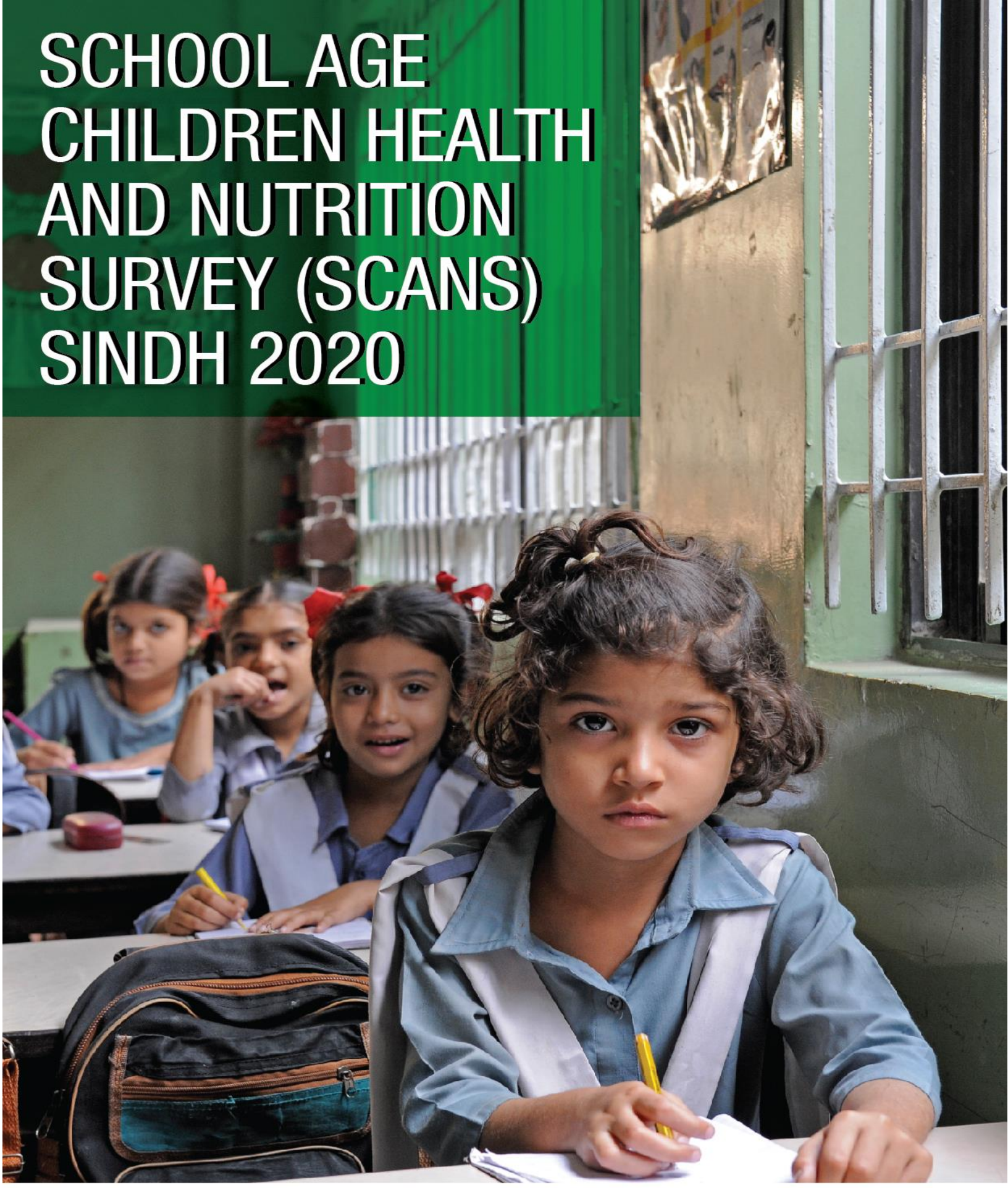
SCHOOL AGE CHILDREN HEALTH AND NUTRITION SURVEY (SCANS) SINDH 2020



TVI
Trust for Vaccines & Immunization

HEALTH DEPARTMENT
GOVERNMENT OF SINDH

THE AGA KHAN UNIVERSITY
INSTITUTE FOR GLOBAL HEALTH
AND DEVELOPMENT

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Message from Dr. Azra Fazal Pechuho

