            | 27.9 ± 13.2          | 0.520   |
| White Bread                             | 2.1 ± 5.9                       | 1.4 ± 5.2   | 0.027   | 2.2 ± 6.0              | 1.9 ± 5.7            | 0.290   |
| Whole meal Bread                        | 17.5 ± 6.6                      | 18.3 ± 5.8  | 0.022   | 17.6 ± 6.4             | 17.4 ± 6.7           | 0.471   |
| Breakfast Cereals                       | 3.7 ± 8.6                       | 2.2 ± 6.4   | <0.001  | 3.6 ± 8.5              | 3.5 ± 8.3            | 0.665   |
| Other Grains                            | 0.4 ± 2.7                       | 0.2 ± 1.6   | 0.025   | 0.3 ± 1.9              | 0.5 ± 2.7            | 0.043   |
| Starchy Foods                           | 2.1 ± 2.0                       | 1.2 ± 1.5   | <0.001  | 2.0 ± 1.9              | 2.0 ± 2.0            | 0.695   |
| Pulses/Legumes                          | 2.5 ± 1.6                       | 2.4 ± 1.7   | 0.372   | 2.5 ± 1.6              | 2.5 ± 1.6            | 0.569   |
| Fruits & Vegetables                     | 13.2 ± 7.8                      | 9.3 ± 6.0   | <0.001  | 12.7 ± 7.6             | 13.0 ± 7.7           | 0.271   |
| Green Leafy Vegetables                  | 1.8 ± 1.7                       | 1.3 ± 1.4   | <0.001  | 1.7 ± 1.6              | 1.8 ± 1.7            | 0.699   |
| Green Leafy Vegetables                  | 1.7 ± 1.6                       | 1.3 ± 1.4   | <0.001  | 1.7 ± 1.6              | 1.7 ± 1.6            | 0.594   |
| Vitamin A Rich Fruits/Vegetables        | 2.3 ± 2.3                       | 1.5 ± 1.8   | <0.001  | 2.2 ± 2.3              | 2.3 ± 2.3            | 0.408   |
| Roots And Tubers                        | 2.3 ± 1.6                       | 2.2 ± 1.6   | 0.166   | 2.3 ± 1.6              | 2.3 ± 1.6            | 0.706   |
| Fresh Fruit                             | 4.4 ± 3.7                       | 2.8 ± 2.8   | <0.001  | 4.2 ± 3.6              | 4.3 ± 3.8            | 0.308   |
| Fruit Juices                            | 0.6 ± 2.4                       | 0.2 ± 1.2   | <0.001  | 0.5 ± 2.1              | 0.6 ± 2.2            | 0.271   |
| Beverages                               | 35.9 ± 13.6                     | 35.7 ± 12.8 | 0.775   | 36.2 ± 13.0            | 35.9 ± 13.7          | 0.549   |
| Beverages Without Water                 | 8.7 ± 7.2                       | 8.4 ± 5.9   | 0.434   | 8.5 ± 6.5              | 8.6 ± 7.2            | 0.592   |
| Sodas                                   | 1.9 ± 4.3                       | 1.1 ± 2.5   | <0.001  | 1.7 ± 3.8              | 1.9 ± 4.3            | 0.211   |
| Black Tea & Coffee                      | 0.4 ± 2.2                       | 0.4 ± 1.9   | 0.877   | 0.3 ± 1.8              | 0.5 ± 2.3            | 0.024   |
| Milk Tea                                | 6.3 ± 5.0                       | 6.8 ± 5.0   | 0.11    | 6.4 ± 5.0              | 6.2 ± 5.0            | 0.252   |
| Water                                   | 27.3 ± 12.0                     | 27.3 ± 11.6 | 0.929   | 27.7 ± 11.7            | 27.3 ± 12.0          | 0.329   |

The survey showed that children of mothers with higher education level consumed more dairy products, fruits and vegetables, fast foods, and beverages compared to mother who had below high level of education (**Table 24**).

Table 24: Food group consumption average numbers of time/week- by maternal education

|   | Punjab                 |             |             |             |             |         |
|---|------------------------|-------------|-------------|-------------|-------------|---------|
|   | Mother education level |             |             |             |             |         |
|   | None                   | Primary     | Middle      | Secondary   | Higher      | p-value |
| Number Of Children 5-9 Years            | 2015                   | 576         | 312         | 453         | 439         |         |
| Dairy                                   | 21.1 ± 15.4            | 23.4 ± 14.6 | 22.6 ± 15.4 | 23.9 ± 15.5 | 25.7 ± 16.5 | 0.001   |
| Full Fat Or Semi-Skimmed Dairy Products | 5.6 ± 8.5              | 6.9 ± 8.3   | 5.6 ± 7.4   | 7.5 ± 8.3   | 7.8 ± 9.2   | 0.001   |
| Whole Milk Cheese                       | 0.0 ± 0.4              | 0.0 ± 0.7   | 0.1 ± 0.0   | 0.0 ± 0.1   | 0.1 ± 0.6   | 0.784   |
| Hard Fats                               | 15.5 ± 11.8            | 16.5 ± 11.4 | 17.0 ± 12.2 | 16.4 ± 12.0 | 17.8 ± 12.4 | 0.066   |
| Fast Food/Junk Food/Snacks              | 15.7 ± 7.9             | 16.4 ± 7.7  | 16.5 ± 7.4  | 16.7 ± 7.4  | 17.9 ± 7.2  | 0.072   |
| French Fries/Chips                      | 5.2 ± 3.4              | 5.0 ± 3.4   | 4.8 ± 3.5   | 4.9 ± 3.4   | 4.9 ± 3.3   | 0.194   |
| Fried Food                              | 1.1 ± 1.9              | 1.3 ± 2.0   | 1.3 ± 1.8   | 1.6 ± 2.2   | 2.1 ± 2.3   | 0.041   |
| Bakery                                  | 3.6 ± 2.3              | 4.0 ± 2.2   | 4.1 ± 2.2   | 4.0 ± 2.2   | 4.4 ± 2.2   | <0.001  |
| Chocolate/Candy                         | 5.9 ± 3.6              | 6.2 ± 3.5   | 6.3 ± 3.3   | 6.1 ± 3.4   | 6.5 ± 3.4   | 0.085   |
| Meats & Alternatives                    | 3.5 ± 3.0              | 4.0 ± 3.0   | 4.3 ± 3.1   | 5.0 ± 3.4   | 6.0 ± 3.4   | 0.001   |
| Red Meat                                | 0.5 ± 1.2              | 0.6 ± 1.2   | 0.6 ± 1.2   | 0.8 ± 1.4   | 1.2 ± 1.6   | 0.022   |
| Poultry                                 | 1.0 ± 1.3              | 1.2 ± 1.4   | 1.3 ± 1.4   | 1.6 ± 1.6   | 1.8 ± 1.6   | 0.003   |
| Fish & Seafood                          | 0.1 ± 0.5              | 0.1 ± 0.5   | 0.2 ± 0.4   | 0.2 ± 0.7   | 0.3 ± 0.8   | 0.357   |
| Eggs                                    | 1.9 ± 1.7              | 2.1 ± 1.6   | 2.2 ± 1.6   | 2.4 ± 1.5   | 2.7 ± 1.4   | 0.042   |
| Grains                                  | 27.2 ± 13.5            | 28.1 ± 12.3 | 28.4 ± 12.7 | 31.2 ± 13.7 | 29.3 ± 13.6 | 0.121   |
| White Bread                             | 1.9 ± 6.0              | 1.8 ± 5.4   | 1.8 ± 5.3   | 2.8 ± 6.3   | 2.6 ± 5.9   | 0.741   |
| Whole Meal Bread                        | 17.6 ± 6.6             | 17.3 ± 6.5  | 17.3 ± 6.9  | 18.0 ± 5.5  | 16.9 ± 7.1  | 0.221   |
| Breakfast Cereals                       | 3.2 ± 8.3              | 4.2 ± 8.2   | 4.0 ± 8.8   | 4.3 ± 9.4   | 3.6 ± 8.3   | 0.016   |
| Other Grains                            | 0.3 ± 2.2              | 0.2 ± 1.8   | 0.5 ± 2.7   | 0.9 ± 4.1   | 0.6 ± 3.2   | 0.315   |
| Starchy Foods                           | 1.7 ± 1.9              | 2.0 ± 1.8   | 2.2 ± 1.9   | 2.6 ± 1.9   | 2.9 ± 2.2   | <0.001  |
| Pulses/Legumes                          | 2.4 ± 1.7              | 2.5 ± 1.6   | 2.6 ± 1.6   | 2.7 ± 1.5   | 2.8 ± 1.4   | 0.013   |
| Fruits & Vegetables                     | 11.5 ± 7.5             | 13.4 ± 7.9  | 13.8 ± 7.7  | 14.8 ± 7.5  | 16.7 ± 6.9  | <0.001  |
| Green Leafy Vegetables                  | 1.6 ± 1.6              | 1.8 ± 1.7   | 2.0 ± 1.6   | 2.1 ± 1.7   | 1.9 ± 1.7   | 0.008   |
| Green Leafy Vegetables                  | 1.5 ± 1.5              | 1.9 ± 1.6   | 1.8 ± 1.6   | 2.0 ± 1.6   | 2.0 ± 1.6   | <0.001  |
| Vitamin A Rich Fruits/Vegetables        | 2.0 ± 2.2              | 2.4 ± 2.2   | 2.5 ± 2.2   | 2.7 ± 2.3   | 2.9 ± 2.5   | 0.002   |
| Roots And Tubers                        | 2.2 ± 1.7              | 2.4 ± 1.6   | 2.2 ± 1.6   | 2.3 ± 1.6   | 2.6 ± 1.4   | 0.147   |
| Fresh Fruit                             | 3.6 ± 3.7              | 4.5 ± 3.6   | 4.7 ± 3.5   | 5.0 ± 3.4   | 6.2 ± 3.3   | <0.001  |
| Fruit Juices                            | 0.5 ± 2.1              | 0.5 ± 2.2   | 0.6 ± 2.1   | 0.8 ± 2.8   | 1.1 ± 2.9   | 0.579   |
| Beverages                               | 34.8 ± 13.6            | 37.4 ± 12.7 | 37.6 ± 13.8 | 36.4 ± 12.7 | 37.9 ± 14.0 | <0.001  |
| Beverages Without Water                 | 9.0 ± 7.7              | 8.4 ± 6.3   | 8.4 ± 6.2   | 7.6 ± 5.8   | 8.6 ± 7.1   | 0.046   |
| Sodas                                   | 1.7 ± 4.6              | 1.7 ± 3.3   | 2.1 ± 4.5   | 1.9 ± 2.8   | 2.5 ± 4.2   | 0.929   |
| Black Tea & Coffee                      | 0.6 ± 2.4              | 0.4 ± 2.6   | 0.1 ± 0.8   | 0.2 ± 1.1   | 0.3 ± 1.7   | 0.231   |
| Milk Tea                                | 6.7 ± 5.2              | 6.2 ± 4.5   | 6.2 ± 4.5   | 5.5 ± 4.8   | 5.7 ± 5.4   | 0.024   |
| Water                                   | 25.8 ± 11.7            | 29.0 ± 12.0 | 29.2 ± 12.5 | 28.8 ± 11.6 | 29.3 ± 11.9 | <0.001  |

*Child Dietary Intake*

24-hour dietary recall was used to assess the dietary intake of school aged children. The mean energy intake among school age children of Punjab was 1233.8 ± 516.2.8 kcal (rural: 1201.4 ± 483.1 kcal; urban setting: 1292 ± 562 kcal). Details on different nutrient intake has been given in **Table 25**.

**Table 25: Nutrient Intake in districts of Punjab**

| Nutrient Intake              | Punjab<br>Mean ± SD |                |                |                |                |                |                |                |                |                |                |                |
|------------------------------|---------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                              | Punjab              | Rural          | Urban          | Rawalpindi     | Sargodha       | Faisalabad     | Gujranwala     | Lahore         | Sahiwal        | Multan         | D.G. Khan      | Bahawalpur     |
| Number of children 5-9 Years | 3774                | 2481           | 1293           | 350            | 274            | 474            | 556            | 663            | 260            | 423            | 379            | 395            |
| Energy (kcal)                | 1233.8 ± 516.2      | 1201.4 ± 483.1 | 1292.0 ± 562.0 | 1228.1 ± 482.9 | 1314.4 ± 657.3 | 1213.9 ± 510.7 | 1256.9 ± 443.1 | 1319.0 ± 478.9 | 1195.5 ± 602.0 | 1157.6 ± 428.2 | 1231.8 ± 523.2 | 1159.8 ± 439.2 |
| Protein (g)                  | 29.7 ± 14.7         | 28.9 ± 14.3    | 31.2 ± 15.2    | 31.0 ± 16.5    | 32.1 ± 15.9    | 27.9 ± 12.8    | 28.6 ± 11.8    | 31.6 ± 14.3    | 28.2 ± 16.5    | 28.0 ± 11.2    | 31.8 ± 16.2    | 28.2 ± 12.4    |
| Total Fat (g)                | 47.3 ± 26.5         | 45.3 ± 24.0    | 50.8 ± 30.0    | 49.0 ± 24.1    | 51.6 ± 33.4    | 45.2 ± 23.9    | 47.4 ± 22.0    | 50.2 ± 23.5    | 46.6 ± 36.7    | 43.6 ± 20.6    | 48.3 ± 27.7    | 43.0 ± 21.8    |
| Fiber, total dietary (g)     | 22.2 ± 10.9         | 22.6 ± 10.7    | 21.6 ± 11.2    | 21.5 ± 9.5     | 24.0 ± 10.8    | 22.9 ± 12.2    | 20.6 ± 10.1    | 22.0 ± 10.7    | 22.6 ± 10.6    | 21.8 ± 10.4    | 22.4 ± 11.0    | 23.8 ± 11.2    |
| Carbohydrate (g)             | 174.4 ± 67.5        | 171.9 ± 64.3   | 178.8 ± 72.2   | 167.5 ± 63.0   | 183.1 ± 81.9   | 176.8 ± 72.9   | 181.3 ± 61.9   | 187.1 ± 66.3   | 166.6 ± 65.0   | 165.2 ± 59.3   | 169.3 ± 66.4   | 166.6 ± 58.9   |
| Calcium (mg)                 | 292.3 ± 218.9       | 289.9 ± 218.9  | 296.5 ± 218.9  | 302.6 ± 224.6  | 323.7 ± 194.4  | 306.2 ± 247.5  | 280.4 ± 200.2  | 310.9 ± 216.4  | 261.3 ± 274.3  | 276.7 ± 181.3  | 289.0 ± 200.5  | 273.4 ± 167.6  |
| Iron (mg)                    | 6.7 ± 3.5           | 6.5 ± 3.2      | 7.0 ± 3.9      | 6.7 ± 3.6      | 7.0 ± 3.7      | 6.7 ± 3.9      | 6.5 ± 3.6      | 7.0 ± 3.8      | 6.3 ± 2.8      | 6.3 ± 2.9      | 6.7 ± 3.3      | 6.7 ± 3.0      |
| Magnesium (mg)               | 169.1 ± 73.7        | 168.6 ± 69.2   | 170.0 ± 80.6   | 161.2 ± 60.7   | 179.6 ± 74.5   | 168.7 ± 88.6   | 165.0 ± 69.8   | 174.7 ± 83.9   | 164.0 ± 74.1   | 165.0 ± 60.8   | 179.4 ± 74.0   | 166.6 ± 64.3   |
| Phosphorus (mg)              | 585.0 ± 263.4       | 579.2 ± 262.5  | 595.3 ± 264.5  | 596.9 ± 266.0  | 632.8 ± 266.9  | 578.1 ± 267.3  | 564.7 ± 228.6  | 604.2 ± 250.2  | 561.1 ± 327.9  | 558.6 ± 211.4  | 604.3 ± 273.9  | 569.8 ± 223.1  |
| Potassium (mg)               | 1061.4 ± 595.2      | 1044.4 ± 553.8 | 1091.9 ± 657.7 | 1075.8 ± 507.3 | 1160.2 ± 651.3 | 1036.4 ± 648.1 | 1014.9 ± 474.7 | 1149.6 ± 761.6 | 989.7 ± 655.8  | 986.5 ± 469.1  | 1157.7 ± 601.2 | 972.9 ± 463.2  |
| Sodium (mg)                  | 1122.4 ± 659.0      | 1088.5 ± 627.5 | 1183.0 ± 704.0 | 1115.3 ± 653.7 | 1169.5 ± 709.7 | 1135.2 ± 665.5 | 1124.7 ± 612.1 | 1184.6 ± 719.8 | 1115.1 ± 632.1 | 1050.1 ± 502.0 | 1072.8 ± 690.2 | 1126.6 ± 656.5 |
| Zinc (mg)                    | 4.5 ± 2.1           | 4.4 ± 2.1      | 4.5 ± 2.0      | 4.5 ± 2.2      | 4.8 ± 2.1      | 4.3 ± 2.0      | 4.3 ± 1.6      | 4.6 ± 1.9      | 4.3 ± 2.1      | 4.4 ± 2.2      | 4.8 ± 2.1      | 4.5 ± 1.8      |
| Copper (mg)                  | 0.7 ± 1.0           | 0.7 ± 1.1      | 0.8 ± 1.0      | 0.8 ± 1.7      | 0.8 ± 1.4      | 0.7 ± 1.1      | 0.7 ± 0.3      | 0.8 ± 1.3      | 0.7 ± 0.3      | 0.7 ± 0.3      | 0.8 ± 0.4      | 0.7 ± 0.8      |

