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

Mother and Child Care Research (MccR)

TVI — Trust for Vaccines & Immunization

POLICY & STRATEGIC PLANNING UNIT — Government of The Punjab

THE AGA KHAN UNIVERSITY — INSTITUTE FOR GLOBAL HEALTH AND DEVELOPMENT

ACKNOWLEDGEMENTS
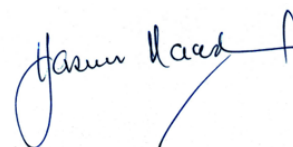
Message from Dr. Yasmeen Rashid

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
Provincial Minister for Primary & Secondary Healthcare / Specialized Healthcare & Medical education in Punjab, Government of Punjab

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.
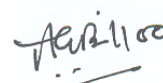
The importance of this survey was critical because, for years, global health measures and policies have prioritized focusing on children under 5 years of age to address the need to reduce mortality in this age group as it was outlined in SDG 3 (newborn and child mortality) and MDG 4. These efforts culminated 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.

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
Distinguished University Professor
& Founding Director
Institute for Global Health and
Development
The Aga Khan University,
Karachi, Pakistan

CONTENTS

CONTRIBUTORS

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, we aimed in 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
Total	108984	54691	**163,675**	**20,178,279**	**12,192,314**	**32,370,593**
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
Total	4594	674	**5,268**	**685,366**	**151,225**	**836,591**
Grand Total	113578	55365	**168,943**	**20,863,645**	**12,343,539**	**33,207,184**

*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 ± 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
Punjab	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	**3582**	**190**

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
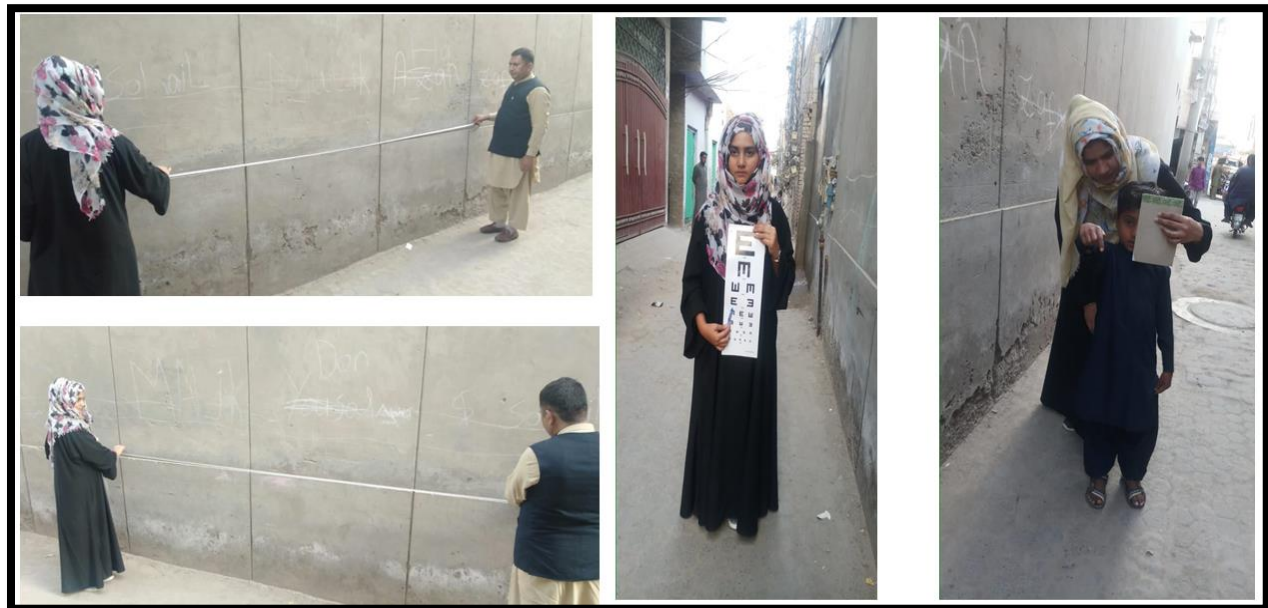
Data Collection Tool

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

Module	Description
	Child and mother anthropometric assessment
F: Nutritional Iron Status Assessment Of Participant	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 (±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 <-2SD), 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)[b,RDA]	1710	1710	1880	1880
Protein, (g/kg) [d]	0.76	0.76	0.76	0.76
Fat, % energy [a,AMDR]	25–35%E	25–35%E	25–35%E	25–35%E
Carbohydrates, g	100	100	100	100
Fiber (g)[a,AI]	25	25	31	31
Calcium, mg [d]	800	800	1100	1100
Phosphorus (mg) [d]	405	405	1055	1055
Iron (mg) [d]	12.6	12.6	17.8	17.8
Zinc,(mg)[f]	8	8	9.3	9.3
Copper (mg) [d]	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) d	110	110	200	200
Potassium (mg)AI,d	2300	2300	2300	2500
Sodium (mg)AI,d	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

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.

AI: 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 4.

Table 4: Number of interviews conducted in Punjab

		Punjab										
		Total	Rural	Urban	Faisalabad	Gujranwala	Lahore	Sahiwal	Multan	D.G. Khan	Bahawalpur	Rawalpindi	Sargodha
Households	Sampled	3915	2576	1339	486	585	678	275	447	388	409	367	280
	Occupied	3895	2563	1332	484	582	674	269	445	388	408	366	279
	Interviewed	3795	2491	1304	476	557	663	262	425	380	401	356	275
	Household response rate	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 ± 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 5).

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 5: Characteristics of Household Heads

Demographics	Total	Rural	Urban
	% (n) Mean ± SD		
Number of households/ children	3795	2491	1304
Mean household size	6.0 ± 2.1	6.1 ± 2.2	5.9 ± 2.0
Sex of household head			
Male	3707 (97.7)	2430 (97.4)	1277 (98.1)
Female	88 (2.3)	61 (2.6)	27 (1.9)
Age of household head			
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)
Marital status of household head			
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)
Language spoken			
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) Mean ± SD		
Dhatki	0 (0.0)	-	-
Other	23 (0.6)	-	-
Religion			
Muslim	3703 (97.9)	-	-
Christian	76 (1.8)	-	-
Hindu	9 (0.2)	-	-
Sikh	6 (0.1)	-	-
Education of household head			
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)
Occupation of household head			
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 6**).