Pakistan has had faced great challenges in child health and nutrition over the years. There has been progress, though uneven. The global focus being directed towards children under the age of five years, but trends are gradually changing. Recognition of the importance to better comprehend nutrition and health status of adolescents and school age children has led to work being done targeting this age group, but to this date limited data is available. Our top priority should be to better understand and eliminate the reasons behind this.

The National Nutrition Survey (NNS) in 2018 highlighted important issues such as the burden of childhood stunting, wasting and widespread micronutrient deficiencies in children under five years. It paved the way for this large-scale household survey targeting adolescent and school aged children with an agenda to adequately assess the situation in the province of Sindh. The primary objectives of this survey were to understand the disparities in socio-economic status, gender, urban or rural residence, in-school and out of school status.

The Ministry of Health, Government of Sindh was greatly privileged to collaborate with the Aga Khan University and Trust for Vaccines & Immunization (TVI). to undertake this survey). The School Age Children Health and Nutrition Survey (SCANS) – Sindh 2020 was a very crucial study undertaken in Sindh to gather valuable health and nutrition information about school aged children residing in all districts of Sindh. The survey has collected information on feeding practices, dietary intake, food knowledge, lifestyle and attitudes, anthropometric measurements. Biochemical assessments of blood samples to assess anemia and vision and dental health assessments were also conducted.

A large number of children in the province are not attending schools, mainly due to their inability to afford the related expenses, lack of access or willingness. These out-of-school children often have to go through structural inequalities and disparities and are more predisposed to gender biases, poverty, child labor, lack of resources and future empowerment. Other than this, school-age children (both in school and out of school) are more prone to contracting communicable and non-communicable diseases.

This survey would not have been possible without the extreme hard work and dedication of the field staff and collaborators who made it possible for us to obtain the required samples and data in every district of Sindh. I am deeply grateful to Dr. Zulfiqar Bhutta and Dr Jai Das and their team for leading the work with great dedication.

This report highlights important areas and aspects for future work on vital health related behaviors and issues of school going age children. For a prosperous Pakistan it is crucial to invest on our youth and understand their health. It is pivotal to increase our comprehension of the role our education and schooling system plays in improving the health, nutrition and lifestyle of children and inspect how education can have far reaching impacts. This study provides an overview of the health-related lifestyle differences between school attending and out of school children, however further effort is required to explore this niche, improve the overall health and nutrition status of children, and eliminate the disparities between the two groups. This requires multi-sectoral plans and initiatives to address malnutrition and its determinants.

Dr. Azra Fazal Pechuho
Provincial Minister of Sindh
Health and Population Welfare
Government of Sindh

Message from Prof. Gaffar Billo

SCANS (School-age Children and Adolescents Nutritional Survey) was conducted in the province of Sindh. 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 Ministry of Health, Sindh.

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 2157 households were included from Sindh, represented both urban and rural populations. 99.6% of these children were currently 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 22.7%, 6.2%, 33%, and 38.9% respectively with boys slightly more affected than girls. 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 Sindh.