| Nutrient Intake                         | Punjab<br>Mean ± SD |                   |                   |                  |                  |                  |                  |                  |                   |                  |                   |                  |
|---|---------------------|-------------------|-------------------|------------------|------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|------------------|
|   | Punjab              | Rural             | Urban             | Rawalpindi       | Sargodha         | Faisalabad       | Gujranwala       | Lahore           | Sahiwal           | Multan           | D.G. Khan         | Bahawalpur       |
| Vitamin A (µg)                          | 235.4 ± 748.3       | 230.7 ± 781.6     | 243.8 ± 688.0     | 338.2 ± 1166.6   | 251.4 ± 966.7    | 217.8 ± 727.7    | 200.5 ± 202.3    | 261.5 ± 939.4    | 202.4 ± 392.8     | 162.7 ± 161.4    | 268.8 ± 597.9     | 199.1 ± 535.1    |
| Vitamin D (D2 + D3) (µg)                | 1.6 ± 12.5          | 1.3 ± 9.8         | 2.1 ± 16.0        | 1.8 ± 10.3       | 3.7 ± 27.2       | 1.2 ± 7.9        | 1.5 ± 10.5       | 2.5 ± 18.7       | 0.9 ± 1.8         | 0.8 ± 3.7        | 1.2 ± 8.2         | 0.6 ± 0.9        |
| Vitamin E (alpha-tocopherol) (mg)       | 1.3 ± 1.9           | 1.1 ± 1.8         | 1.4 ± 2.0         | 1.5 ± 1.8        | 1.3 ± 1.7        | 1.0 ± 1.5        | 1.2 ± 2.0        | 1.4 ± 1.7        | 1.2 ± 2.5         | 1.1 ± 2.1        | 1.4 ± 1.7         | 0.9 ± 1.3        |
| Thiamin (mg)                            | 0.8 ± 0.4           | 0.8 ± 0.4         | 0.7 ± 0.4         | 0.7 ± 0.3        | 0.8 ± 0.5        | 0.8 ± 0.4        | 0.7 ± 0.4        | 0.8 ± 0.4        | 0.7 ± 0.4         | 0.7 ± 0.3        | 0.8 ± 0.4         | 0.8 ± 0.4        |
| Riboflavin (mg)                         | 1.0 ± 1.4           | 1.0 ± 1.4         | 1.0 ± 1.5         | 0.9 ± 0.9        | 1.0 ± 1.1        | 0.9 ± 1.1        | 1.0 ± 1.4        | 1.0 ± 1.7        | 0.9 ± 1.0         | 0.9 ± 1.2        | 1.3 ± 2.3         | 1.0 ± 1.8        |
| Niacin (mg)                             | 9.9 ± 5.1           | 9.9 ± 5.1         | 9.9 ± 5.1         | 9.6 ± 5.5        | 10.6 ± 6.1       | 10.1 ± 6.0       | 9.1 ± 4.4        | 10.2 ± 5.1       | 9.3 ± 4.2         | 9.6 ± 3.9        | 10.3 ± 4.7        | 10.4 ± 4.8       |
| Vitamin B-6 (mg)                        | 1.5 ± 3.4           | 1.6 ± 3.7         | 1.4 ± 2.8         | 1.0 ± 1.9        | 1.8 ± 3.2        | 1.9 ± 4.7        | 1.7 ± 3.5        | 1.9 ± 3.5        | 1.4 ± 2.8         | 1.4 ± 3.1        | 1.4 ± 3.9         | 1.2 ± 2.5        |
| Folate, total (µg)                      | 131.8 ± 91.2        | 130.6 ± 90.7      | 134.1 ± 91.8      | 141.3 ± 107.1    | 139.3 ± 93.7     | 134.5 ± 96.0     | 123.7 ± 74.3     | 138.4 ± 96.1     | 111.2 ± 61.2      | 117.6 ± 59.6     | 145.0 ± 108.8     | 132.6 ± 80.9     |
| L-ascorbic acid (mg)                    | 93.1 ± 307.1        | 102.6 ± 335.3     | 76.2 ± 251.6      | 53.4 ± 180.9     | 108.3 ± 296.2    | 137.6 ± 433.0    | 118.6 ± 320.6    | 111.3 ± 317.1    | 79.0 ± 255.5      | 78.1 ± 281.6     | 66.4 ± 350.8      | 68.7 ± 228.3     |
| Fatty acids, total saturated (mg)       | 18603.4 ± 11194.1   | 18001.8 ± 10680.6 | 19681.8 ± 11915.0 | 18595.9 ± 8942.9 | 19438.9 ± 9718.5 | 17387.5 ± 9701.4 | 19063.7 ± 9690.7 | 19750.7 ± 9603.3 | 19766.8 ± 18369.5 | 17205.0 ± 8735.4 | 19523.2 ± 13166.2 | 16573.0 ± 9050.0 |
| Fatty acids, total monounsaturated (mg) | 12995.7 ± 7971.1    | 12284.1 ± 7405.9  | 14271.4 ± 8685.5  | 14162.2 ± 7602.9 | 14149.1 ± 8262.8 | 12050.3 ± 7019.2 | 13040.3 ± 6423.1 | 14133.0 ± 7285.2 | 12938.3 ± 11351.4 | 11465.3 ± 5930.4 | 13070.1 ± 8726.9  | 11639.0 ± 7264.3 |
| Fatty acids, total polyunsaturated (mg) | 6890.8 ± 5051.8     | 6359.3 ± 4650.7   | 7843.5 ± 5521.4   | 7759.4 ± 5224.3  | 7678.2 ± 6080.9  | 6729.7 ± 5391.1  | 7035.1 ± 4643.3  | 7800.8 ± 5216.8  | 6298.9 ± 4448.8   | 5909.2 ± 3963.6  | 6255.0 ± 4472.0   | 6058.7 ± 4695.6  |
| Cholesterol (mg)                        | 109.3 ± 317.6       | 96.6 ± 302.0      | 132.2 ± 340.9     | 158.7 ± 504.2    | 112.7 ± 271.7    | 75.7 ± 123.7     | 93.2 ± 102.7     | 131.7 ± 457.7    | 125.3 ± 373.9     | 85.2 ± 174.2     | 123.4 ± 233.0     | 73.6 ± 145.8     |

A significantly greater intake of energy, proteins, sodium, vitamin A, L-ascorbic acid, and fatty acids (saturated, mono-unsaturated, and poly-unsaturated) was reported among the household under the richest wealth quintiles, while a significantly greater intake of carbohydrate was reported among households under middle wealth quintile (**Table 26**).

Table 26: Nutrient intake in districts of Punjab- by wealth quintile

| Nutrient Intake                         | Punjab<br>Mean ± SD   |                  |                   |                   |                   |         |
|---|-----------------------|------------------|-------------------|-------------------|-------------------|---------|
|   | Wealth index quintile |                  |                   |                   |                   |         |
|   | Poorest               | Poor             | Middle            | Rich              | Richest           | p-value |
| Number of children 5-9 Years            | 755                   | 754              | 753               | 755               | 757               |         |
| Energy (kcal)                           | 1091.4 ± 392.2        | 1175.6 ± 459.3   | 1209.3 ± 482.1    | 1279.0 ± 490.0    | 1404.2 ± 643.5    | <0.001  |
| Protein (g)                             | 26.5 ± 10.7           | 28.0 ± 12.9      | 29.0 ± 13.7       | 30.0 ± 13.4       | 34.8 ± 19.1       | 0.012   |
| Total Fat (g)                           | 40.0 ± 19.1           | 43.4 ± 21.3      | 46.1 ± 22.5       | 49.7 ± 24.8       | 56.7 ± 36.5       | 0.001   |
| Fiber, total dietary (g)                | 22.7 ± 10.3           | 23.0 ± 11.4      | 22.6 ± 11.0       | 21.7 ± 10.4       | 21.2 ± 10.9       | 0.554   |
| Carbohydrate (g)                        | 159.4 ± 56.1          | 170.6 ± 63.8     | 171.3 ± 64.2      | 180.0 ± 67.5      | 189.7 ± 78.5      | <0.001  |
| Calcium (mg)                            | 263.4 ± 165.8         | 266.8 ± 171.6    | 281.2 ± 233.9     | 295.9 ± 208.9     | 351.9 ± 273.5     | 0.694   |
| Iron (mg)                               | 6.2 ± 2.8             | 6.5 ± 3.4        | 6.5 ± 3.1         | 6.8 ± 3.3         | 7.3 ± 4.4         | 0.019   |
| Magnesium (mg)                          | 164.9 ± 62.4          | 169.2 ± 78.2     | 166.3 ± 73.3      | 168.2 ± 66.4      | 176.5 ± 84.3      | 0.231   |
| Phosphorus (mg)                         | 546.3 ± 209.8         | 561.7 ± 232.2    | 571.7 ± 267.4     | 588.0 ± 251.9     | 654.5 ± 318.3     | 0.177   |
| Potassium (mg)                          | 971.9 ± 458.6         | 1004.9 ± 547.8   | 1033.9 ± 585.0    | 1073.0 ± 554.5    | 1216.7 ± 742.8    | 0.205   |
| Sodium (mg)                             | 992.4 ± 502.8         | 1054.9 ± 561.4   | 1103.7 ± 615.0    | 1164.5 ± 633.3    | 1287.3 ± 861.1    | 0.023   |
| Zinc (mg)                               | 4.3 ± 2.1             | 4.4 ± 1.9        | 4.3 ± 1.8         | 4.4 ± 1.9         | 4.9 ± 2.5         | 0.438   |
| Copper (mg)                             | 0.7 ± 0.9             | 0.8 ± 1.1        | 0.7 ± 0.9         | 0.8 ± 1.3         | 0.8 ± 1.0         | 0.481   |
| Vitamin A (µg)                          | 184.2 ± 602.9         | 198.7 ± 725.2    | 211.7 ± 588.8     | 268.0 ± 934.3     | 311.0 ± 813.8     | 0.673   |
| Vitamin D (D2 + D3) (µg)                | 0.8 ± 5.4             | 0.9 ± 4.2        | 1.5 ± 12.9        | 1.8 ± 15.9        | 2.9 ± 17.1        | 0.696   |
| Vitamin E (alpha-tocopherol) (mg)       | 0.9 ± 1.2             | 1.1 ± 1.4        | 1.2 ± 1.9         | 1.4 ± 1.8         | 1.7 ± 2.5         | 0.02    |
| Thiamin (mg)                            | 0.8 ± 0.3             | 0.8 ± 0.4        | 0.7 ± 0.3         | 0.7 ± 0.3         | 0.8 ± 0.5         | 0.585   |
| Riboflavin (mg)                         | 0.9 ± 1.4             | 0.9 ± 1.0        | 0.9 ± 1.4         | 1.1 ± 1.6         | 1.2 ± 1.7         | 0.203   |
| Niacin (mg)                             | 9.8 ± 4.3             | 9.9 ± 4.9        | 9.6 ± 4.5         | 9.6 ± 4.7         | 10.5 ± 6.7        | 0.815   |
| Vitamin B-6 (mg)                        | 1.5 ± 3.7             | 1.6 ± 3.4        | 1.5 ± 3.0         | 1.4 ± 3.1         | 1.7 ± 3.7         | 0.784   |
| Folate, total (µg)                      | 122.8 ± 70.2          | 129.8 ± 88.6     | 126.3 ± 82.4      | 135.5 ± 85.8      | 144.4 ± 118.0     | 0.087   |
| L-ascorbic acid (mg)                    | 91.1 ± 339.6          | 93.1 ± 305.7     | 94.1 ± 273.4      | 86.2 ± 282.0      | 101.0 ± 334.1     | 0.901   |
| Fatty acids, total saturated (mg)       | 16176.5 ± 8799.9      | 17219.1 ± 9426.3 | 18388.9 ± 10209.9 | 19283.3 ± 10487.7 | 21772.2 ± 14712.0 | 0.026   |
| Fatty acids, total monounsaturated (mg) | 10431.7 ± 5318.1      | 11797.0 ± 6724.9 | 12709.9 ± 6978.9  | 13786.0 ± 7960.2  | 16074.3 ± 10287.7 | <0.001  |
| Fatty acids, total polyunsaturated (mg) | 5026.2 ± 3101.6       | 6160.4 ± 4190.3  | 6696.4 ± 4335.5   | 7628.2 ± 5358.5   | 8815.7 ± 6448.3   | <0.001  |
| Cholesterol (mg)                        | 65.9 ± 119.8          | 75.2 ± 129.8     | 90.3 ± 135.2      | 128.5 ± 472.2     | 183.6 ± 459.4     | 0.148   |

A significantly greater intake of energy, proteins, total fats, fiber, carbohydrate, calcium, iron, magnesium, phosphorus, folate, fatty acids (total saturated and mono-unsaturated), and cholesterol was found among males aged 5-9 years old compared to girls (**Table 27**). By ever attended school, the survey showed greater intake of energy, proteins, total fats, carbohydrate, calcium, iron, phosphorus, potassium, sodium, zinc, copper, vitamins (A, D, E, riboflavin), fatty acids (total saturated, mono-unsaturated, poly-unsaturated), and cholesterol among children who had ever attended school