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 6: 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 7**).

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 7: Household and personal assets

Household and Personal Assets	Punjab		
	Total	Rural	Urban
Number of households	3795	2491	1304
Percentage of households that own a:			
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)
Percentage of households that own			
Agricultural land	709 (17.2)	639 (24.1)	70 (4.9)
Any livestock	1029 (25.9)	940 (36.5)	89 (7.1)
Percentage of households where at least one member owns or has a			
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)
Ownership of dwelling			
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 8**). People reported to receive clear and sweet drinking water at the time of collection.

Table 8: 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 9 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 9: 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
Division									
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
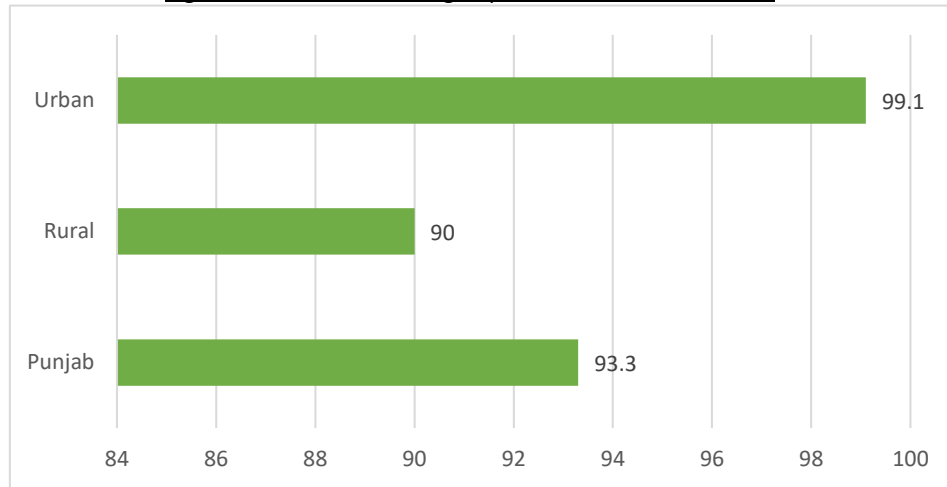
The percentage of households with access to an improved sanitation facility was greatest in Gujranwala (99.2%) and lowest in D.G. Khan (81.5%). (**Figure 6**).

Figure 6: Households using improved sanitation facilities by cities
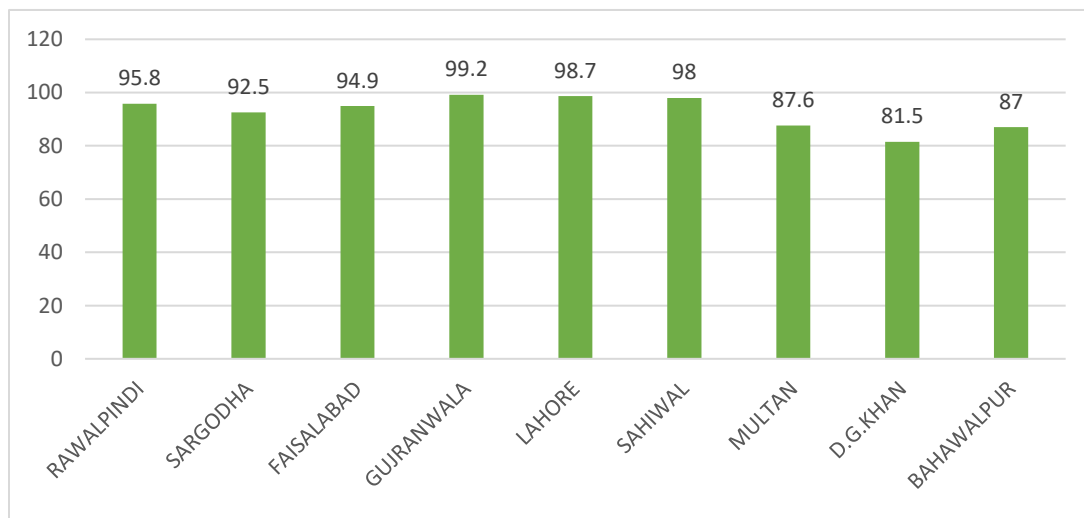
Flushed to sewer system was the most (39.1%) commonly used improved sanitation method. Only 27.8% of rural respondents reported using flush to piped sewer system. More rural respondents reported using flush to septic tank (29.8%).

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 10**). 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 10: Household sanitation facilities

	Types of sanitation facilities												
	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	Number of households
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
Division													
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**).