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. Azra Fazal Pechuho for her 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. Our project was conducted in Sindh, which by size and population density are the largest provinces in Pakistan. The Aga Khan University collaborated with the Ministries of Health, Sindh, 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 field work, our donors and partners for the valuable support they have provided throughout the entirety of this project. I am especially grateful to Dr Azra Fazal Pechuho, the honorable health minister of Sindh who took personal interest in this project and provided full support. 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 &
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ACRONYMS

AKU	Aga Khan University
ARI	Acute Respiratory Infection
BISP	Benazir Income Support Program
BMI	Body Mass Index
DBM	Burden of malnutrition
DHS	Demographic and Health Survey
DMU	Data Management Unit
ERC	Ethical Review Committee
FFQ	Food Frequency Questionnaire
FIES	Food Insecurity Experience Scale
HAZ	Height of Age z-score
HH	Household
LMICs	Low- and middle- income countries
MDGs	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

For several decades, researchers and epidemiologists globally have focused on health of children under five years of age due to 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 has inadvertently led to neglect of school-aged children and adolescents (1). Recent advances have brought the focus on malnutrition trends and general health outcomes amongst adolescents especially those older than 15 years of age (2-4); however, there is still dearth of information regarding malnutrition trends, eating habits, food choices and dietary intakes amongst school-aged children 5 to 9.9 years of age.

Over the years it has been observed that mortality trends in children younger than five years of age have decreased at a faster rate as compared to trends in older children aged 5 to 14 years (5). Although the top five causes of death in this age group are lower respiratory tract infections, diarrheal diseases, drowning, meningitis, and road injuries, 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 sociodemographic index (6). In 2015, nearly 7.2 million deaths were reported amongst children and adolescents globally, with 463,000 deaths amongst school-aged children 5 to 9 years (6). The following year, in 2016, 98% of all deaths in children and adolescents aged 5 to 14 years transpired in low- and middle-income countries (LMICs) with half of the total number of deaths being accounted for by seven countries alone, including Pakistan (5).

Pakistan is also one of the countries facing the issue of double burden of malnutrition (DBM). The Lancet series on DBM reports this issue to be prevalent in LMICs and defines it as the coexistence of undernutrition and overnutrition in a population (7, 8). DBM is attributed mainly to 'nutrition transition' which is due to rapid urbanization, industrialization, trade expansion, changing diets, decreased physical activity and easy access to and abundance of high-calorie foods, is leading to a simultaneous rise in overweight and obesity rates while the issue of undernutrition in a country prevails (7, 9). Food insecurity is another issue 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 (10), 36.9% of the individuals in Pakistan face food insecurity which is a major contributor to poor nutrition amongst children. This not only increases the risk of malnutrition but also adversely impacts education and health (11). These children develop poor dietary habits which are known to contribute towards development of non-communicable diseases into adulthood (12).

The province of Sindh, in Pakistan, particularly has very high prevalence of malnourished children in its region. As per the NNS 2018 report, 45.5% children less than five years of age are stunted, 41.3% underweight and 5.2% are overweight and obese (10). The prevalence of underweight children is highest in Sindh, while prevalence of overweight and obesity is lowest, as compared to other provinces of Pakistan (10).

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. For Sindh specifically, they reported 13.7% to be stunted, 22.7% underweight, 7.6% overweight and 3.8% obese (13).

It is important that nutritional status and dietary intake of school-aged children 5 to 9.9 years of age be assessed so that these children enter the second decade of life and onto adulthood in a healthy state. 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 to determine nutritional and health status of both in-school and out-of-school school-aged children 5 to 9.9 years of age, in the province of Sindh, 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 Sindh, 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

Study Design, Location, and Population

A cross-sectional multistage complex household survey was conducted on health and nutrition of school-aged children from Sindh, 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 Sindh, 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 was 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 as 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:

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
Balochistan	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) (14) and National Nutrition Survey (NNS) (10) response rates, precision, confidence, and design effect. It was assumed that the response rate was 90%, 95% confidence Interval, 7% precision, 1.5% design effect and extrapolated provincial prevalence of low BMI (defined as BMI-for-age less than 2 SD) in 5 to 9 years as 21.9% for Sindh (NNS 2017 data). The total minimum sample size required was calculated to be approximately 242 in the smallest division of Sindh, 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 which was required at the province level for Sindh.