Table 27: Nutrient intake in Punjab- by gender and ever attended school

| Nutrient Intake                         | Punjab            |                   |                   |         |                                 |                   |         |
|---|-------------------|-------------------|-------------------|---------|---------------------------------|-------------------|---------|
|   | Total             | Gender            |                   |         | Have child ever attended school |                   |         |
|   |                   | Male              | Female            | p-value | Yes                             | No                | p-value |
| Number of children 5-9 Years            | 3774              | 1927              | 1847              |         | 3481                            | 293               |         |
| Energy (kcal)                           | 1233.8 ± 516.2    | 1265.0 ± 545.2    | 1202.1 ± 482.9    | <0.001  | 1242.6 ± 516.7                  | 1121.4 ± 495.4    | <0.001  |
| Protein (g)                             | 29.7 ± 14.7       | 30.2 ± 14.5       | 29.2 ± 14.9       | 0.036   | 29.8 ± 14.6                     | 28.0 ± 16.0       | 0.058   |
| Total Fat (g)                           | 47.3 ± 26.5       | 48.1 ± 26.3       | 46.4 ± 26.8       | 0.041   | 47.6 ± 26.2                     | 42.5 ± 30.2       | 0.005   |
| Fiber, total dietary (g)                | 22.2 ± 10.9       | 22.7 ± 11.1       | 21.8 ± 10.6       | 0.009   | 22.4 ± 10.9                     | 20.4 ± 10.4       | 0.002   |
| Carbohydrate (g)                        | 174.4 ± 67.5      | 179.5 ± 72.4      | 169.1 ± 61.6      | <0.001  | 175.6 ± 68.0                    | 159.2 ± 58.7      | <0.001  |
| Calcium (mg)                            | 292.3 ± 218.9     | 300.5 ± 228.8     | 283.9 ± 208.2     | 0.020   | 293.7 ± 221.7                   | 274.4 ± 175.6     | 0.076   |
| Iron (mg)                               | 6.7 ± 3.5         | 6.8 ± 3.5         | 6.5 ± 3.5         | 0.004   | 6.7 ± 3.5                       | 6.2 ± 3.4         | 0.020   |
| Magnesium (mg)                          | 169.1 ± 73.7      | 172.5 ± 73.0      | 165.6 ± 74.2      | 0.004   | 169.7 ± 74.0                    | 161.0 ± 68.2      | 0.038   |
| Phosphorus (mg)                         | 585.0 ± 263.4     | 596.3 ± 269.1     | 573.4 ± 257.0     | 0.008   | 587.5 ± 263.2                   | 553.2 ± 263.8     | 0.033   |
| Potassium (mg)                          | 1061.4 ± 595.2    | 1080.9 ± 585.9    | 1041.5 ± 603.8    | 0.042   | 1067.0 ± 601.0                  | 989.2 ± 503.2     | 0.012   |
| Sodium (mg)                             | 1122.4 ± 659.0    | 1148.6 ± 662.3    | 1095.6 ± 654.7    | 0.014   | 1132.5 ± 657.2                  | 993.1 ± 666.8     | 0.001   |
| Zinc (mg)                               | 4.5 ± 2.1         | 4.5 ± 2.0         | 4.4 ± 2.1         | 0.059   | 4.5 ± 2.1                       | 4.3 ± 2.0         | 0.055   |
| Copper (mg)                             | 0.7 ± 1.0         | 0.7 ± 0.4         | 0.8 ± 1.4         | 0.086   | 0.7 ± 1.1                       | 0.7 ± 0.8         | 0.398   |
| Vitamin A (µg)                          | 235.4 ± 748.3     | 207.3 ± 377.7     | 264.2 ± 986.8     | 0.020   | 236.9 ± 756.5                   | 216.2 ± 622.0     | 0.590   |
| Vitamin D (D2 + D3) (µg)                | 1.6 ± 12.5        | 1.5 ± 12.0        | 1.6 ± 12.9        | 0.805   | 1.6 ± 12.9                      | 0.7 ± 1.6         | <0.001  |
| Vitamin E (alpha-tocopherol) (mg)       | 1.3 ± 1.9         | 1.2 ± 1.7         | 1.3 ± 2.1         | 0.104   | 1.3 ± 1.9                       | 1.1 ± 2.1         | 0.336   |
| Thiamin (mg)                            | 0.8 ± 0.4         | 0.8 ± 0.4         | 0.7 ± 0.3         | <0.001  | 0.8 ± 0.4                       | 0.7 ± 0.3         | 0.081   |
| Riboflavin (mg)                         | 1.0 ± 1.4         | 1.0 ± 1.3         | 1.0 ± 1.6         | 0.569   | 1.0 ± 1.4                       | 1.0 ± 1.6         | 0.714   |
| Niacin (mg)                             | 9.9 ± 5.1         | 10.1 ± 5.4        | 9.7 ± 4.8         | 0.011   | 9.9 ± 5.1                       | 9.4 ± 4.8         | 0.101   |
| Vitamin B-6 (mg)                        | 1.5 ± 3.4         | 1.6 ± 3.5         | 1.4 ± 3.2         | 0.053   | 1.6 ± 3.4                       | 1.1 ± 2.1         | <0.001  |
| Folate, total (µg)                      | 131.8 ± 91.2      | 134.2 ± 93.1      | 129.4 ± 89.2      | 0.110   | 132.0 ± 90.4                    | 130.4 ± 101.5     | 0.804   |
| L-ascorbic acid (mg)                    | 93.1 ± 307.1      | 101.4 ± 322.5     | 84.7 ± 290.6      | 0.095   | 96.5 ± 313.9                    | 49.4 ± 183.9      | <0.001  |
| Fatty acids, total saturated (mg)       | 18603.4 ± 11194.1 | 18928.8 ± 10319.0 | 18271.3 ± 12001.5 | 0.072   | 18736.5 ± 10924.5               | 16901.0 ± 14301.5 | 0.032   |
| Fatty acids, total monounsaturated (mg) | 12995.7 ± 7971.1  | 13210.3 ± 7689.9  | 12776.8 ± 8237.8  | 0.095   | 13098.1 ± 7840.0                | 11686.1 ± 9514.4  | 0.013   |
| Fatty acids, total polyunsaturated (mg) | 6890.8 ± 5051.8   | 7065.6 ± 5249.1   | 6712.4 ± 4838.4   | 0.032   | 6973.5 ± 5066.2                 | 5832.5 ± 4712.7   | <0.001  |
| Cholesterol (mg)                        | 109.3 ± 317.6     | 102.3 ± 189.7     | 116.4 ± 406.8     | 0.174   | 110.7 ± 319.6                   | 91.8 ± 288.2      | 0.286   |

By maternal education, the survey showed a significantly greater in intake of energy, total fats, carbohydrates, calcium, potassium, sodium, and fatty acids (total saturated, monounsaturated, and polyunsaturated) among children whose mother had a higher education level (Table 28).

Table 28: Nutrient intake in Punjab- by maternal education

| Nutrient Intake                         | Punjab                 |                  |                   |                   |                   |         |
|---|------------------------|------------------|-------------------|-------------------|-------------------|---------|
|   | Mother education level |                  |                   |                   |                   |         |
|   | None                   | Primary          | Middle            | Secondary         | Higher            | p-value |
| Number of children 5-9 Years            | 2001                   | 575              | 310               | 451               | 437               |         |
| Energy (kcal)                           | 1188.8 ± 502.9         | 1234.5 ± 453.1   | 1229.2 ± 501.4    | 1313.3 ± 567.3    | 1377.0 ± 577.0    | 0.037   |
| Protein (g)                             | 28.7 ± 13.8            | 29.1 ± 12.3      | 29.1 ± 15.4       | 31.6 ± 16.9       | 34.0 ± 17.7       | 0.526   |
| Total Fat (g)                           | 45.2 ± 26.0            | 45.8 ± 19.8      | 47.1 ± 26.3       | 51.4 ± 28.1       | 55.5 ± 32.6       | 0.547   |
| Fiber, total dietary (g)                | 22.6 ± 10.7            | 22.6 ± 11.2      | 21.3 ± 11.7       | 21.9 ± 10.6       | 21.2 ± 10.7       | 0.934   |
| Carbohydrate (g)                        | 169.5 ± 66.6           | 178.6 ± 66.8     | 173.7 ± 64.5      | 181.0 ± 68.4      | 186.3 ± 72.1      | 0.004   |
| Calcium (mg)                            | 283.6 ± 202.6          | 280.8 ± 161.7    | 284.5 ± 185.3     | 310.3 ± 322.4     | 338.4 ± 252.1     | 0.733   |
| Iron (mg)                               | 6.6 ± 3.3              | 6.7 ± 3.3        | 6.4 ± 3.9         | 7.0 ± 4.0         | 7.0 ± 3.7         | 0.475   |
| Magnesium (mg)                          | 168.7 ± 69.3           | 168.7 ± 67.6     | 163.9 ± 90.9      | 173.2 ± 90.0      | 171.0 ± 70.2      | 0.993   |
| Phosphorus (mg)                         | 575.3 ± 249.0          | 573.9 ± 216.3    | 567.1 ± 259.9     | 611.3 ± 342.0     | 634.3 ± 294.2     | 0.899   |
| Potassium (mg)                          | 1029.2 ± 535.3         | 1037.8 ± 497.6   | 1059.9 ± 626.7    | 1140.2 ± 877.3    | 1172.1 ± 603.8    | 0.718   |
| Sodium (mg)                             | 1099.5 ± 644.1         | 1104.0 ± 592.5   | 1064.4 ± 628.0    | 1185.1 ± 752.4    | 1239.1 ± 723.5    | 0.877   |
| Zinc (mg)                               | 4.4 ± 1.9              | 4.5 ± 2.2        | 4.3 ± 2.1         | 4.6 ± 2.3         | 4.7 ± 2.2         | 0.660   |
| Copper (mg)                             | 0.7 ± 1.0              | 0.8 ± 1.0        | 0.8 ± 1.6         | 0.8 ± 1.3         | 0.7 ± 0.3         | 0.800   |
| Vitamin A (µg)                          | 215.7 ± 678.3          | 222.0 ± 745.9    | 256.8 ± 1045.8    | 302.5 ± 998.7     | 265.2 ± 448.5     | 0.856   |
| Vitamin D (D2 + D3) (µg)                | 1.2 ± 10.1             | 1.2 ± 11.2       | 1.7 ± 8.4         | 3.4 ± 24.0        | 2.0 ± 10.5        | 0.995   |
| Vitamin E (alpha-tocopherol) (mg)       | 1.2 ± 1.9              | 1.2 ± 1.4        | 1.3 ± 1.7         | 1.4 ± 1.7         | 1.7 ± 2.4         | 0.877   |
| Thiamin (mg)                            | 0.8 ± 0.4              | 0.7 ± 0.3        | 0.7 ± 0.3         | 0.7 ± 0.4         | 0.8 ± 0.4         | 0.196   |
| Riboflavin (mg)                         | 1.0 ± 1.4              | 0.9 ± 1.3        | 0.9 ± 1.1         | 1.1 ± 2.1         | 1.1 ± 1.4         | 0.338   |
| Niacin (mg)                             | 9.9 ± 4.9              | 9.8 ± 4.7        | 9.5 ± 6.4         | 9.8 ± 5.6         | 10.0 ± 5.2        | 0.490   |
| Vitamin B-6 (mg)                        | 1.5 ± 3.4              | 1.7 ± 3.3        | 1.4 ± 2.7         | 1.6 ± 4.1         | 1.6 ± 3.0         | 0.287   |
| Folate, total (µg)                      | 131.4 ± 83.7           | 127.7 ± 81.4     | 122.6 ± 97.1      | 138.7 ± 128.1     | 139.3 ± 89.5      | 0.333   |
| L-ascorbic acid (mg)                    | 89.8 ± 309.6           | 101.9 ± 296.4    | 76.3 ± 236.9      | 101.3 ± 375.9     | 101.7 ± 272.0     | 0.393   |
| Fatty acids, total saturated (mg)       | 17684.1 ± 10449.2      | 17926.0 ± 8243.2 | 19114.9 ± 11889.9 | 20504.6 ± 12770.2 | 21726.7 ± 14650.0 | 0.560   |
| Fatty acids, total monounsaturated (mg) | 12193.1 ± 7472.7       | 12424.2 ± 5935.3 | 13194.7 ± 8186.2  | 14375.3 ± 8681.8  | 16177.0 ± 10471.4 | 0.439   |
| Fatty acids, total polyunsaturated (mg) | 6374.6 ± 4835.5        | 6724.3 ± 4046.7  | 6949.4 ± 4731.9   | 7612.4 ± 5455.7   | 8885.9 ± 6417.3   | 0.081   |
| Cholesterol (mg)                        | 91.7 ± 312.3           | 81.7 ± 102.7     | 114.1 ± 194.3     | 154.5 ± 341.3     | 183.9 ± 518.9     | 0.223   |

The survey also showed that the children with normal hemoglobin levels had a significantly greater in intake of energy, proteins, total fats, carbohydrates, magnesium, phosphorus, potassium, riboflavin, vitamin B6, folate, and L-ascorbic acid as compared to children who were anemic (**Table 29**). By household food insecurity status, the survey showed a significantly greater intake of energy, total fats, and fatty acids (total saturated, monounsaturated, and polyunsaturated) among mild food insecure households, while a significantly greater intake of proteins and cholesterol was found among food secure households

Table 29: Nutrient intake in Punjab- by hemoglobin concentration and food security status