Figure 7: Handwashing practices with soap/detergent in Punjab (%)
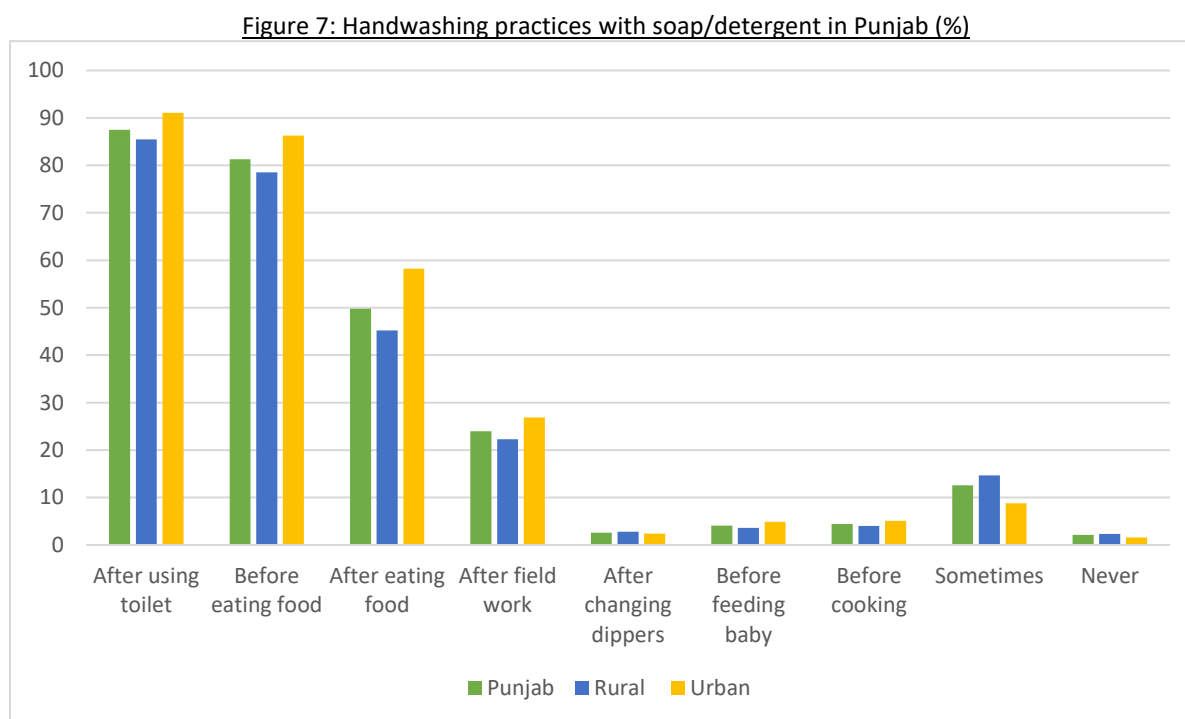
At regional level 98.4% (rural: 98.6%; urban: 98.2%) of the households had no specific place for washing hands in their dwelling, plot or yard. Around 88.8% of the households in Punjab had water and soap for handwashing. Apart from water, 6.9% of the households had no cleaning agent to wash hands. This was more prevalent in rural areas (9.3%) compared to urban areas (2.7%) of Punjab.

Table 11: 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
Punjab 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
Punjab 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 12**). 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
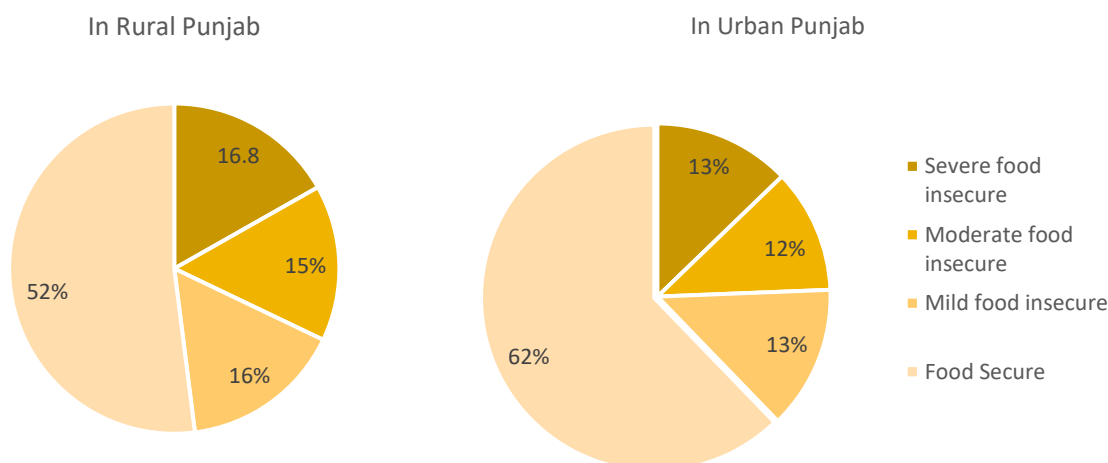
Table 12: Food insecurity status of households in Punjab

	Food Insecurity Status % (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 ≤ 3 food groups), 24.9% had medium dietary diversity (consumption of 4–5 food groups) and 66.7% had high dietary diversity (consumption of ≥ 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 13**).

Table 13: Household dietary diversity of Punjab

	Household Dietary Diversity % (n)		
	Lowest dietary diversity (≤ 3 food groups)	Medium dietary diversity (4 and 5 food groups)	High dietary diversity (≥ 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 14 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 ± 1.5 years. Of the total sample, most children were from Lahore 17.5%, and the least from Sahiwal 6.9%.

Table 14: Child characteristics

	% (n) Mean ± SD
Punjab	3795 (67.2)
Punjab Rural	2491 (43.0)
Punjab Urban	1304 (24.2)
Division	
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)
Gender	5952
Male	3032 (50.4)
Female	2920 (49.6)
Mean age	7.5 ± 1.5
Age	
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 15**).

Table 15: Schooling among children aged 5-9 years' old

Schooling	% (n)
	3795
Has the child ever attended school?	
Yes	3500 (92.7)
No	295 (7.3)
Reasons for never attending school:	
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)
Type of school child attended:	
Private	1654 (43.9)
Public.	1771 (46.8)
Madrassa	12 (0.3)
Trust (NGO)	60 (1.7)
Other specify	3 (0.1)
Does child currently attend school?	
Yes	3482 (92.2)
No	18 (0.5)
Did child miss school for at least 1 month in last year?	
Yes	52 (1.5)
No	3448 (91.3)
Main reason for not attending school regularly?	
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)
What is the main language of instruction at this school?	
English	657 (16.8)
Urdu	2840 (75.9)
Sindhi	0 (0.0)
Other	3 (0.1)
During school year, # of days/week did child walk/ride bicycle to & from school?	
0 days	793 (20.4)
1–2 days	25 (0.7)
3-4 days	94 (2.4)