Table 2. Sample Size (Total Sample)

	Total population	%	Ratio relative to lowest province	SS multiplied	**Total SSUs (individuals)**	**Total EBs**
Sindh	47,886,051					
Larkana	6,192,380	12.93149022	1.172293691	509.9477555	266	14
Sukkur	5,538,555	11.56611348	1.048516577	456.1047111	238	13
Hyderabad	10,592,635	22.12050227	2.005316079	872.3124942	455	24
Karachi	16,051,521	33.52024371	3.038750334	1321.856395	689	35
Mirpur Khas	4,228,683	8.830719827	0.800541698	348.2356387	181	10
Shaheed Benazirabad	5,282,277	11.03093049	1	435	227	12
	47,886,051	100		3943.456995	**2055**	**108**

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 (15).

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.

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. For child health, the mothers/caregivers were asked to recall the number of episodes/frequencies and reported if the incident took place daily, more than a week, about every week, about every month or the episode took place rarely or there was no incidence 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. 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 **Table3**.

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

Module	Description
	Grains
	Fruits and vegetables
	Other
	24-hour dietary recall
E: Respondent And Child's Physical Information	Respondent and child's physical information
	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 Sindh. 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 Karachi and a refresher training was conducted in Hyderabad 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 of implementation and response times. 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 March 5th, 2020 to March 22nd, 2020 (45 clusters) and the second round of survey was conducted from June 1st, 2020 to July 17th, 2020 (63 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 firewalls 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 (16).

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
Magnesium (mg) [d]	110	110	200	200
Potassium (mg)[AI,d]	2300	2300	2300	2500

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
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 2230 (rural: 1233; urban: 997) households of Sindh, of which 2222 households were occupied and 2157 households with children 5-9 years of age were interviewed with a response rate was 97.1%. The remaining 73 households could not be surveyed due to a lack of requisite security clearances and due to refusal to participate in the survey.

The households approached were from the cities of Hyderabad (n=492), Karachi (n=673), Larkana (n=287), Mirpur Khas (n=214), Shaheed Benazirabad (n=252) and Sukkur (n=239) (**Table 5**). The response rate was greater in the rural areas (97.6%) compared to the urban areas (96.5%) of Sindh. The response rate also varied by cities with highest response rate in S. Benazirabad (100%) and Larkana with 99% response rate.

Table 5: Number of interviews conducted in Sindh

		SINDH								
		Total	**Rural**	**Urban**	**Larkana**	**Sukkur**	**Hyderabad**	**Mirpur Khas**	**Karachi**	**S. Benazirabad**
Households (n)	**Sampled**	2230	1233	997	290	248	513	217	710	252
	Occupied	2222	1228	994	290	246	509	217	708	252
	Interviewed	2157	1198	959	287	239	492	214	673	252
	Household response rate (%)	97.1	97.6	96.5	99	97.2	96.7	98.6	95.1	100

Characteristics of heads of households

Most households were headed by men (97.6%), while female-headed households constituted only 2.4% of the sample. Majority of the male household heads were married (94.6%). The mean household size was 6.5±2.3. In most families, the heads were aged between 30 to 39 years of age (40.7) followed by 40 to 49 (39.2%) years of age (**Table 6**).

Among the interviewed households, 87% of the population comprised of Muslims, while minorities also included Hindus (12.5%) and Christians (0.4%). Sindhi (37.9%) and Urdu (19.5%) were the most spoken language among all.

Over half (51.6%) of all heads of households lacked any formal education. For the rest, 12.3% had a head who had attended primary school, 6% middle school, 13.9% secondary school and around 16.1% had acquired higher education. The most common occupations of heads of households

were unskilled manual labor (36.5%), and skilled manual labor (27.4%). Around 3.8% of the household heads were unemployed and 5% were retired.