| Nutrient Intake                         | Punjab             |                      |          |                        |                        |                    |                   |         |
|---|--------------------|----------------------|----------|------------------------|------------------------|--------------------|-------------------|---------|
|   | HB level           |                      |          | Food Insecurity Status |                        |                    |                   |         |
|   | Anemia (<11 gm/dL) | Normal (>= 11 gm/dL) | P-values | Severe food insecure   | Moderate food insecure | Mild food insecure | Food Secure       | p-value |
| Number of children 5-9 Years            | 1,199              | 2,292                |          |                        | 584                    | 530                | 569               |         |
| Energy (kcal)                           | 1210.2 ± 485.6     | 1247.5 ± 532.4       | 0.037    | 1042.5 ± 403.9         | 1148.4 ± 428.2         | 1175.0 ± 506.4     | 1323.0 ± 540.1    | <0.001  |
| Protein (g)                             | 29.0 ± 13.8        | 30.2 ± 15.3          | 0.022    | 24.6 ± 11.9            | 27.5 ± 12.0            | 28.3 ± 13.4        | 32.0 ± 15.7       | <0.001  |
| Total Fat (g)                           | 46.2 ± 24.7        | 47.7 ± 27.4          | 0.092    | 37.7 ± 18.2            | 42.6 ± 20.1            | 44.5 ± 23.8        | 51.8 ± 29.1       | <0.001  |
| Fiber, total dietary (g)                | 21.7 ± 10.5        | 22.5 ± 10.9          | 0.036    | 21.0 ± 10.2            | 22.2 ± 10.7            | 22.1 ± 11.6        | 22.6 ± 10.8       | 0.056   |
| Carbohydrate (g)                        | 171.6 ± 63.2       | 176.2 ± 70.0         | 0.047    | 153.0 ± 57.7           | 166.5 ± 62.2           | 167.2 ± 65.0       | 184.0 ± 69.6      | <0.001  |
| Calcium (mg)                            | 291.3 ± 225.8      | 292.5 ± 218.3        | 0.882    | 220.7 ± 146.5          | 270.1 ± 188.5          | 284.3 ± 262.4      | 319.7 ± 224.3     | <0.001  |
| Iron (mg)                               | 6.5 ± 3.6          | 6.8 ± 3.5            | 0.085    | 5.9 ± 2.8              | 6.3 ± 3.5              | 6.6 ± 3.3          | 7.0 ± 3.7         | 0.029   |
| Magnesium (mg)                          | 166.0 ± 75.0       | 171.1 ± 73.1         | 0.057    | 152.3 ± 60.1           | 167.8 ± 81.8           | 166.2 ± 72.3       | 174.7 ± 74.3      | <0.001  |
| Phosphorus (mg)                         | 576.6 ± 258.4      | 590.3 ± 268.1        | 0.141    | 495.8 ± 202.6          | 554.8 ± 227.1          | 569.9 ± 284.4      | 620.9 ± 271.8     | <0.001  |
| Potassium (mg)                          | 1042.8 ± 603.7     | 1077.0 ± 597.9       | 0.111    | 860.0 ± 428.2          | 993.1 ± 531.0          | 1016.0 ± 620.1     | 1145.3 ± 621.6    | <0.001  |
| Sodium (mg)                             | 1098.0 ± 664.6     | 1136.9 ± 661.8       | 0.100    | 981.1 ± 588.2          | 1055.7 ± 559.0         | 1098.6 ± 620.1     | 1185.5 ± 700.6    | 0.030   |
| Zinc (mg)                               | 4.4 ± 2.2          | 4.5 ± 2.0            | 0.093    | 4.0 ± 1.9              | 4.3 ± 1.8              | 4.3 ± 1.9          | 4.7 ± 2.2         | 0.001   |
| Copper (mg)                             | 0.8 ± 1.5          | 0.7 ± 0.8            | 0.368    | 0.6 ± 0.4              | 0.7 ± 0.3              | 0.7 ± 1.2          | 0.8 ± 1.2         | 0.050   |
| Vitamin A (µg)                          | 258.5 ± 1009.4     | 228.1 ± 621.5        | 0.340    | 134.3 ± 198.8          | 196.4 ± 450.8          | 215.3 ± 785.6      | 271.6 ± 822.1     | 0.003   |
| Vitamin D (D2 + D3) (µg)                | 1.9 ± 14.9         | 1.5 ± 11.9           | 0.469    | 0.8 ± 5.9              | 0.8 ± 3.2              | 0.9 ± 3.8          | 2.2 ± 16.2        | 0.974   |
| Vitamin E (alpha-tocopherol) (mg)       | 1.3 ± 1.8          | 1.2 ± 1.8            | 0.611    | 0.9 ± 1.2              | 1.0 ± 1.3              | 1.1 ± 1.5          | 1.5 ± 2.2         | 0.146   |
| Thiamin (mg)                            | 0.7 ± 0.4          | 0.8 ± 0.4            | 0.390    | 0.7 ± 0.3              | 0.7 ± 0.4              | 0.7 ± 0.4          | 0.8 ± 0.4         | 0.012   |
| Riboflavin (mg)                         | 1.0 ± 1.7          | 1.0 ± 1.3            | 0.930    | 0.8 ± 1.2              | 0.9 ± 1.2              | 1.1 ± 1.7          | 1.0 ± 1.5         | 0.667   |
| Niacin (mg)                             | 9.7 ± 5.2          | 10.0 ± 5.2           | 0.096    | 9.1 ± 4.4              | 9.8 ± 4.5              | 9.7 ± 4.5          | 10.1 ± 5.5        | 0.015   |
| Vitamin B-6 (mg)                        | 1.5 ± 3.0          | 1.6 ± 3.6            | 0.681    | 1.3 ± 3.1              | 1.4 ± 2.7              | 1.4 ± 3.5          | 1.7 ± 3.6         | 0.517   |
| Folate, total (µg)                      | 131.5 ± 92.6       | 132.7 ± 92.1         | 0.719    | 114.5 ± 75.5           | 126.1 ± 100.7          | 126.2 ± 76.4       | 139.3 ± 94.6      | 0.030   |
| L-ascorbic acid (mg)                    | 89.1 ± 269.6       | 96.9 ± 332.1         | 0.456    | 67.8 ± 285.9           | 76.9 ± 247.5           | 84.0 ± 316.9       | 107.1 ± 323.2     | 0.567   |
| Fatty acids, total saturated (mg)       | 18212.1 ± 10765.4  | 18731.1 ± 11167.1    | 0.182    | 14860.5 ± 7481.4       | 16990.7 ± 8876.1       | 17775.4 ± 10775.6  | 20250.3 ± 12179.4 | <0.001  |
| Fatty acids, total monounsaturated (mg) | 12605.0 ± 7574.3   | 13230.4 ± 8169.0     | 0.024    | 10144.0 ± 5585.5       | 11152.6 ± 5642.1       | 12258.5 ± 7473.4   | 14435.8 ± 8678.2  | 0.003   |
| Fatty acids, total polyunsaturated (mg) | 6727.7 ± 5109.2    | 7020.8 ± 5073.9      | 0.107    | 5297.3 ± 3639.4        | 5691.8 ± 3641.0        | 6394.0 ± 4490.6    | 7763.7 ± 5545.8   | 0.071   |
| Cholesterol (mg)                        | 114.8 ± 417.6      | 107.5 ± 266.5        | 0.584    | 55.1 ± 89.9            | 74.7 ± 116.0           | 92.9 ± 199.6       | 137.1 ± 402.1     | 0.002   |

There was no significant increase in nutrient intake among underweight, overweight/obese, and stunted children. Cholesterol intake was found to be significantly greater among normal children compared to stunted children. Children with Hb ≥ 11gm/dl had greater intake of energy, protein, total fat, carbohydrate, iron, magnesium, phosphorus, potassium, sodium, zinc, copper, vitamins (A, B-6, riboflavin, niacin, folate, L-ascorbic acid), cholesterol and fatty acids (total saturated, mono-unsaturated, and poly-unsaturated) compared to children who were anemic with Hb <11gm/dl (Table 30).



Table 30: Nutrient intake in Punjab- by nutrition status

| Nutrient Intake                         | Punjab            |                   |          |                      |                    |                          |          |                    |                      |          |
|---|-------------------|-------------------|----------|----------------------|--------------------|--------------------------|----------|--------------------|----------------------|----------|
|   | Height for age    |                   |          | BMI-for-age          |                    |                          |          | HB concentration   |                      |          |
|   | Normal            | Stunting          | P-values | Underweight (- <2SD) | Normal(- 2<BAZ<+1) | Overweight/Obese (+ 1SD) | P-values | Anemia (<11 gm/dL) | Normal (>= 11 gm/dL) | P-values |
| Number of children 5-9 Years            | 2,902             | 704               |          | 615                  | 2,668              | 293                      |          | 1,199              | 2,292                |          |
| Energy (kcal)                           | 1252.1 ± 530.3    | 1168.3 ± 463.1    | <0.001   | 1209.8 ± 501.2       | 1229.2 ± 512.4     | 1337.0 ± 589.8           | 0.388    | 1210.2 ± 485.6     | 1247.5 ± 532.4       | 0.037    |
| Protein (g)                             | 30.1 ± 14.8       | 28.0 ± 13.9       | <0.001   | 29.2 ± 13.9          | 29.4 ± 14.2        | 33.2 ± 19.5              | 0.701    | 29.0 ± 13.8        | 30.2 ± 15.3          | 0.022    |
| Total Fat (g)                           | 48.0 ± 27.3       | 44.2 ± 23.3       | <0.001   | 45.6 ± 23.8          | 46.9 ± 25.9        | 53.2 ± 35.1              | 0.231    | 46.2 ± 24.7        | 47.7 ± 27.4          | 0.092    |
| Fiber, total dietary (g)                | 22.6 ± 11.0       | 20.7 ± 10.0       | <0.001   | 21.4 ± 10.9          | 22.4 ± 10.8        | 22.1 ± 10.7              | 0.053    | 21.7 ± 10.5        | 22.5 ± 10.9          | 0.036    |
| Carbohydrate (g)                        | 176.9 ± 69.0      | 166.1 ± 62.4      | <0.001   | 171.8 ± 62.9         | 174.3 ± 68.2       | 183.3 ± 73.3             | 0.389    | 171.6 ± 63.2       | 176.2 ± 70.0         | 0.047    |
| Calcium (mg)                            | 297.4 ± 226.4     | 272.9 ± 182.1     | 0.002    | 296.8 ± 256.4        | 286.7 ± 194.7      | 326.9 ± 300.5            | 0.358    | 291.3 ± 225.8      | 292.5 ± 218.3        | 0.882    |
| Iron (mg)                               | 6.8 ± 3.5         | 6.3 ± 2.9         | <0.001   | 6.5 ± 3.4            | 6.7 ± 3.4          | 7.0 ± 4.0                | 0.242    | 6.5 ± 3.6          | 6.8 ± 3.5            | 0.085    |
| Magnesium (mg)                          | 171.5 ± 73.9      | 159.1 ± 64.1      | <0.001   | 165.5 ± 72.2         | 168.6 ± 70.9       | 176.6 ± 79.4             | 0.327    | 166.0 ± 75.0       | 171.1 ± 73.1         | 0.057    |
| Phosphorus (mg)                         | 594.2 ± 271.2     | 550.5 ± 230.6     | <0.001   | 575.7 ± 278.3        | 581.0 ± 249.5      | 636.8 ± 337.1            | 0.663    | 576.6 ± 258.4      | 590.3 ± 268.1        | 0.141    |
| Potassium (mg)                          | 1083.3 ± 620.8    | 978.7 ± 479.6     | <0.001   | 1046.1 ± 613.9       | 1056.4 ± 587.2     | 1125.7 ± 611.7           | 0.706    | 1042.8 ± 603.7     | 1077.0 ± 597.9       | 0.111    |
| Sodium (mg)                             | 1133.8 ± 662.2    | 1062.9 ± 610.9    | 0.007    | 1072.9 ± 625.4       | 1118.2 ± 653.1     | 1224.8 ± 735.8           | 0.108    | 1098.0 ± 664.6     | 1136.9 ± 661.8       | 0.100    |
| Zinc (mg)                               | 4.5 ± 2.1         | 4.2 ± 1.8         | <0.001   | 4.4 ± 2.3            | 4.4 ± 1.9          | 4.8 ± 2.4                | 0.969    | 4.4 ± 2.2          | 4.5 ± 2.0            | 0.093    |
| Copper (mg)                             | 0.8 ± 1.2         | 0.6 ± 0.3         | <0.001   | 0.7 ± 1.1            | 0.8 ± 1.1          | 0.7 ± 0.3                | 0.836    | 0.8 ± 1.5          | 0.7 ± 0.8            | 0.368    |
| Vitamin A (µg)                          | 250.1 ± 853.2     | 189.2 ± 245.5     | 0.001    | 219.1 ± 761.7        | 240.3 ± 802.3      | 255.7 ± 420.2            | 0.538    | 258.5 ± 1009.4     | 228.1 ± 621.5        | 0.340    |
| Vitamin D (D2 + D3) (µg)                | 1.5 ± 12.5        | 1.8 ± 13.8        | 0.627    | 2.1 ± 17.8           | 1.5 ± 12.2         | 1.2 ± 5.2                | 0.438    | 1.9 ± 14.9         | 1.5 ± 11.9           | 0.469    |
| Vitamin E (alpha-tocopherol) (mg)       | 1.3 ± 2.0         | 1.1 ± 1.4         | 0.03     | 1.3 ± 2.2            | 1.2 ± 1.7          | 1.5 ± 2.5                | 0.723    | 1.3 ± 1.8          | 1.2 ± 1.8            | 0.611    |
| Thiamin (mg)                            | 0.8 ± 0.4         | 0.7 ± 0.3         | 0.001    | 0.7 ± 0.4            | 0.8 ± 0.4          | 0.8 ± 0.4                | 0.305    | 0.7 ± 0.4          | 0.8 ± 0.4            | 0.390    |
| Riboflavin (mg)                         | 1.0 ± 1.5         | 0.9 ± 1.3         | 0.049    | 1.0 ± 1.6            | 1.0 ± 1.4          | 1.0 ± 1.2                | 0.582    | 1.0 ± 1.7          | 1.0 ± 1.3            | 0.930    |
| Niacin (mg)                             | 10.0 ± 5.1        | 9.4 ± 5.2         | 0.006    | 9.5 ± 4.7            | 9.9 ± 5.2          | 10.4 ± 5.3               | 0.062    | 9.7 ± 5.2          | 10.0 ± 5.2           | 0.096    |
| Vitamin B-6 (mg)                        | 1.5 ± 3.3         | 1.6 ± 3.6         | 0.631    | 1.6 ± 3.0            | 1.6 ± 3.5          | 1.4 ± 2.9                | 0.818    | 1.5 ± 3.0          | 1.6 ± 3.6            | 0.681    |
| Folate, total (µg)                      | 133.5 ± 94.1      | 121.3 ± 66.5      | <0.001   | 126.7 ± 75.6         | 132.0 ± 92.2       | 132.2 ± 88.3             | 0.131    | 131.5 ± 92.6       | 132.7 ± 92.1         | 0.719    |
| L-ascorbic acid (mg)                    | 93.5 ± 300.9      | 98.7 ± 325.1      | 0.701    | 95.3 ± 275.2         | 94.9 ± 315.3       | 80.1 ± 262.1             | 0.971    | 89.1 ± 269.6       | 96.9 ± 332.1         | 0.456    |
| Fatty acids, total saturated (mg)       | 18851.4 ± 11307.0 | 17472.0 ± 10471.0 | 0.002    | 18074.8 ± 10085.3    | 18409.0 ± 10706.5  | 20857.7 ± 15639.3        | 0.464    | 18212.1 ± 10765.4  | 18731.1 ± 11167.1    | 0.182    |
| Fatty acids, total monounsaturated (mg) | 13197.6 ± 8159.2  | 12141.5 ± 7156.6  | 0.001    | 12418.0 ± 7286.9     | 12925.9 ± 7769.8   | 14748.1 ± 10528.3        | 0.124    | 12605.0 ± 7574.3   | 13230.4 ± 8169.0     | 0.024    |
| Fatty acids, total polyunsaturated (mg) | 6985.4 ± 5182.0   | 6532.9 ± 4554.6   | 0.021    | 6633.7 ± 5177.7      | 6884.5 ± 4997.4    | 7618.6 ± 5475.7          | 0.275    | 6727.7 ± 5109.2    | 7020.8 ± 5073.9      | 0.107    |
| Cholesterol (mg)                        | 112.2 ± 344.5     | 98.8 ± 222.0      | 0.205    | 89.0 ± 111.3         | 111.0 ± 355.4      | 139.4 ± 305.1            | 0.007    | 114.8 ± 417.6      | 107.5 ± 266.5        | 0.584    |

Compared to the recommended daily allowance (RDA), 88.1% (rural: 90.2%; urban: 84.2%) of the children in Punjab had a lower energy intake. More than half of school-aged children had inadequate intake of dietary fiber (65.7%), calcium (98.2%), iron (96.3%), potassium (97.5%), sodium (51.4%), zinc (96.6%), and micronutrients such as vitamin A (82.7%), vitamin D (99.4%), vitamin E (98.2%), folate (78.4%), and L-ascorbic acid (70.3%) (**Table 31**).