Schooling	% (n)
5-6 days	2588 (69.2)
During school year, how long did it usually take to get/from school?	
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 (%)
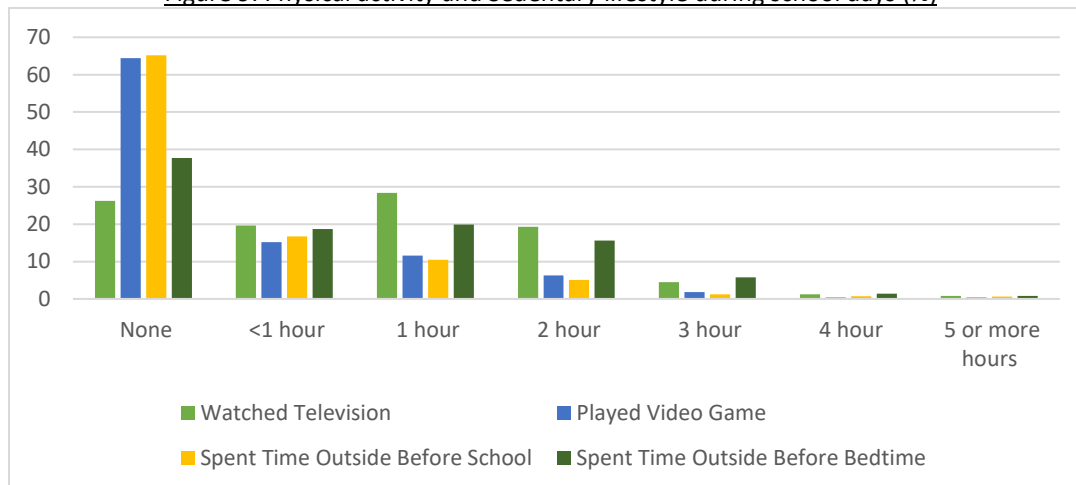
On a weekend, 24.1% of the children did not watch television, while 12.6% watched television for less than an hour, 21.7% watched for an hour, and 23.1% of the children watched television for two hours. Sixty-two percent of the children did not play video/ computer/tablets/mobile phone games or used 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 (%)
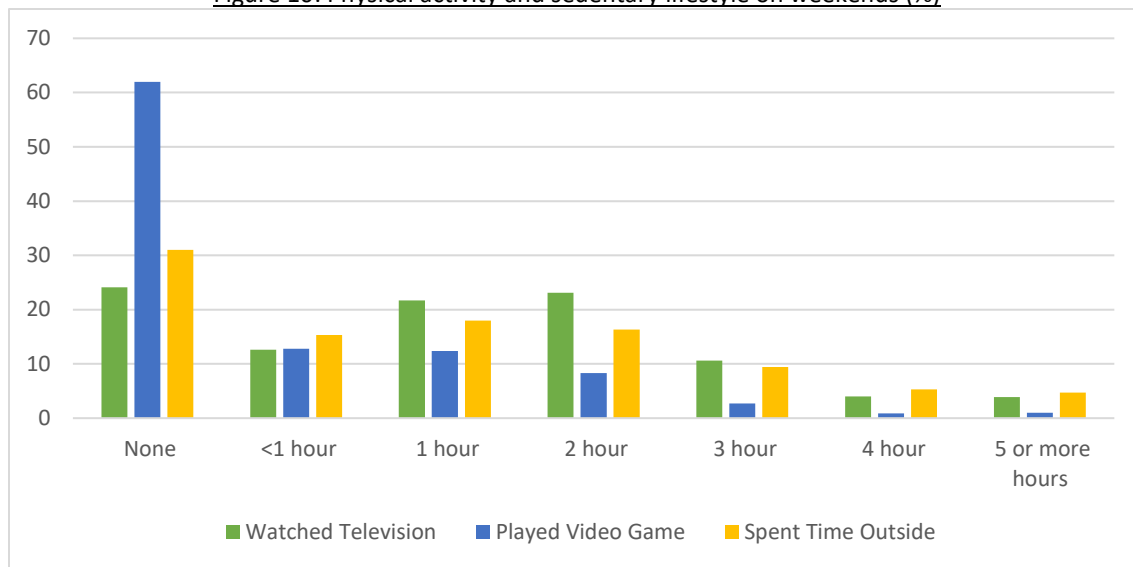
Physical Activity and Sedentary Lifestyles among Children Out of School

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 (%)
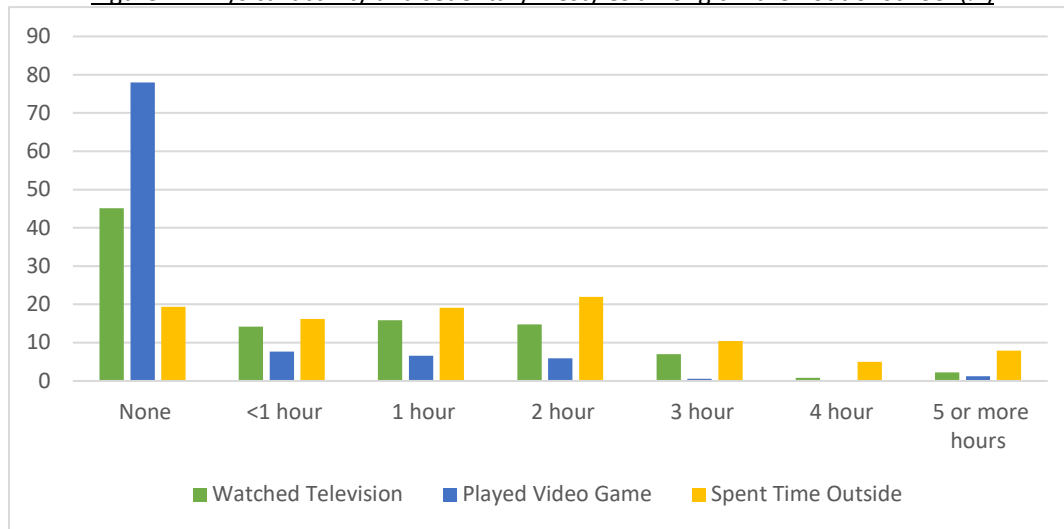
Nutrition Status

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 11).** The prevalence was higher in rural (21.3%) than in urban areas (17.1%) **(Figure 12)**. Stunting was highest (25.3%) amongst those aged nine years of age **(Table 16)**. In contrast to other districts of Punjab, Gujranwala had highest prevalence of stunted children which was 23.6%.