Table 6: Characteristics of Household Heads

Demographics	Total	Rural	Urban
	Mean ± SD n (%)		
Number of households/ children	2157	1198	959
Mean household size	6.5 ± 2.3	6.6 ± 2.3	6.4 ± 2.3
Sex of household head			
Male	2105 (97.6)	1178 (98.3)	927 (96.5)
Female	52 (2.4)	20 (1.7)	32 (3.5)
Age of household head			
15-19	1 (0.1)	1 (0.1)	0 (0.0)
20-29	146 (7.2)	97 (8.0)	49 (5.8)
30-39	861 (40.7)	475 (40.7)	386 (40.6)
40-49	846 (39.2)	488 (40.4)	358 (37.1)
50-59	202 (8.7)	103 (7.8)	99 (10.2)
60-69	56 (2.3)	22 (1.9)	34 (3.0)
70-79	30 (1.2)	8 (0.8)	22 (1.9)
80+	15 (0.7)	4 (0.4)	11 (1.2)
Marital status of household head			
Married	2035 (94.6)	1145 (95.6)	890 (92.8)
Unmarried	12 (0.6)	6 (0.6)	6 (0.6)
Widowed	109 (4.8)	47 (3.8)	62 (6.4)
Divorced/Separated	1 (0.1)	0 (0.0)	1 (0.2)
Language spoken			
Punjabi	63 (2.6)	-	-
Hindko	82 (4.5)	-	-
Siraiki	353 (15.9)	-	-
Urdu	467 (19.5)	-	-
Balochi	172 (7.6)	-	-
Sindhi	758 (37.9)	-	-
Pashto	73 (2.2)	-	-
Kutchi	11 (0.4)	-	-
Gujrati	23 (1.1)	-	-
Dhatki	69 (3.6)	-	-
Other	86 (4.6)	-	-
Religion			
Muslim	1938 (87.0)	-	-
Christian	10 (0.4)	-	-
Hindu	208 (12.5)	-	-

Demographics	Total	Rural	Urban
	Mean ± SD n (%)		
Sikh	1 (0.0)	-	-
Education of household head			
None	1100 (51.6)	649 (53.5)	451 (48.4)
Primary	266 (12.3)	151 (12.4)	115 (12.1)
Middle	128 (6.0)	73 (6.3)	55 (5.4)
Secondary	304 (13.9)	158 (13.2)	146 (15.1)
Higher	355 (16.1)	167 (14.6)	188 (18.7)
Missing/DK	4 (0.2)	0 (0.0)	4 (0.4)
Occupation of household head			
Housewife	44 (1.9)	15 (1.2)	29 (3.1)
Professional/Managerial	176 (7.5)	73 (5.9)	103 (10.1)
Clerical/Technical	27 (1.2)	15 (1.2)	12 (1.1)
Sales and services	166 (8.0)	73 (6.7)	93 (10.3)
Skilled manual	590 (27.4)	316 (26.4)	274 (29.2)
Unskilled manual	775 (36.5)	519 (43.0)	256 (25.2)
Business	152 (7.0)	69 (5.5)	83 (9.6)
Student	5 (0.3)	2 (0.3)	3 (0.3)
Unemployed	81 (3.8)	43 (3.8)	38 (4.0)
Retired	113 (5.0)	55 (4.4)	58 (5.9)
Teacher	28 (1.4)	18 (1.5)	10 (1.2)

Housing characteristics

About 87.2% of households indicated that they had an electricity connection in their dwelling. With regard to flooring materials, 63.9% of households had finished flooring, with greater proportion in urban areas (84.5%) compared to rural areas (51.9%). Natural flooring was more prevalent in rural areas (46.7%) compared to urban areas (15.3%) in Sindh (**Table 7**).

Finished roofing was found in almost 71.8% of dwellings of Sindh. Similar to finished floors, the proportion of finished roofs was higher in urban (87.4%) households compared to rural households (62.7%). Likewise, finished external walls were more common (80.3%) than rudimentary or natural walls in urban areas of Sindh.