Table 31: Inadequate nutrient intake in Punjab

|                                   | Total n (%) | Punjab n (%) |             |            |            |            |            |            |            |            |            |            |
|-----------------------------------|-------------|--------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                   |             | Rural        | Urban       | Rawalpindi | Sargodha   | Faisalabad | Gujranwala | Lahore     | Sahiwal    | Multan     | D.G. Khan  | Bahawalpur |
| Number of children 5-9 Years      | 3774        | 2481         | 1293        | 350        | 274        | 474        | 556        | 663        | 260        | 423        | 379        | 395        |
| Energy (kcal)                     | 3322 (88.1) | 2239 (90.2)  | 1083 (84.2) | 303 (86.8) | 230 (84.4) | 424 (89.0) | 484 (87.4) | 558 (84.3) | 235 (89.0) | 387 (91.8) | 327 (87.1) | 374 (94.2) |
| Protein (g)                       | 358 (9.8)   | 250 (10.3)   | 108 (8.8)   | 31 (8.5)   | 14 (5.6)   | 60 (12.6)  | 60 (10.8)  | 49 (7.6)   | 33 (14.8)  | 35 (8.3)   | 39 (9.6)   | 37 (10.7)  |
| Total Fat (g)                     | 1401 (38.0) | 835 (35.0)   | 566 (43.2)  | 175 (47.9) | 103 (38.3) | 161 (35.2) | 211 (39.7) | 270 (40.8) | 82 (34.2)  | 141 (33.3) | 145 (37.1) | 113 (30.6) |
| Fiber, total dietary (g)          | 2461 (65.7) | 1579 (64.3)  | 882 (68.2)  | 246 (71.1) | 160 (58.8) | 310 (63.3) | 392 (72.4) | 424 (65.7) | 164 (64.4) | 290 (66.5) | 250 (65.5) | 225 (56.9) |
| Carbohydrate (g)                  | 312 (8.5)   | 215 (9.0)    | 97 (7.8)    | 33 (9.2)   | 20 (7.5)   | 31 (6.5)   | 32 (6.0)   | 44 (6.9)   | 27 (11.8)  | 49 (10.6)  | 44 (11.5)  | 32 (9.1)   |
| Calcium (mg)                      | 3706 (98.2) | 2441 (98.2)  | 1265 (98.1) | 339 (97.0) | 269 (98.4) | 464 (97.9) | 548 (98.4) | 647 (97.8) | 255 (98.3) | 417 (98.5) | 376 (98.9) | 391 (98.7) |
| Iron (mg)                         | 3635 (96.3) | 2418 (97.5)  | 1217 (94.2) | 331 (95.0) | 259 (94.3) | 460 (96.9) | 536 (95.8) | 630 (94.9) | 256 (98.4) | 414 (97.7) | 367 (97.5) | 382 (96.8) |
| Magnesium (mg)                    | 978 (26.3)  | 642 (26.2)   | 336 (26.5)  | 105 (30.8) | 61 (23.1)  | 123 (27.0) | 157 (27.6) | 163 (24.6) | 73 (29.4)  | 119 (27.6) | 85 (21.1)  | 92 (24.4)  |
| Phosphorus (mg)                   | 1280 (34.4) | 868 (35.4)   | 412 (32.5)  | 124 (37.1) | 76 (28.2)  | 153 (33.5) | 210 (38.3) | 214 (31.6) | 100 (40.1) | 161 (36.8) | 124 (31.5) | 118 (30.4) |
| Potassium (mg)                    | 3679 (97.5) | 2432 (97.9)  | 1247 (96.6) | 340 (97.7) | 258 (94.0) | 461 (96.8) | 549 (98.8) | 644 (97.2) | 256 (98.2) | 415 (98.2) | 365 (96.4) | 391 (98.9) |
| Sodium (mg)                       | 1928 (51.4) | 1310 (53.5)  | 618 (47.8)  | 192 (55.3) | 136 (49.2) | 239 (50.0) | 270 (48.0) | 321 (49.3) | 122 (48.2) | 235 (54.7) | 221 (60.4) | 192 (47.5) |
| Zinc (mg)                         | 3655 (96.6) | 2412 (96.8)  | 1243 (96.3) | 336 (95.4) | 260 (94.8) | 462 (97.2) | 547 (98.4) | 640 (96.9) | 252 (96.7) | 416 (98.1) | 359 (94.2) | 383 (96.7) |
| Copper (mg)                       | 416 (11.1)  | 275 (11.3)   | 141 (10.7)  | 45 (13.5)  | 25 (9.4)   | 57 (11.9)  | 71 (11.6)  | 60 (8.8)   | 27 (11.9)  | 54 (12.1)  | 39 (9.6)   | 38 (10.3)  |
| Vitamin A (µg)                    | 3128 (82.7) | 2099 (84.1)  | 1029 (80.1) | 272 (78.6) | 236 (86.2) | 401 (83.7) | 457 (81.1) | 522 (79.5) | 225 (85.3) | 367 (86.5) | 295 (78.5) | 353 (88.7) |
| Vitamin D (D2 + D3) (µg)          | 3749 (99.4) | 2465 (99.4)  | 1284 (99.3) | 347 (99.0) | 270 (98.5) | 471 (99.6) | 552 (99.5) | 658 (99.3) | 258 (99.1) | 421 (99.5) | 378 (99.8) | 394 (99.8) |
| Vitamin E (alpha-tocopherol) (mg) | 3708 (98.2) | 2446 (98.5)  | 1262 (97.6) | 340 (97.4) | 272 (99.1) | 470 (99.2) | 549 (98.7) | 648 (97.8) | 251 (95.7) | 416 (98.2) | 368 (97.3) | 394 (99.8) |
| Thiamin (mg)                      | 989 (26.6)  | 627 (25.9)   | 362 (27.9)  | 110 (31.8) | 63 (23.0)  | 100 (20.8) | 181 (33.4) | 164 (24.3) | 76 (30.8)  | 118 (27.1) | 106 (26.4) | 71 (19.1)  |
| Riboflavin (mg)                   | 1171 (31.2) | 797 (32.4)   | 374 (29.2)  | 110 (31.7) | 71 (26.9)  | 141 (29.0) | 200 (35.6) | 193 (28.8) | 92 (37.9)  | 134 (32.0) | 113 (29.1) | 117 (29.7) |
| Niacin (mg)                       | 844 (22.5)  | 540 (21.9)   | 304 (23.5)  | 89 (25.6)  | 52 (19.0)  | 100 (21.0) | 163 (28.3) | 133 (20.1) | 63 (24.9)  | 100 (23.0) | 75 (18.9)  | 69 (18.7)  |
| Vitamin B-6 (mg)                  | 1046 (28.4) | 686 (28.4)   | 360 (28.4)  | 118 (33.7) | 70 (25.2)  | 127 (27.4) | 162 (30.4) | 157 (23.4) | 85 (34.6)  | 133 (30.6) | 95 (23.8)  | 99 (26.4)  |
| Folate, total (µg)                | 2957 (78.4) | 1959 (79.0)  | 998 (77.5)  | 265 (76.2) | 212 (76.9) | 365 (77.0) | 446 (80.8) | 496 (75.3) | 227 (87.1) | 360 (84.2) | 273 (71.4) | 313 (79.0) |
| L-ascorbic acid (mg)              | 2659 (70.3) | 1740 (70.5)  | 919 (70.0)  | 232 (66.3) | 184 (68.0) | 317 (66.6) | 368 (66.7) | 459 (68.3) | 195 (75.5) | 332 (78.2) | 276 (73.4) | 296 (74.3) |

The survey reported inadequate intake of energy, carbohydrates, magnesium, phosphorus, sodium, thiamine, riboflavin, and folates among school aged girls compared to boys. Inadequate intake of energy, dietary fibers, carbohydrates, phosphorus, sodium, and L-ascorbic acid was observed among children who had not ever attended schools (**Table 32**).

Table 32: Inadequate nutrient intake in Punjab- by gender and ever attended school

| Nutrient Intake                   | Punjab<br>n (%) |              |              |         |                                 |             |         |
|-----------------------------------|-----------------|--------------|--------------|---------|---------------------------------|-------------|---------|
|                                   | Total           | Gender       |              |         | Have child ever attended school |             |         |
|                                   |                 | Male         | Female       | p-value | Yes                             | No          | p-value |
| Number of children 5-9 Years      | 3774            | 1927         | 1847         |         | 3481                            | 293         |         |
| Energy (kcal)                     | 3322 (88.1)     | 1675 (86.8%) | 1647 (89.3%) | 0.030   | 3055 (87.8%)                    | 267 (91.9%) | 0.044   |
| Protein (g)                       | 358 (9.8)       | 175 (9.1%)   | 183 (10.4%)  | 0.224   | 330 (9.8%)                      | 28 (9.3%)   | 0.815   |
| Total Fat (g)                     | 1401 (38.0)     | 707 (37.1%)  | 694 (38.8%)  | 0.318   | 1302 (38.2%)                    | 99 (35.5%)  | 0.412   |
| Fiber, total dietary (g)          | 2461 (65.7)     | 1231 (64.2%) | 1230 (67.1%) | 0.089   | 2254 (65.1%)                    | 207 (72.6%) | 0.015   |
| Carbohydrate (g)                  | 312 (8.5)       | 136 (6.9%)   | 176 (10.2%)  | 0.001   | 270 (8.2%)                      | 42 (13.4%)  | 0.004   |
| Calcium (mg)                      | 3706 (98.2)     | 1888 (97.9%) | 1818 (98.4%) | 0.312   | 3414 (98.1%)                    | 292 (99.6%) | 0.117   |
| Iron (mg)                         | 3635 (96.3)     | 1851 (96.1%) | 1784 (96.5%) | 0.554   | 3347 (96.2%)                    | 288 (97.9%) | 0.214   |
| Magnesium (mg)                    | 978 (26.3)      | 469 (24.8%)  | 509 (27.9%)  | 0.049   | 905 (26.4%)                     | 73 (25.2%)  | 0.681   |
| Phosphorus (mg)                   | 1280 (34.4)     | 607 (31.6%)  | 673 (37.2%)  | 0.001   | 1194 (34.8%)                    | 86 (28.7%)  | 0.054   |
| Potassium (mg)                    | 3679 (97.5)     | 1879 (97.6%) | 1800 (97.4%) | 0.720   | 3390 (97.4%)                    | 289 (98.5%) | 0.326   |
| Sodium (mg)                       | 1928 (51.4)     | 935 (48.8%)  | 993 (54.1%)  | 0.003   | 1743 (50.4%)                    | 185 (65.0%) | <0.001  |
| Zinc (mg)                         | 3655 (96.6)     | 1871 (97.0%) | 1784 (96.3%) | 0.277   | 3374 (96.7%)                    | 281 (95.3%) | 0.247   |
| Copper (mg)                       | 416 (11.1)      | 199 (10.1%)  | 217 (12.0%)  | 0.088   | 377 (10.9%)                     | 39 (12.7%)  | 0.396   |
| Vitamin A (µg)                    | 3128 (82.7)     | 1598 (83.3%) | 1530 (82.1%) | 0.381   | 2874 (82.4%)                    | 254 (86.4%) | 0.115   |
| Vitamin D (D2 + D3) (µg)          | 3749 (99.4)     | 1913 (99.3%) | 1836 (99.4%) | 0.544   | 3457 (99.4%)                    | 292 (99.4%) | 0.905   |
| Vitamin E (alpha-tocopherol) (mg) | 3708 (98.2)     | 1903 (98.5%) | 1805 (97.8%) | 0.112   | 3419 (98.2%)                    | 289 (98.2%) | 0.993   |
| Thiamin (mg)                      | 989 (26.6)      | 477 (24.8%)  | 512 (28.6%)  | 0.017   | 908 (26.5%)                     | 81 (27.9%)  | 0.651   |
| Riboflavin (mg)                   | 1171 (31.2)     | 562 (29.1%)  | 609 (33.5%)  | 0.008   | 1088 (31.5%)                    | 83 (28.3%)  | 0.296   |
| Niacin (mg)                       | 844 (22.5)      | 417 (21.5%)  | 427 (23.5%)  | 0.195   | 772 (22.3%)                     | 72 (24.5%)  | 0.424   |
| Vitamin B-6 (mg)                  | 1046 (28.4)     | 512 (27.1%)  | 534 (29.8%)  | 0.095   | 961 (28.3%)                     | 85 (29.8%)  | 0.623   |
| Folate, total (µg)                | 2957 (78.4)     | 1479 (76.8%) | 1478 (80.1%) | 0.027   | 2722 (78.5%)                    | 235 (77.8%) | 0.792   |
| L-ascorbic acid (mg)              | 2659 (70.3)     | 1339 (70.1%) | 1320 (70.6%) | 0.750   | 2429 (69.8%)                    | 230 (77.4%) | 0.012   |

The survey also reported a significant inadequate sodium intake among households under poorest households, while there was no significant difference reported for inadequate energy intake, proteins, fats, and other nutrients (**Table 33**).

Table 33: Inadequate nutrient intake in Punjab- by wealth quintiles

| Nutrient Intake                   | Punjab (%)            |             |             |             |             |         |
|-----------------------------------|-----------------------|-------------|-------------|-------------|-------------|---------|
|                                   | Wealth index quintile |             |             |             |             | p-value |
|                                   | Poorest               | Poor        | Middle      | Rich        | Richest     |         |
| Number of children 5-9 Years      | 755                   | 754         | 753         | 755         | 757         |         |
| Energy (kcal)                     | 717 (95.3%)           | 688 (91.1%) | 671 (89.4%) | 651 (86.0%) | 595 (78.9%) | 0.003   |
| Protein (g)                       | 78 (10.9%)            | 83 (11.1%)  | 79 (10.2%)  | 69 (9.8%)   | 49 (6.9%)   | 0.893   |
| Total Fat (g)                     | 212 (28.1%)           | 227 (30.1%) | 277 (38.2%) | 322 (43.9%) | 363 (48.8%) | 0.430   |
| Fiber, total dietary (g)          | 478 (64.3%)           | 463 (60.3%) | 499 (66.0%) | 501 (68.1%) | 520 (69.4%) | 0.150   |
| Carbohydrate (g)                  | 90 (11.9%)            | 69 (9.7%)   | 62 (8.5%)   | 50 (6.9%)   | 41 (5.9%)   | 0.215   |
| Calcium (mg)                      | 751 (99.5%)           | 746 (99.1%) | 743 (98.7%) | 745 (98.7%) | 721 (95.0%) | 0.365   |
| Iron (mg)                         | 741 (98.1%)           | 740 (97.8%) | 727 (96.8%) | 730 (96.8%) | 697 (92.1%) | 0.664   |
| Magnesium (mg)                    | 188 (24.5%)           | 203 (28.1%) | 215 (29.7%) | 200 (26.9%) | 172 (22.3%) | 0.153   |
| Phosphorus (mg)                   | 263 (35.2%)           | 278 (37.6%) | 272 (37.0%) | 263 (35.1%) | 204 (27.0%) | 0.382   |
| Potassium (mg)                    | 746 (98.7%)           | 742 (98.4%) | 737 (97.9%) | 742 (98.1%) | 712 (94.3%) | 0.631   |
| Sodium (mg)                       | 448 (61.0%)           | 392 (52.5%) | 394 (51.7%) | 360 (48.0%) | 334 (44.5%) | 0.002   |
| Zinc (mg)                         | 741 (97.8%)           | 735 (97.1%) | 737 (97.7%) | 737 (97.5%) | 705 (93.0%) | 0.498   |
| Copper (mg)                       | 89 (11.8%)            | 87 (11.6%)  | 83 (11.2%)  | 80 (10.7%)  | 77 (10.1%)  | 0.878   |
| Vitamin A (µg)                    | 675 (89.7%)           | 655 (87.3%) | 642 (85.2%) | 609 (79.6%) | 547 (72.1%) | 0.170   |
| Vitamin D (D2 + D3) (µg)          | 753 (99.9%)           | 750 (99.4%) | 747 (99.3%) | 751 (99.5%) | 748 (98.9%) | 0.102   |
| Vitamin E (alpha-tocopherol) (mg) | 750 (99.3%)           | 746 (98.9%) | 742 (98.6%) | 741 (98.3%) | 729 (95.7%) | 0.372   |
| Thiamin (mg)                      | 173 (24.1%)           | 201 (26.5%) | 204 (28.3%) | 203 (26.7%) | 208 (27.4%) | 0.327   |
| Riboflavin (mg)                   | 252 (34.3%)           | 259 (35.2%) | 254 (33.9%) | 232 (30.6%) | 174 (22.5%) | 0.758   |
| Niacin (mg)                       | 150 (20.2%)           | 168 (22.4%) | 174 (24.0%) | 176 (23.2%) | 176 (22.3%) | 0.330   |
| Vitamin B-6 (mg)                  | 198 (26.7%)           | 227 (31.0%) | 222 (30.9%) | 213 (28.8%) | 186 (24.3%) | 0.098   |
| Folate, total (µg)                | 620 (82.3%)           | 602 (80.0%) | 609 (80.6%) | 557 (74.6%) | 569 (75.0%) | 0.290   |
| L-ascorbic acid (mg)              | 577 (77.5%)           | 564 (75.9%) | 520 (68.3%) | 514 (67.6%) | 484 (62.9%) | 0.494   |

The survey also reported an inadequate energy intake, potassium, sodium, and vitamin A intake among children whose mothers were illiterate. Total fat intake was inadequate among children whose mothers were highly educated (**Table 34**).