Figure 11: Prevalence of stunted children in Punjab- by gender (%)
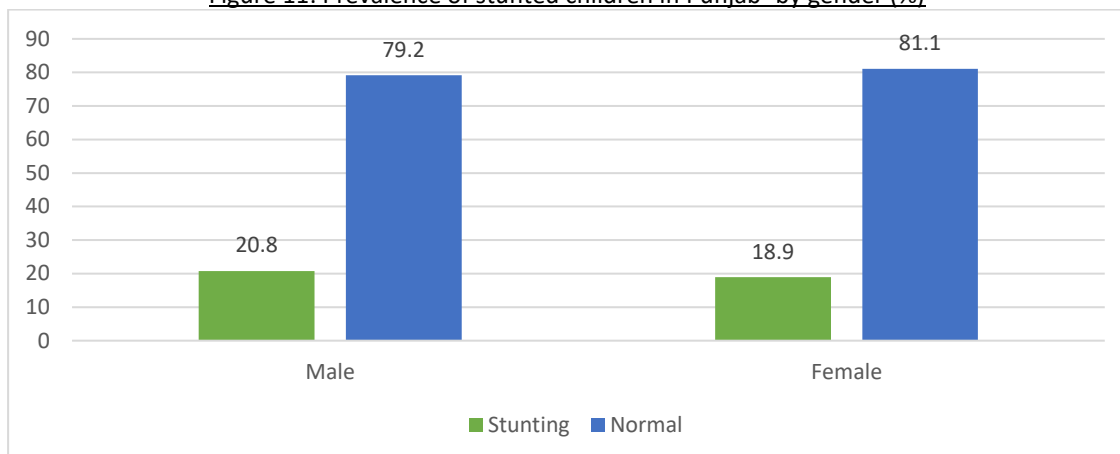
Figure 12: Prevalence of stunted children in Punjab
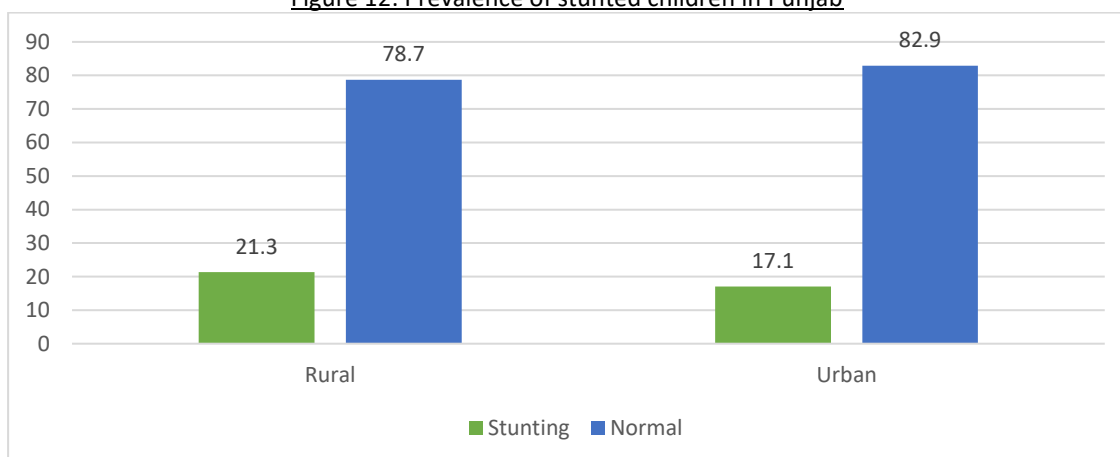
Table 16: Nutrition status of children – stunting

	Height for age % (n)	
	Normal (- ≥2SD)	Stunting (-<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 % (n)	
	Normal (- ≥2SD)	Stunting (-<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 13)** with slightly higher prevalence amongst boys (19%) than girls (15.3%) **(Figure 14)**. 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 17)**

Figure 13: Prevalence of underweight children in Punjab- by setting (%).
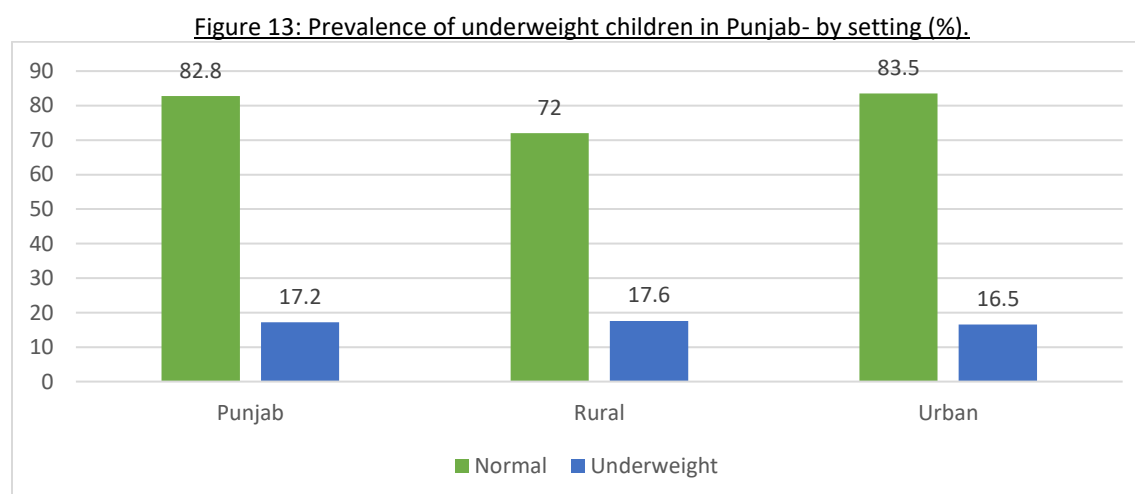
Figure 14: Prevalence of underweight children in Punjab- by gender (%)

Table 17: Nutrition status of children – underweight

	BMI-for-age z-score % (n)	
	Underweight (- <2SD)	Normal (-2<BAZ<+1)
Punjab	864 (17.2)	3677 (74.8)
Division		
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)
Gender		
Male	489 (19.0%)	1811 (72.0%)
Female	375 (15.3%)	1866 (77.6%)
Age		
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 15)**. Prevalence was slightly higher in

urban areas (8.9%) than in rural areas (7.6%) (**Figure 16**). 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 18**).