At the regional level, the greatest proportion (58%) of respondents reported having one room for sleeping purposes in their households. A small proportion in Sindh (33%) utilized two rooms for sleeping. About 9% of the respondents reported using three or more rooms for sleeping of which majority were from urban areas (12.2%) of Sindh.

The majority (78.7%) reported that they cooked within the premises of their home. Outdoor cooking was more common in rural areas (20.7%) of Sindh. LPG/ natural gas (45.5%) and wood

(45.3%) were the most commonly used fuels for cooking. Solid fuels were most commonly used in rural areas (69.2%) of Sindh and in cities likes Mirpurkhas (94.5%) and Larkana (81.5%).

Table 7: Housing Characteristics

Housing Characteristics	SINDH n (%)		
	Total	Rural	Urban
Number of households	2157	1198	959
Electricity Connection			
Yes	1895 (87.2)	986 (82.6)	909 (94.9)
Flooring			
Natural floor	691 (35.1)	540 (46.7)	151 (15.3)
Rudimentary floor	20 (0.9)	18 (1.4)	2 (0.2)
Finished floor	1446 (63.9)	640 (51.9)	806 (84.5)
Other	0 (0.0)	0 (0.0)	0 (0.0)
Roof			
Natural roofing	104 (4.7)	76 (5.6)	28 (3.1)
Rudimentary roofing	457 (23.5)	362 (31.8)	95 (9.5)
Finished roofing	1595 (71.8)	760 (62.7)	835 (87.4)
Other	1 (0.0)	0 (0.0)	1 (0.1)
Exterior walls			
Natural walls	104 (4.7)	76 (5.6)	28 (3.1)
Rudimentary walls	606 (31.7)	453 (40.5)	153 (16.5)
Finished walls	1446 (63.7)	669 (53.9)	777 (80.3)
Other	1 (0.0)	0 (0.0)	1 (0.1)
Rooms used for sleeping			
1	1184 (58.0)	749 (64.5)	435 (47.0)
2	753 (33.0)	360 (28.5)	393 (40.8)
3 or more	220 (9.0)	89 (7.0)	131 (12.2)
Place for cooking			
In the house	1714 (78.7)	879 (74.1)	835 (86.7)
In a separate building	107 (4.9)	64 (5.2)	43 (4.4)
Outdoors	336 (16.4)	255 (20.7)	81 (8.9)
Other	0 (0.0)	0 (0.0)	0 (0.0)
Cooking fuel			
LPG/natural gas/biogas	1080 (45.5)	374 (30.6)	706 (71.0)
Coal/lignite	1 (0.0)	1 (0.0)	0 (0.0)
Charcoal	152 (7.7)	105 (8.8)	47 (5.8)
Wood	898 (45.3)	699 (58.7)	199 (22.5)
Agricultural Crop Residue	2 (0.1)	1 (0.1)	1 (0.1)
Animal dung	22 (1.2)	17 (1.7)	5 (0.5)
Other	2 (0.1)	1 (0.1)	1 (0.1)
Solid fuel for cooking	1075 (54.4)	823 (69.2)	252 (28.9)

Household and personal assets

The possession of television (57.9%) and refrigerators (44.4%) was greater amongst the other assets and this result was consistent throughout the other cities of Sindh. As expected, 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 surpassed any other asset with an overall rate of more than 87.7% regionwide. This was followed by possession of watches (60%) and motorcycles or scooters (51.4%) (**Table 8**).

Agricultural land ownership was highest in Sukkur (24.5%), and Mirpur Khas (20.4%) and lowest in Karachi with only 0.2%. Ownership of farm animals and/or livestock was 44.9% in Mirpur Khas, 38.7% in Sukkur, 34.1% in S. Benazirabad, 31.4% in Hyderabad, whereas in the rest of the regions ownership ranged from 14.7% to 1.9%. Ownership of a dwelling by a household member was high in all cities of Sindh, exceeding 98.2% (and as high as 100% in Mirpur Khas), except in Karachi where it was 77.5%. Ownership was higher in rural (93.5%) than urban (86%) areas of Sindh.