Table 34: Inadequate nutrient intake in Punjab- by maternal education

| Nutrient Intake              | Punjab<br>Mean ± SD    |                |                |                |                |         |
|------------------------------|------------------------|----------------|----------------|----------------|----------------|---------|
|                              | Mother education level |                |                |                |                | p-value |
|                              | None                   | Primary        | Middle         | Secondary      | Higher         |         |
| Number of children 5-9 Years | 2001                   | 575            | 310            | 451            | 437            |         |
| Energy (kcal)                | 1188.8 ± 502.9         | 1234.5 ± 453.1 | 1229.2 ± 501.4 | 1313.3 ± 567.3 | 1377.0 ± 577.0 | 0.037   |
| Protein (g)                  | 28.7 ± 13.8            | 29.1 ± 12.3    | 29.1 ± 15.4    | 31.6 ± 16.9    | 34.0 ± 17.7    | 0.526   |
| Total Fat (g)                | 45.2 ± 26.0            | 45.8 ± 19.8    | 47.1 ± 26.3    | 51.4 ± 28.1    | 55.5 ± 32.6    | 0.547   |
| Fiber, total dietary (g)     | 22.6 ± 10.7            | 22.6 ± 11.2    | 21.3 ± 11.7    | 21.9 ± 10.6    | 21.2 ± 10.7    | 0.934   |
| Carbohydrate (g)             | 169.5 ± 66.6           | 178.6 ± 66.8   | 173.7 ± 64.5   | 181.0 ± 68.4   | 186.3 ± 72.1   | 0.004   |

| Nutrient Intake                   | Punjab<br>Mean $\pm$ SD |                    |                    |                    |                    |         |
|-----------------------------------|-------------------------|--------------------|--------------------|--------------------|--------------------|---------|
|                                   | Mother education level  |                    |                    |                    |                    |         |
|                                   | None                    | Primary            | Middle             | Secondary          | Higher             | p-value |
| Number of children 5-9 Years      | 2001                    | 575                | 310                | 451                | 437                |         |
| Calcium (mg)                      | 283.6 $\pm$ 202.6       | 280.8 $\pm$ 161.7  | 284.5 $\pm$ 185.3  | 310.3 $\pm$ 322.4  | 338.4 $\pm$ 252.1  | 0.733   |
| Iron (mg)                         | 6.6 $\pm$ 3.3           | 6.7 $\pm$ 3.3      | 6.4 $\pm$ 3.9      | 7.0 $\pm$ 4.0      | 7.0 $\pm$ 3.7      | 0.475   |
| Magnesium (mg)                    | 168.7 $\pm$ 69.3        | 168.7 $\pm$ 67.6   | 163.9 $\pm$ 90.9   | 173.2 $\pm$ 90.0   | 171.0 $\pm$ 70.2   | 0.993   |
| Phosphorus (mg)                   | 575.3 $\pm$ 249.0       | 573.9 $\pm$ 216.3  | 567.1 $\pm$ 259.9  | 611.3 $\pm$ 342.0  | 634.3 $\pm$ 294.2  | 0.899   |
| Potassium (mg)                    | 1029.2 $\pm$ 535.3      | 1037.8 $\pm$ 497.6 | 1059.9 $\pm$ 626.7 | 1140.2 $\pm$ 877.3 | 1172.1 $\pm$ 603.8 | 0.718   |
| Sodium (mg)                       | 1099.5 $\pm$ 644.1      | 1104.0 $\pm$ 592.5 | 1064.4 $\pm$ 628.0 | 1185.1 $\pm$ 752.4 | 1239.1 $\pm$ 723.5 | 0.877   |
| Zinc (mg)                         | 4.4 $\pm$ 1.9           | 4.5 $\pm$ 2.2      | 4.3 $\pm$ 2.1      | 4.6 $\pm$ 2.3      | 4.7 $\pm$ 2.2      | 0.660   |
| Copper (mg)                       | 0.7 $\pm$ 1.0           | 0.8 $\pm$ 1.0      | 0.8 $\pm$ 1.6      | 0.8 $\pm$ 1.3      | 0.7 $\pm$ 0.3      | 0.800   |
| Vitamin A ( $\mu$ g)              | 215.7 $\pm$ 678.3       | 222.0 $\pm$ 745.9  | 256.8 $\pm$ 1045.8 | 302.5 $\pm$ 998.7  | 265.2 $\pm$ 448.5  | 0.856   |
| Vitamin D (D2 + D3) ( $\mu$ g)    | 1.2 $\pm$ 10.1          | 1.2 $\pm$ 11.2     | 1.7 $\pm$ 8.4      | 3.4 $\pm$ 24.0     | 2.0 $\pm$ 10.5     | 0.995   |
| Vitamin E (alpha-tocopherol) (mg) | 1.2 $\pm$ 1.9           | 1.2 $\pm$ 1.4      | 1.3 $\pm$ 1.7      | 1.4 $\pm$ 1.7      | 1.7 $\pm$ 2.4      | 0.877   |
| Thiamin (mg)                      | 0.8 $\pm$ 0.4           | 0.7 $\pm$ 0.3      | 0.7 $\pm$ 0.3      | 0.7 $\pm$ 0.4      | 0.8 $\pm$ 0.4      | 0.196   |
| Riboflavin (mg)                   | 1.0 $\pm$ 1.4           | 0.9 $\pm$ 1.3      | 0.9 $\pm$ 1.1      | 1.1 $\pm$ 2.1      | 1.1 $\pm$ 1.4      | 0.338   |
| Niacin (mg)                       | 9.9 $\pm$ 4.9           | 9.8 $\pm$ 4.7      | 9.5 $\pm$ 6.4      | 9.8 $\pm$ 5.6      | 10.0 $\pm$ 5.2     | 0.490   |
| Vitamin B-6 (mg)                  | 1.5 $\pm$ 3.4           | 1.7 $\pm$ 3.3      | 1.4 $\pm$ 2.7      | 1.6 $\pm$ 4.1      | 1.6 $\pm$ 3.0      | 0.287   |
| Folate, total ( $\mu$ g)          | 131.4 $\pm$ 83.7        | 127.7 $\pm$ 81.4   | 122.6 $\pm$ 97.1   | 138.7 $\pm$ 128.1  | 139.3 $\pm$ 89.5   | 0.333   |
| L-ascorbic acid (mg)              | 963 (68.2%)             | 133 (63.6%)        | 62 (57.4%)         | 94 (56.2%)         | 84 (54.3%)         | 0.216   |

Among the stunted children, there was inadequate intake of energy, dietary fiber, iron, magnesium, phosphorus, sodium, copper, and vitamin A, B-16, E, riboflavin, thiamine, niacin, folate and L-ascorbic acid. While among the overweight/obese children there was inadequate intake of protein compared to underweight and normal children. Protein intake was significantly greater among the anemic children compared to children with normal Hb levels (**Table 35**).

**Table 35: Inadequate nutrient intake in Punjab- by nutrition status**

| Nutrient Intake              | Punjab<br>n (%) |            |          |                      |                     |                          |          |                    |                      |          |
|------------------------------|-----------------|------------|----------|----------------------|---------------------|--------------------------|----------|--------------------|----------------------|----------|
|                              | Height for age  |            |          | BMI-for-age          |                     |                          |          | HB concentrations  |                      |          |
|                              | Normal          | Stunting   | P-values | Underweight (- <2SD) | Normal (- 2<BAZ<+1) | Overweight/Obese (+ 1SD) | P-values | Anemia (<11 gm/dL) | Normal (>= 11 gm/dL) | P-values |
| Number of children 5-9 Years | 2,902           | 704        |          | 615                  | 2,668               | 293                      |          | 1,199              | 2,292                |          |
| Energy (kcal)                | 2530 (87.2)     | 644 (91.7) | 0.002    | 543 (88.7)           | 2369 (88.9)         | 235 (80.3)               | 0.944    | 1076 (89.2)        | 1993 (87.3)          | 0.127    |
| Protein (g)                  | 293 (10.1)      | 61 (8.1)   | 0.118    | 33 (5.6)             | 252 (9.1)           | 65 (22.9)                | 0.011    | 95 (7.8)           | 233 (10.5)           | 0.018    |
| Total Fat (g)                | 1083 (37.8)     | 249 (37.7) | 0.972    | 236 (36.9)           | 963 (37.2)          | 126 (45.3)               | 0.908    | 446 (37.6)         | 849 (38.2)           | 0.752    |
| Fiber, total dietary (g)     | 1848 (64.0)     | 505 (72.7) | <0.001   | 404 (66.8)           | 1738 (65.4)         | 196 (67.9)               | 0.553    | 790 (66.1)         | 1485 (65.5)          | 0.760    |
| Carbohydrate (g)             | 222 (8.0)       | 70 (10.1)  | 0.101    | 48 (7.3)             | 227 (9.1)           | 16 (6.0)                 | 0.190    | 106 (9.4)          | 185 (8.2)            | 0.281    |
| Calcium (mg)                 | 2846 (98.0)     | 697 (99.1) | 0.060    | 606 (97.9)           | 2625 (98.5)         | 283 (96.3)               | 0.372    | 1183 (98.5)        | 2248 (98.0)          | 0.311    |
| Iron (mg)                    | 2783 (95.8)     | 691 (98.3) | 0.004    | 597 (96.7)           | 2572 (96.5)         | 277 (94.2)               | 0.873    | 1160 (96.6)        | 2204 (96.0)          | 0.440    |

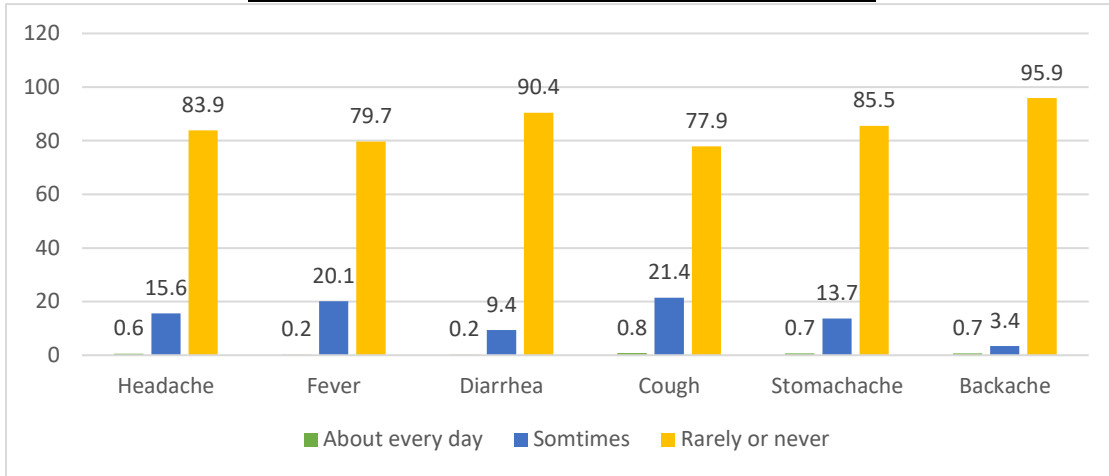
| Nutrient Intake                   | Punjab<br>n (%) |            |          |                         |                        |                                 |          |                       |                         |          |
|-----------------------------------|-----------------|------------|----------|-------------------------|------------------------|---------------------------------|----------|-----------------------|-------------------------|----------|
|                                   | Height for age  |            |          | BMI-for-age             |                        |                                 |          | HB concentrations     |                         |          |
|                                   | Normal          | Stunting   | P-values | Underweight<br>(- <2SD) | Normal<br>(- 2<BAZ<+1) | Overweight/<br>Obese<br>(+ 1SD) | P-values | Anemia (<11<br>gm/dL) | Normal (>= 11<br>gm/dL) | P-values |
| Number of children 5-9 Years      | 2,902           | 704        |          | 615                     | 2,668                  | 293                             |          | 1,199                 | 2,292                   |          |
| Magnesium (mg)                    | 706 (24.8)      | 226 (32.6) | <0.001   | 161 (27.1)              | 693 (26.4)             | 75 (25.3)                       | 0.769    | 304 (25.6)            | 594 (26.3)              | 0.711    |
| Phosphorus (mg)                   | 923 (32.3)      | 300 (43.4) | <0.001   | 202 (34.1)              | 908 (34.3)             | 108 (38.6)                      | 0.928    | 380 (32.4)            | 799 (35.0)              | 0.161    |
| Potassium (mg)                    | 2817 (97.1)     | 697 (99.0) | 0.006    | 598 (97.2)              | 2607 (97.8)            | 280 (95.5)                      | 0.402    | 1172 (97.5)           | 2231 (97.4)             | 0.842    |
| Sodium (mg)                       | 1443 (50.3)     | 402 (57.4) | 0.002    | 336 (55.6)              | 1362 (51.4)            | 134 (46.4)                      | 0.088    | 623 (51.9)            | 1164 (51.2)             | 0.716    |
| Zinc (mg)                         | 2805 (96.5)     | 689 (97.5) | 0.223    | 602 (97.6)              | 2588 (96.8)            | 276 (93.9)                      | 0.370    | 1171 (97.1)           | 2211 (96.3)             | 0.283    |
| Copper (mg)                       | 297 (10.3)      | 100 (14.3) | 0.007    | 79 (13.2)               | 287 (10.9)             | 30 (9.6)                        | 0.135    | 141 (12.0)            | 245 (10.6)              | 0.261    |
| Vitamin A (µg)                    | 2376 (81.9)     | 608 (85.7) | 0.035    | 519 (84.8)              | 2213 (82.7)            | 230 (79.1)                      | 0.237    | 991 (82.6)            | 1902 (82.7)             | 0.926    |
| Vitamin D (D2 + D3) (µg)          | 2884 (99.4)     | 699 (99.4) | 0.933    | 609 (98.8)              | 2652 (99.5)            | 292 (99.7)                      | 0.101    | 1190 (99.3)           | 2279 (99.5)             | 0.437    |
| Vitamin E (alpha-tocopherol) (mg) | 2845 (97.9)     | 699 (99.3) | 0.040    | 602 (97.7)              | 2630 (98.5)            | 282 (95.8)                      | 0.181    | 1177 (98.0)           | 2254 (98.3)             | 0.691    |
| Thiamin (mg)                      | 728 (25.7)      | 218 (30.9) | 0.013    | 174 (28.6)              | 688 (26.5)             | 76 (25.5)                       | 0.322    | 315 (26.4)            | 601 (26.8)              | 0.827    |
| Riboflavin (mg)                   | 843 (29.5)      | 273 (38.7) | <0.001   | 187 (31.2)              | 838 (31.7)             | 87 (29.6)                       | 0.825    | 362 (30.0)            | 722 (32.0)              | 0.267    |
| Niacin (mg)                       | 614 (21.4)      | 192 (27.0) | 0.004    | 153 (25.0)              | 583 (22.1)             | 64 (21.0)                       | 0.152    | 275 (22.5)            | 503 (22.3)              | 0.919    |
| Vitamin B-6 (mg)                  | 758 (26.9)      | 239 (34.5) | <0.001   | 166 (27.4)              | 751 (29.0)             | 74 (26.3)                       | 0.476    | 345 (29.2)            | 615 (27.7)              | 0.397    |
| Folate, total (µg)                | 2254 (77.8)     | 576 (82.6) | 0.010    | 499 (81.3)              | 2074 (78.0)            | 235 (80.2)                      | 0.097    | 925 (77.3)            | 1803 (78.8)             | 0.361    |
| L-ascorbic acid (mg)              | 2011 (69.1)     | 527 (75.5) | 0.002    | 428 (69.6)              | 1887 (70.8)            | 207 (70.3)                      | 0.585    | 865 (72.2)            | 1591 (69.5)             | 0.129    |