Figure 15: Prevalence of overweight/obese children in Punjab- by gender (%)

Figure 16: Prevalence of overweight/obese children in Punjab- by setting (%)
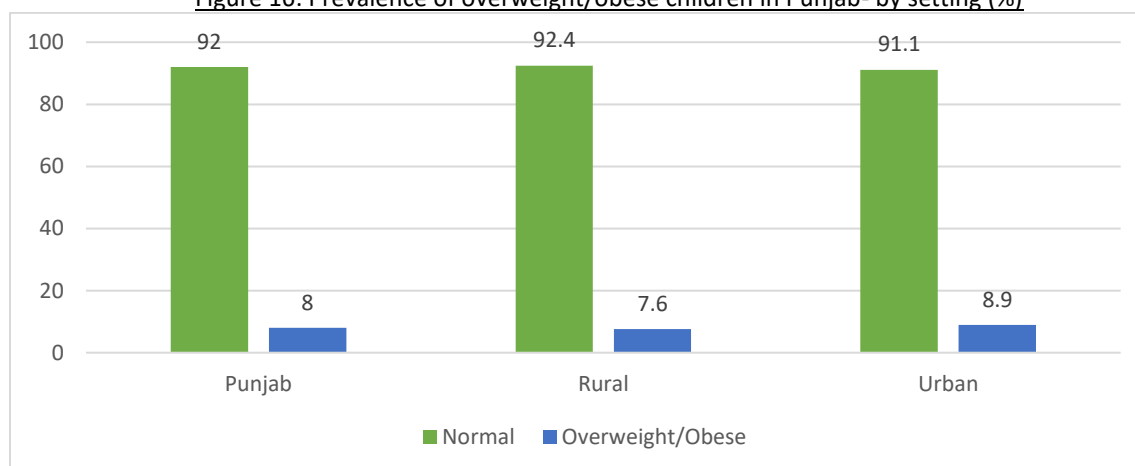
Table 18: Nutrition status of children – overweight/obesity

	BMI-for-age z-score % (n)	
	Normal (-2<BAZ<+1)	Overweight / Obese (+ 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 % (n)	
	Normal (-2<BAZ<+1)	Overweight / Obese (+ 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 17**). 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 19**).

Figure 17: Anemia prevalence in urban and rural areas of Punjab
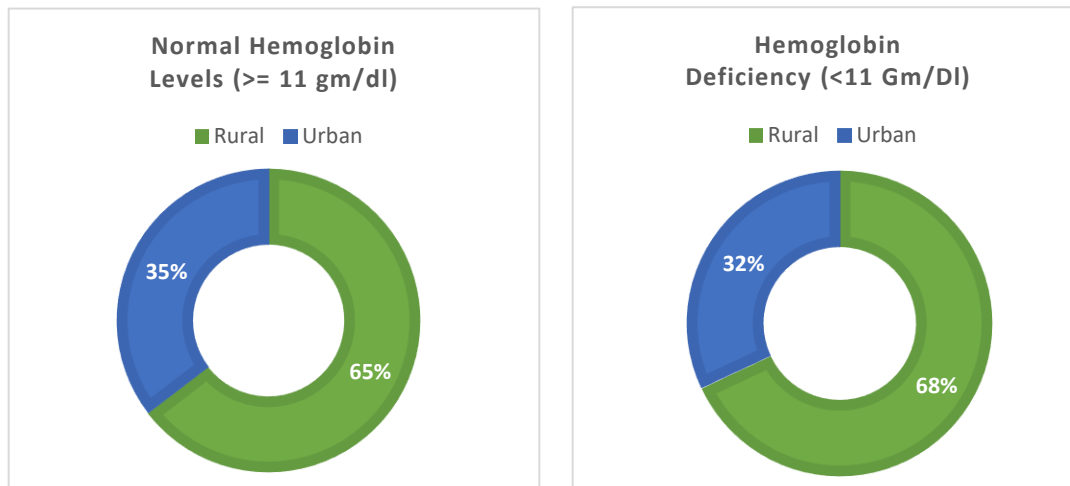
Table 19: Hemoglobin levels of children 5-9 years of age

	Hemoglobin Levels % (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 18.**

Figure 18: Occasions of increased frequency in meals
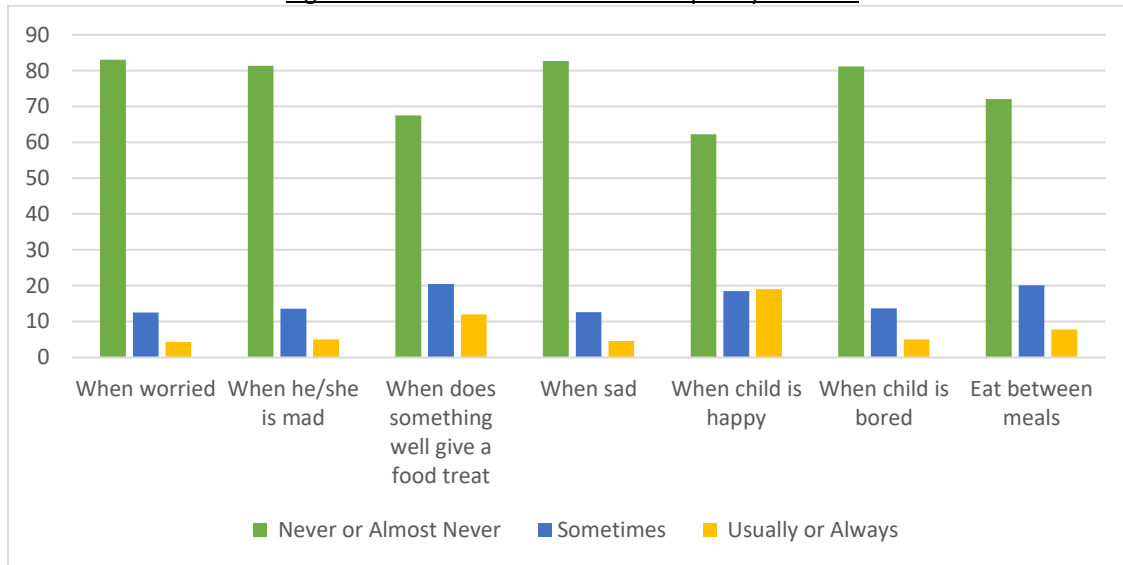
Semi Quantitative Food Frequency

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 20**).

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 20: 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 fiver 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 21**).

Table 21: Food group consumption average numbers of time/week- by wealth quintiles

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

They 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 22**).

Table 22: 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 23**).

Table 23: 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 23**.

Table 23: Nutrient Intake in districts of Punjab

Nutrient Intake	Punjab											Bahawalpur
	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
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

Nutrient Intake	Punjab											Bahawalpur
	Punjab	Rural	Urban	Rawalpindi	Sargodha	Faisalabad	Gujranwala	Lahore	Sahiwal	Multan	D.G. Khan	Bahawalpur
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 24**).

Table 24: Nutrient intake in districts of Punjab- by wealth quintile

Nutrient Intake	Punjab 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 25**). 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 25: 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 26**).

Table 26: 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 27**). 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 27: 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	2076	
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 28**).

Table 28: 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), 87.9% (rural: 90.2.6%; 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 29**).

Table 29: 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)	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
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

	Total n (%)	Punjab n (%)										
		Rural	Urban	Rawalpindi	Sargodha	Faisalabad	Gujranwala	Lahore	Sahiwal	Multan	D.G. Khan	Bahawalpur
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

The survey reported inadequate intake of proteins, magnesium, phosphorus, sodium, copper, and vitamins such as riboflavin and niacin among school aged girls compared to boys. Inadequate intake of energy, iron, sodium, zinc, vitamin A, E and L-ascorbic acid was observed among children who had not ever attended schools and inadequate intake of total fats, thiamine, niacin, and folate was observed among children who had ever attended schools (**Table 30**).

Table 29: 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

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 30**).

Nutrient Intake	PUNJAB (%)					
	Wealth index quintile					
	Poorest	Poor	Middle	Rich	Richest	p-value
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 31**)

Table 31: 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

Nutrient Intake	Punjab					
	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 ± 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)	963 (68.2%)	133 (63.6%)	62 (57.4%)	94 (56.2%)	84 (54.3%)	0.216

Among the stunted children, there was a significantly greater intake of phosphorus, sodium, riboflavin, and folate, while among the overweight/obese children there was significantly greater intake of protein compared to underweight and normal children. Folate intake was significantly greater among the anemic children (**Table 32**).

Table 32: Nutrient intake in Punjab- by nutrition status

Nutrient Intake	PUNJAB 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)	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

| Nutrient Intake	PUNJAB 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	
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

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 19**).

Figure 19 Frequency of health issues of children 5-9 years
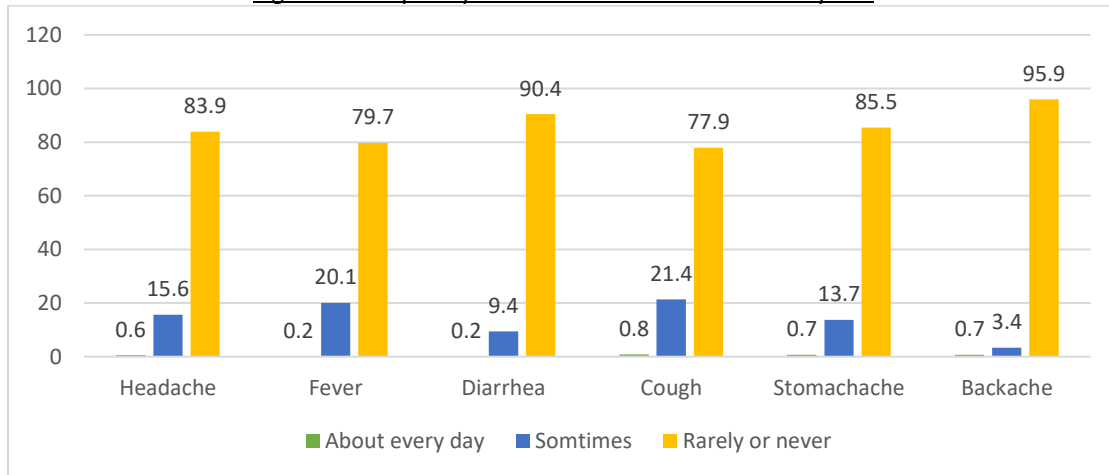
Children aged 5-9 years were questioned on potential mental health issues in the past six months of the survey and majority of the children reported rare or no issues related to lack of sleep, feelings of being low, nervous, and dizziness. A moderate percentage of children reported feeling irritable or having a bad temper at almost daily basis (25.3%). Few children reported to have these symptoms in months or in weeks (**Figure 20**).