## Child Health

### General Health

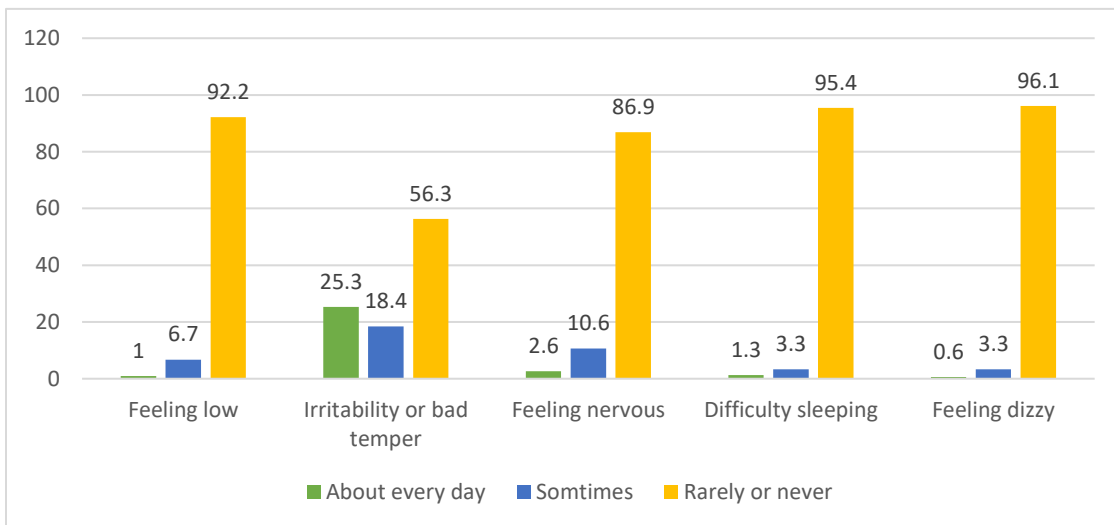
Dehydration due to diarrhea, acute respiratory infections (ARI) and fever are significant contributing factors to childhood morbidity and mortality globally. Prompt medical attention when a child presents symptoms of these illnesses is crucial in reducing child morbidity and death. Diarrhea if prolonged or recurrent, can also be associated with significant nutrition penalty. This survey collected information about episodes of diarrhea, fever, headache, cough, backache, and stomachache that occurred in the last six months of survey and majority of the surveyed children reported rare or no frequency of headache, fever, diarrhea, cough, stomachache, and backache in last six months (**Figure 20**).

Figure 20: Frequency of health issues of children 5-9 years



Children aged 5-9 years were questioned on potential mental health issues in the past six months of the survey and majority of the children reported rare or no issues related to lack of sleep, feelings of being low, nervous, and dizziness. A moderate percentage of children reported feeling irritable or having a bad temper at almost daily basis (25.3%). Few children reported to have these symptoms in months or in weeks (**Figure 21**).

Figure 21: Frequency of mental health issues of children 5-9 years



The survey showed significantly greater frequency of mental health issues among the children who were surveyed pre-lockdown compared to children who were surveyed post-lockdown. These children reported several episodes of feeling low, irritability/bad temper, nervousness, and difficulty sleeping in past six months. Post lockdown, majority of the children reported rare or no episode of irritability or bad tempered, nervousness, and difficulty sleeping. The survey showed no significant effect on dizziness among children who were survey pre or post lockdown. Similar trends of mental health issues were observed among urban and rural dwellers (**Table 36**).

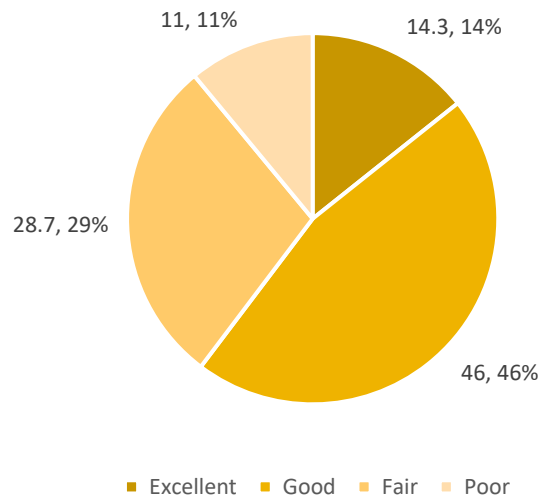


Table 36: Frequency of mental health issues of children 5-9 years- by pre/post lockdown

|  | Punjab n (%) |              |               |          |              |               |          |              |               |          |
|--|--------------|--------------|---------------|----------|--------------|---------------|----------|--------------|---------------|----------|
|  | Overall      |              |               |          | Rural        |               |          | Urban        |               |          |
|  | Overall      | Pre lockdown | Post lockdown | P-values | Pre lockdown | Post lockdown | P-values | Pre lockdown | Post lockdown | P-values |
| N  | 3795         | 1571         | 2224          |          | 1065         | 1426          |          | 506          | 798           |          |
| Frequency of Feeling low in last 6 months:                   |              |              |               |          |              |               |          |              |               |          |
| About every day  | 38 (1.0%)    | 30 (1.9%)    | 8 (0.2%)      | <0.001   | 26 (2.7%)    | 4 (0.2%)      | <0.001   | 4 (0.6%)     | 4 (0.4%)      | 0.524    |
| More than 1/week   | 78 (2.0%)    | 49 (3.1%)    | 29 (1.2%)     | <0.001   | 32 (2.9%)    | 22 (1.5%)     | 0.023    | 17 (3.5%)    | 7 (0.7%)      | 0.001    |
| About every week   | 51 (1.2%)    | 27 (1.4%)    | 24 (1.1%)     | 0.509    | 20 (1.6%)    | 15 (1.2%)     | 0.360    | 7 (1.0%)     | 9 (1.1%)      | 0.859    |
| About every month  | 128 (3.5%)   | 58 (3.8%)    | 70 (3.3%)     | 0.430    | 35 (3.1%)    | 48 (3.5%)     | 0.612    | 23 (4.9%)    | 22 (2.7%)     | 0.069    |
| Rarely or never  | 3500 (92.2%) | 1407 (89.8%) | 2093 (94.2%)  | <0.001   | 952 (89.6%)  | 1337 (93.6%)  | 0.001    | 455 (90.0%)  | 756 (95.2%)   | 0.001    |
| Frequency of Irritability or bad temper in last 6 months:    |              |              |               |          |              |               |          |              |               |          |
| About every day  | 964 (25.3%)  | 377 (23.4%)  | 587 (26.8%)   | 0.031    | 256 (23.2%)  | 359 (26.1%)   | 0.129    | 121 (23.7%)  | 228 (28.1%)   | 0.106    |
| More than 1/week   | 336 (8.1%)   | 104 (6.1%)   | 232 (9.7%)    | <0.001   | 66 (5.5%)    | 159 (9.9%)    | 0.000    | 38 (7.2%)    | 73 (9.2%)     | 0.264    |
| About every week   | 166 (4.5%)   | 66 (4.3%)    | 100 (4.6%)    | 0.700    | 49 (4.4%)    | 79 (5.5%)     | 0.263    | 17 (4.1%)    | 21 (2.9%)     | 0.316    |
| About every month  | 213 (5.8%)   | 116 (7.6%)   | 97 (4.5%)     | <0.001   | 75 (7.2%)    | 63 (4.6%)     | 0.017    | 41 (8.2%)    | 34 (4.2%)     | 0.006    |
| Rarely or never  | 2116 (56.3%) | 908 (58.6%)  | 1208 (54.5%)  | 0.022    | 619 (59.8%)  | 766 (53.9%)   | 0.007    | 289 (56.7%)  | 442 (55.6%)   | 0.725    |
| Frequency of Feeling nervous in last 6 months:               |              |              |               |          |              |               |          |              |               |          |
| About every day  | 95 (2.6%)    | 55 (3.6%)    | 40 (1.8%)     | 0.003    | 39 (3.5%)    | 22 (1.6%)     | 0.006    | 16 (3.7%)    | 18 (2.3%)     | 0.202    |
| More than 1/week   | 159 (4.1%)   | 47 (2.9%)    | 112 (5.0%)    | 0.004    | 32 (2.9%)    | 84 (6.0%)     | 0.001    | 15 (2.8%)    | 28 (3.1%)     | 0.819    |
| About every week   | 91 (2.5%)    | 32 (2.0%)    | 59 (2.8%)     | 0.199    | 25 (2.2%)    | 40 (2.9%)     | 0.380    | 7 (1.7%)     | 19 (2.6%)     | 0.361    |
| About every month  | 162 (4.0%)   | 94 (5.3%)    | 68 (3.0%)     | 0.001    | 66 (5.6%)    | 48 (3.1%)     | 0.003    | 28 (4.9%)    | 20 (2.8%)     | 0.07     |
| Rarely or never  | 3288 (86.9%) | 1343 (86.2%) | 1945 (87.4%)  | 0.306    | 903 (85.7%)  | 1232 (86.5%)  | 0.616    | 440 (86.9%)  | 713 (89.2%)   | 0.256    |
| Frequency of Difficulties getting to sleep in last 6 months: |              |              |               |          |              |               |          |              |               |          |
| About every day  | 57 (1.3%)    | 27 (1.5%)    | 30 (1.2%)     | 0.333    | 21 (1.7%)    | 22 (1.2%)     | 0.279    | 6 (1.2%)     | 8 (1.1%)      | 0.824    |
| More than 1/week   | 33 (0.8%)    | 10 (0.6%)    | 23 (1.0%)     | 0.155    | 9 (0.8%)     | 14 (1.1%)     | 0.501    | 1 (0.1%)     | 9 (0.8%)      | 0.092    |
| About every week   | 18 (0.5%)    | 6 (0.3%)     | 12 (0.6%)     | 0.362    | 3 (0.2%)     | 7 (0.6%)      | 0.191    | 3 (0.6%)     | 5 (0.6%)      | 0.941    |
| About every month  | 77 (2.0%)    | 33 (1.9%)    | 44 (2.0%)     | 0.792    | 24 (2.2%)    | 25 (1.8%)     | 0.592    | 9 (1.4%)     | 19 (2.4%)     | 0.235    |
| Rarely or never  | 3610 (95.4%) | 1495 (95.7%) | 2115 (95.2%)  | 0.547    | 1008 (95.1%) | 1358 (95.3%)  | 0.829    | 487 (96.7%)  | 757 (95.2%)   | 0.202    |
| Frequency of Feeling dizzy in last 6 months:                 |              |              |               |          |              |               |          |              |               |          |
| About every day  | 20 (0.6%)    | 9 (0.6%)     | 11 (0.5%)     | 0.575    | 8 (1.0%)     | 6 (0.4%)      | 0.172    | 1 (0.1%)     | 5 (0.6%)      | 0.078    |
| More than 1/week   | 34 (1.0%)    | 14 (1.0%)    | 20 (1.0%)     | 0.940    | 10 (1.0%)    | 15 (1.1%)     | 0.878    | 4 (1.0%)     | 5 (0.8%)      | 0.739    |
| About every week   | 20 (0.6%)    | 6 (0.5%)     | 14 (0.8%)     | 0.418    | 2 (0.1%)     | 7 (0.7%)      | 0.063    | 4 (1.1%)     | 7 (1.0%)      | 0.867    |
| About every month  | 63 (1.7%)    | 27 (1.9%)    | 36 (1.6%)     | 0.521    | 18 (1.7%)    | 21 (1.5%)     | 0.630    | 9 (2.1%)     | 15 (1.8%)     | 0.696    |
| Rarely or never  | 3658 (96.1%) | 1515 (96.0%) | 2143 (96.2%)  | 0.772    | 1027 (96.1%) | 1377 (96.3%)  | 0.808    | 488 (95.7%)  | 766 (95.9%)   | 0.893    |

When asked to rate the health of their child 14,3% of the caregivers rated it as excellent, 46% rated it as good. 28.7% rated it as fair and 11% rated their health as poor (**Figure 22**)

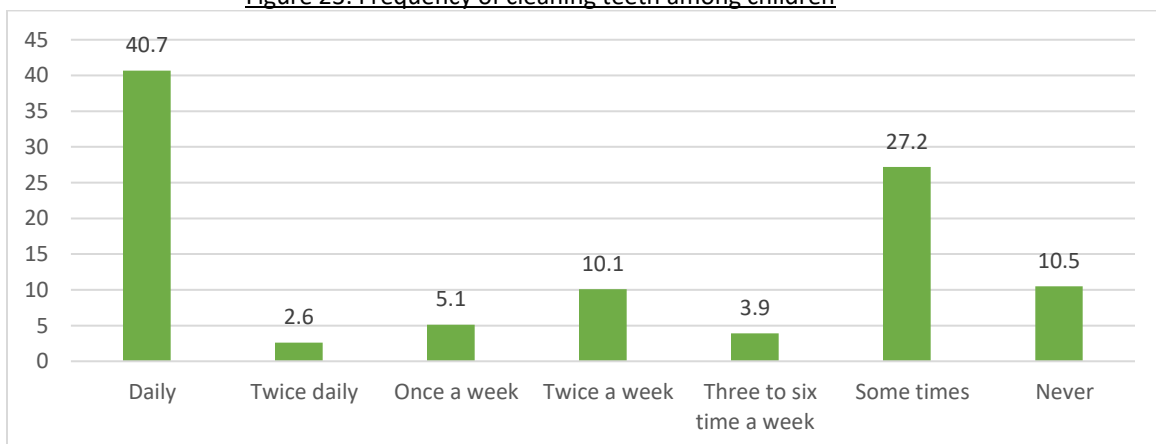
Figure 22: Opinion about overall child health



### Dental Health

About 40.7% of the children aged 5-9 years cleaned their teeth daily, 27.2% children cleaned their teeth occasionally, 10.5% of children never cleaned their teeth and only 2.6% of the children cleaned their teeth twice daily (**Figure 23**). Ninety-two percent of the children used toothpaste, 2.0% of the children used Miswak (herb), while 5.3% of the children did not use anything to clean their teeth.

Figure 23: Frequency of cleaning teeth among children



Three percent of the children used beetle nuts, while 96.8% did not use tobacco. According to 49.4% of the children, the health of their teeth was good, 88% of children had no dental issue in the last 12 months, and 93.5% of the children had never visit a dentist for a dental issue. Only 3.5% of the children had visited a dentist once in last 12 months due to pain in teeth or gums (78.2%) or due to bleeding in teeth/gums/mouth (5.7%). About 15.1% of the children reported the need of a dental visit, but 67.5% of the children were unable to visit a dentist due to cost, while 10.8% thought it was not a serious problem (**Table 37**). Fifty-nine percent of the children

visited private dentists, 17.8% visited private/public doctor, and 14.6% children visited to public dentist for any dental issue.

Table 37: Dental Health of school aged children of Punjab

| Dental Health Practices                                | Total        | Rural        | Urban        |
|--|--------------|--------------|--------------|
|  | % (n)        |              |              |
|  | 3795         | 2491         | 1304         |
| <b>Frequency of cleaning teeth:</b>                    |              |              |              |
| Daily  | 1539 (40.7%) | 837 (33.8%)  | 702 (52.9%)  |
| Twice daily  | 94 (2.6%)    | 38 (1.7%)    | 56 (4.1%)    |
| Once a week  | 201 (5.1%)   | 149 (5.8%)   | 52 (3.7%)    |
| Twice a week   | 391 (10.1%)  | 259 (10.0%)  | 132 (10.3%)  |
| Three to six time a week                               | 144 (3.9%)   | 95 (3.8%)    | 49 (4.0%)    |
| Sometimes  | 1026 (27.2%) | 769 (30.9%)  | 257 (20.6%)  |
| Never  | 400 (10.5%)  | 344 (13.9%)  | 56 (4.4%)    |
| <b>Source used to clean teeth</b>                      |              |              |              |
| Toothpaste   | 3126 (92.4%) | 1906 (89.1%) | 1220 (97.7%) |
| Miswak   | 75 (2.0%)    | 70 (3.1%)    | 5 (0.3%)     |
| Other Specify  | 7 (0.3%)     | 7 (0.5%)     | 0 (0.0%)     |
| Nothing  | 187 (5.3%)   | 164 (7.3%)   | 23 (2.0%)    |
| <b>Frequency of use of tobacco source</b>              |              |              |              |
| Betel nuts   | 110 (3.0%)   | 61 (2.5%)    | 49 (4.0%)    |
| Chewing tobacco/gutka                                  | 1 (0.0%)     | 1 (0.0%)     | 0 (0.0%)     |
| Paan   | 1 (0.1%)     | 0 (0.0%)     | 1 (0.1%)     |
| Cigarettes   | 3 (0.1%)     | 1 (0.1%)     | 2 (0.3%)     |
| None of above  | 3681 (96.8%) | 2428 (97.4%) | 1253 (95.7%) |
| <b>Opinion about dental health</b>                     |              |              |              |
| Excellent  | 400 (10.2%)  | 252 (9.9%)   | 148 (10.7%)  |
| Very good  | 574 (15.2%)  | 363 (14.6%)  | 211 (16.4%)  |
| Good   | 1865 (49.4%) | 1240 (50.4%) | 625 (47.5%)  |
| Average  | 563 (14.7%)  | 362 (14.2%)  | 201 (15.6%)  |
| Poor   | 312 (8.4%)   | 207 (8.4%)   | 105 (8.6%)   |
| <b>Experienced any teeth problems during past year</b> |              |              |              |
| Have difficulty biting hard food                       | 302 (7.9%)   | 186 (7.4%)   | 116 (8.7%)   |
| Have difficulty in chewing                             | 312 (8.0%)   | 196 (7.7%)   | 116 (8.6%)   |
| Miss school for whole days                             | 21 (0.5%)    | 14 (0.5%)    | 7 (0.5%)     |
| Dissatisfied with appearance of                        | 27 (0.8%)    | 16 (0.7%)    | 11 (0.9%)    |
| Avoids smiling and laughing due                        | 14 (0.4%)    | 12 (0.5%)    | 2 (0.3%)     |
| Other children make fun of teeth                       | 12 (0.3%)    | 9 (0.3%)     | 3 (0.3%)     |

| Dental Health Practices   | Total        | Rural        | Urban        |
|---|--------------|--------------|--------------|
|   | % (n)        |              |              |
| No such problem   | 3355 (88.4%) | 2217 (89.1%) | 1138 (87.1%) |
| <b>No of visits to dentist during past 12 months</b>                        |              |              |              |
| Once  | 132 (3.5%)   | 68 (2.8%)    | 64 (4.9%)    |
| Twice   | 62 (1.6%)    | 40 (1.6%)    | 22 (1.5%)    |
| ≥ 3 times   | 22 (0.5%)    | 15 (0.5%)    | 7 (0.5%)     |
| Never   | 29 (0.8%)    | 14 (0.5%)    | 15 (1.3%)    |
| Don't know  | 3549 (93.5%) | 2354 (94.6%) | 1195 (91.7%) |
| <b>Reason of last dental visit</b>  | 1 (0.0%)     | 0 (0.0%)     | 1 (0.1%)     |
| Pain with teeth, gums, or mouth   |              |              |              |
| Bleeding with teeth, gums, or mouth   | 197 (78.2%)  | 117 (83.5%)  | 80 (72.2%)   |
| Correction/realignment/straightening of teeth                               | 15 (5.7%)    | 6 (4.3%)     | 9 (7.4%)     |
| Routine check-up of teeth   | 15 (7.2%)    | 7 (5.9%)     | 8 (8.8%)     |
| Other   | 10 (4.2%)    | 4 (3.2%)     | 6 (5.3%)     |
| <b>Type of health care provider for teeth/gum care:</b>                     | 6 (3.0%)     | 2 (1.9%)     | 4 (4.3%)     |
| Public/private Doctor   |              |              |              |
| Private Dentist   | 47 (17.8%)   | 32 (22.4%)   | 15 (12.5%)   |
| Public Dentist  | 138 (59.0%)  | 72 (54.4%)   | 66 (64.3%)   |
| Dental Hygienist  | 39 (14.6%)   | 20 (13.6%)   | 19 (15.7%)   |
| Nurse   | 8 (3.3%)     | 5 (4.2%)     | 3 (2.2%)     |
| Hakeem  | 3 (0.8%)     | 3 (1.4%)     | 0 (0.0%)     |
| <b>During past 12 months, child required dental care but did not get it</b> | 4 (1.3%)     | 1 (0.5%)     | 3 (2.3%)     |
| <b>Main reason of not getting dental care</b>                               | 209 (84.9%)  | 115 (84.9%)  | 94 (84.9%)   |
| No dentist in the area  |              |              |              |
| Could not afford cost   | 3 (4.8%)     | 1 (1.6%)     | 2 (8.6%)     |
| Did not want to spend the money   | 24 (67.5%)   | 14 (59.2%)   | 10 (77.1%)   |
| Dentist is too far/no transport   | 1 (2.0%)     | 0 (0.0%)     | 1 (4.4%)     |
| Child is afraid or does not like dentists                                   | 1 (2.1%)     | 1 (3.9%)     | 0 (0.0%)     |
| Unable to take time off from work   | 2 (3.9%)     | 1 (4.6%)     | 1 (3.1%)     |
| Did not think it was serious/problem would go away                          | 2 (8.9%)     | 2 (16.5%)    | 0 (0.0%)     |

## Vision

### Left Eye:

Among the survey children, 13.4% of the children had a week sight in the left eye of which 10.5% children had an eyesight of 6/9, 1.5% had 6/12, 0.6% has 6/18, 0.3% had 6/24 and 0.1 had 6/36. Vision test was not performed in 0.6% children (**Table 38**).

About, 86% of the children had a good sight in the left eye. Among these, 45.1% of the children had an eyesight of 5/6, and 40.9% had an 6/6 eyesight.

*Right Eye:*

Among the survey children, 13.5% of the children had a weak sight in the right eye of which 10.6% children had an eyesight of 6/9, 1.9% had 6/12, 0.6% has 6/18, 0.3% had 6/24 and 0.1% had 6/36. Vision test was not performed in 0.6% children.

About 88.9% of the children had a good sight in the right eye. Among these, 46.4% of the children had an eyesight of 5/6, and 39.5% had a 6/6 eyesight.

Eyesight of urban and rural dwellers is given in **Table 38**

Table 38: Vision Test of school aged children

| Vision Test                      | Punjab n (%) |              |             |
|----------------------------------|--------------|--------------|-------------|
|                                  | Overall      | Rural        | Urban       |
| <b>N</b>                         | 3731         | 2454         | 1277        |
| <b>Vision test of left eye:</b>  |              |              |             |
| 5/6                              | 1665 (45.1%) | 1110 (45.8%) | 555 (44.0%) |
| 6/6                              | 1532 (40.9%) | 1017 (41.3%) | 515 (40.1%) |
| 6/9                              | 393 (10.5%)  | 244 (9.8%)   | 149 (11.8%) |
| 6/12                             | 73 (1.9%)    | 42 (1.6%)    | 31 (2.4%)   |
| 6/18                             | 28 (0.6%)    | 18 (0.5%)    | 10 (0.6%)   |
| 6/24                             | 14 (0.3%)    | 9 (0.4%)     | 5 (0.3%)    |
| 6/36                             | 4 (0.1%)     | 3 (0.1%)     | 1 (0.1%)    |
| 6/60                             | 0 (0.0%)     | 0 (0.0%)     | 0 (0.0%)    |
| Not performed                    | 22 (0.6%)    | 11 (0.5%)    | 11 (0.8%)   |
| <b>Vision test of right eye:</b> |              |              |             |
| 5/6                              | 1708 (46.4%) | 1138 (47.2%) | 570 (44.9%) |
| 6/6                              | 1491 (39.5%) | 1000 (39.9%) | 491 (38.8%) |
| 6/9                              | 389 (10.6%)  | 227 (9.6%)   | 162 (12.4%) |
| 6/12                             | 75 (1.9%)    | 46 (1.7%)    | 29 (2.2%)   |
| 6/18                             | 30 (0.6%)    | 21 (0.7%)    | 9 (0.5%)    |
| 6/24                             | 12 (0.3%)    | 7 (0.3%)     | 5 (0.4%)    |
| 6/36                             | 4 (0.1%)     | 4 (0.2%)     | 0 (0.0%)    |
| 6/60                             | 0 (0.0%)     | 0 (0.0%)     | 0 (0.0%)    |
| Not performed                    | 22 (0.6%)    | 11 (0.5%)    | 11 (0.8%)   |

**DISCUSSION**

The survey included rural and urban households of Punjab with school aged children (5 to 9 years old). Majority of the surveyed households were Muslims. A very small fraction of households were found to be headed by women and lack of formal education was found to be prominent in household heads. Superior housing characteristics like finished floors and walls, along with

household assets such as television, refrigerator and internet connections were more frequently present in urban areas compared with rural areas. Almost all houses surveyed in Punjab with an approximately equal urban vs rural distribution were found to be using no means of water treatment process to purify drinking water before use. Greater than 90% of the households had access to improved sanitation facilities (Urban more than rural), with Gujranwala having the highest proportion. The NNS 2018, also reported lack of access to water, sanitation and hygiene facilities in rural areas as compared to urban areas of Pakistan (12). Household food insecurity was mostly prevalent among rural compared to urban dwellers. More than half of the surveyed household had a high dietary diversity, which was shown to be slightly more common in households in urban areas compared to rural areas.

Schooling through public and private schools was mostly preferred in Punjab with almost ninety percent surveyed children currently attending school. Attending schools had a positive impact in reducing sedentary activities in children like watching television for long hours, but alongside this it also led to children spending less time playing outside, hence leading to an overall decrease in physical activity on a school day. The household survey reported a lack of social and financial support from the government and the NGOs, as very few households were reported to be supported by the BISP program implemented by the government. The NNS 2018 (12), also reported only 4.9% coverage of social protection programs in Pakistan with 6.2% coverage in rural and 2.9% coverage in urban areas of Pakistan.

With the existing poverty, the survey reported occasional incidence of diarrhea, fever, cough, and other health issues among children. It also showed presence of anemia and malnutrition such as stunting, underweight, and overweight/obesity among school aged children. These issues were found to dominate among rural dwellers and smaller cities of Punjab as compared to urban dwellers and larger developed cities of Punjab. This study reported 19.9% prevalence of stunting, 17.2% underweight, and 8.0% of overweight and obesity among school age children, with higher prevalence of stunting and underweight in rural areas and higher prevalence of overweight in urban areas of Punjab. In concordance with our survey, a study reporting pooled analysis also showed high prevalence of stunting and underweight in rural areas, and overweight and obesity in urban areas of Pakistan. The higher prevalence of obesity could also be due to sedentary lifestyle and less physical activity among children residing in urban areas (18). The prevalence of undernutrition in rural areas can be attributed due to food insecurity, poor living standards coupled with poverty, lack of education, and poor dietary intake (19). Despite the long-term focus on stunting and underweight in Pakistan, the finding suggests on continuum of efforts to prevent maternal malnutrition, childhood wasting and stunting. Intervention should also be implemented to reduce the prevalence of overweight and obesity among children living in urban areas through community mobilization, increasing nutritional/health awareness and by imposing taxes on fast and junk food to discourage their consumption.

Based on the RDA (20), the survey reported high protein, fat, and carbohydrate intake among school aged children, with significantly increased intake among wealthy proportion of the population when compared across different wealth quintiles (i.e., poor vs. rich). Different dietary studies have also reported on increased carbohydrate intake among school-aged children of

Pakistan (10, 21-23). The survey showed inadequate intake of micronutrients like vitamins A, C, D, E, zinc, iron, folic acid, phosphorus, and magnesium, with only children from high socio-economic status found to be taking recommended intake of vitamin supplements, while no significant supplement nutrient intake was observed among stunted, underweight, and overweight/obese children. The results suggest need of community mobilization strategies, including context-specific behavior change guidance for school-aged children from educational institutions or community awareness programs to encourage consumption of vitamin and protein rich diets such as seasonal fruits, vegetables, eggs, lentils, and milk and its derivatives. The findings of this survey also suggest development of an evidence-informed, integrated package of interventions for school children targeting the poorest and most vulnerable sections of the population (both in-school and out of school children). The intervention plan should also involve components of health, nutrition, and lifestyle involving, dental, sanitation and hygiene practices to improve nutrition and health outcomes of children living in Pakistan. Moreover, the government should also implement social support to increase affordability of school, which can have a positive impact in increasing school attendance. Teacher training activities and sessions should be conducted to gauge and improve the quality of education.

This survey has been adjusted for clustering and it is the first survey which has explored various factors which effects health, nutrition, and lifestyle of children in this age group. Other strengths of the study include the use of a locally validated household food security access scale, culturally sensitive questionnaire, and the collection of anthropometric measurements by trained data collection team to increase the accuracy of data and reduce the risk of reporting bias. Anthropometric measurements of each child were taken thrice to reduce bias.

## CONCLUSION

This survey reports on the health, nutrition, and lifestyle of school age children by highlighting the burden of malnutrition, dietary and meal patterns, sanitation and hygiene practices, schooling in children 5-9 years old living in urban and rural areas of Punjab. It suggests implementation of large integrated programs to improve health and nutrition outcomes among children, especially who live in the rural areas of Punjab. It also suggests need of interventions to improve school attendance and quality education and the development of a comprehensive school health and nutrition program focusing on multitude of issues and including life skills development, health and nutrition education and optimum lifestyle and education behaviors.

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