Figure 20: Frequency of mental health issues of children 5-9 years
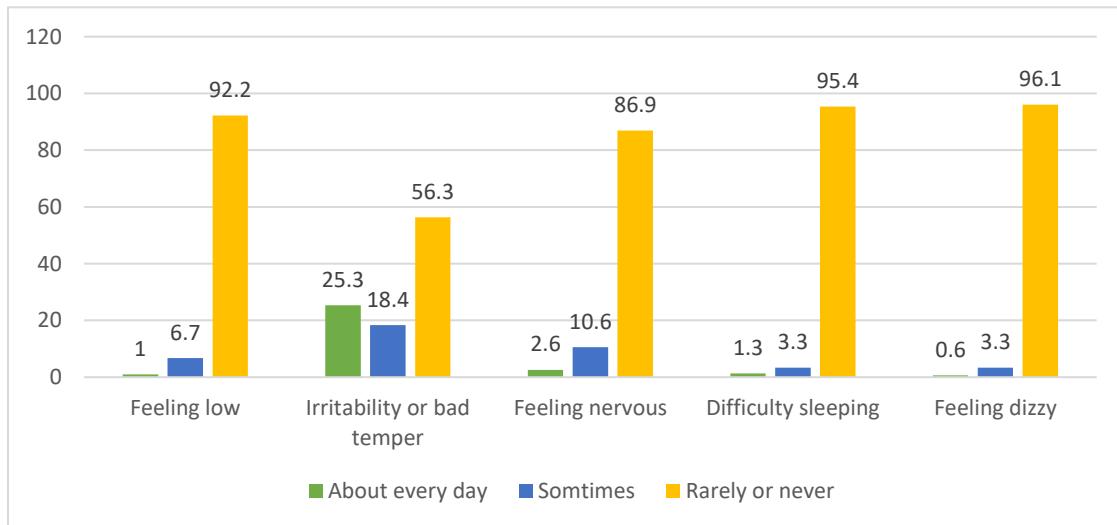
The survey showed significantly greater frequency of mental health issues among the children who were surveyed pre-lockdown compared to children who were surveyed post-lockdown. These children reported several episodes of feeling low, irritability/bad temper, nervousness, and difficulty sleeping in past 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 33**).

Table 33: 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 21**)

Figure 21: Opinion about overall child health

- Excellent
- Good
- Fair
- Poor
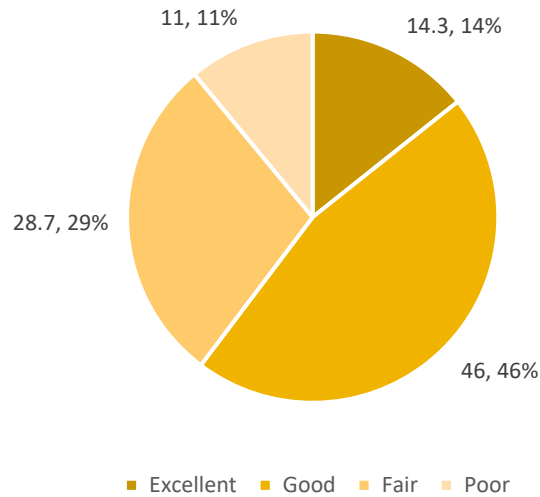
Dental Health

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 20**). 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 20: Frequency of cleaning teeth among children
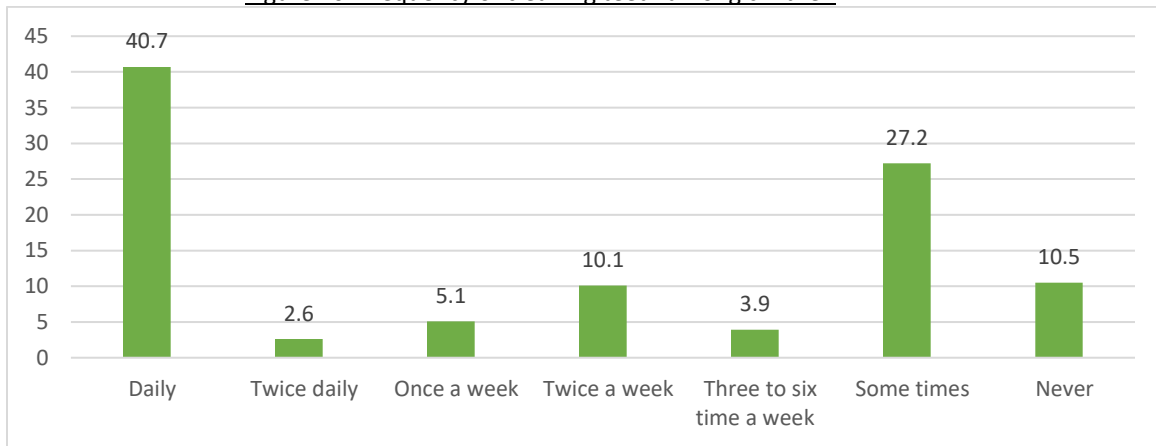
Three percent of the children used beetle nuts, while 96.8% did not use tobacco. According to 49.4% of the children, the health of their teeth was good, 88% of children had no dental issue in the last 12 months, and 93.5% of the children had never visit a dentist for a dental issue. Only 3.5% of the 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 32**). 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 32: Dental Health of school aged children of Punjab

Dental Health Practices	Total	Rural	Urban
	% (n)		
	3795	2491	1304
Frequency of cleaning teeth:			
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%)
What does the child usually use to clean teeth?			
Toothpaste	3126 (92.4%)	1906 (89.1%)	1220 (97.7%)
Miswak	75 (2.0%)	70 (3.1%)	5 (0.3%)
Tooth Powder	0 (0.0%)	0 (0.0%)	0 (0.0%)
Other Specify	7 (0.3%)	7 (0.5%)	0 (0.0%)
Nothing	187 (5.3%)	164 (7.3%)	23 (2.0%)
How frequently does the child use the following:			
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%)
Opinion about dental health of child:			
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%)
Don't know	81 (2.0%)	67 (2.5%)	14 (1.2%)
Experience any teeth problems during past year:			
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%)
No of visits to dentist during past 12 months:			
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%)
Reason of last dental visit:	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 Specify	10 (4.2%)	4 (3.2%)	6 (5.3%)
Don't know	3 (1.6%)	1 (1.1%)	2 (2.1%)
Type of health care provider for teeth/gum care:	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%)
Don't know	7 (3.3%)	4 (3.5%)	3 (2.9%)
During past 12 months, was child needed dental care but not get it?	4 (1.3%)	1 (0.5%)	3 (2.3%)
Yes			
No	37 (15.1%)	22 (15.1%)	15 (15.1%)
Main reason for could not get the dental care he/she needed?	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 33)**.

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 33**

Table 33: Vision Test of school aged children

Vision Test	Punjab n (%)		
	Overall	Rural	Urban
N	3731	2454	1277
Vision test of left eye:			
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%)
Vision test of right eye:			
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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