Table 8: Household and personal assets

Household and Personal Assets	SINDH n (%)		
	Total	Rural	Urban
Number of households	2157	1198	959
Percentage of households that own a:			
Radio	75 (3.7)	42 (3.5)	33 (4.1)
Television	1290 (57.9)	566 (47.3)	724 (76.1)
Landline phone	77 (3.5)	27 (2.1)	50 (5.8)
Refrigerator	1029 (44.4)	407 (33.2)	622 (63.6)
Air conditioner	188 (8.0)	41 (3.9)	147 (15.1)
Computer/laptop	230 (8.9)	66 (4.9)	164 (15.8)
Internet connection	255 (10.2)	82 (6.6)	173 (16.3)
Percentage of households that owns a:			
Agricultural land	239 (11.3)	171 (13.8)	68 (7.0)
Any livestock	479 (23.5)	381 (31.6)	98 (9.7)
Percentage of households where at least one member owns or has a			
Watch	1350 (60.0)	675 (54.5)	675 (69.3)
Mobile Phone	1897 (87.7)	1022 (85.7)	875 (91.2)
Bicycle	213 (9.2)	105 (8.7)	108 (10.0)
Motorcycle or scooter	1151 (51.4)	577 (46.6)	574 (59.6)
Animal-drawn cart	112 (5.3)	82 (6.9)	30 (2.6)
Car or truck or bus	64 (3.2)	28 (2.8)	36 (3.7)
Tractor	19 (1.1)	16 (1.5)	3 (0.4)
Boat with a motor	10 (0.5)	7 (0.6)	3 (0.3)
Boat without motor	19 (0.9)	9 (0.9)	10 (1.0)
Bank account	442 (19.8)	220 (18.6)	222 (22.0)
Ownership of dwelling			
Own	1940 (90.7)	1120 (93.5)	820 (86.0)
Rent	207 (8.7)	68 (5.5)	139 (14.0)
Other	10 (0.6)	10 (1.0)	0 (0.0)

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 equally divided into quintiles. Overall, 429 children belonged to poorest quintile, 419 to poor, 427 to middle, 424 to rich, and 427 children in Sindh belonged to the richest quintile.

Water, sanitation, and hygiene (WASH)

Lack of safe drinking water and sanitation have 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, 95.2% (rural: 95.3%; urban: 95%) of the households were using an improved source of drinking water, while most the cities of Sindh had > 90% access to improved sources, Mirpur Khas (80.7%) had lower rates of access.

For improved source of drinking water, 37.9% of the households used handpumps and 35% of the households used water piped into the dwelling (**Table 9**). People reported to receive clear and sweet drinking water at the time of collection.

Table 9: Household use of improved water sources

	Use of improved water sources n (%)																
	Piped into dwelling	Piped to yard/plot	Piped to neighbor	Public tap/stand pipe	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
SINDH	774 (35.0)	29 (1.5)	37 (1.6)	55 (2.7)	48 (2.0)	199 (10.2)	787 (37.9)	2 (0.1)	11 (0.5)	2 (0.0)	48 (1.7)	3 (0.1)	52 (2.5)	110 (4.1)	0 (0.0)	2043 (95.2)	2157
Sindh Rural	333 (28.8)	18 (1.8)	21 (1.6)	47 (3.7)	6 (0.7)	105 (10.3)	569 (46.2)	2 (0.2)	2 (0.2)	0 (0.0)	15 (1.0)	2 (0.2)	45 (3.3)	33 (2.0)	0 (0.0)	1134 (95.3)	1198
Sindh Urban	441 (45.6)	11 (1.0)	16 (1.7)	8 (0.9)	42 (4.3)	94 (10.0)	218 (23.6)	0 (0.0)	9 (1.1)	2 (0.1)	33 (2.8)	1 (0.1)	7 (1.0)	77 (7.8)	0 (0.0)	909 (95.0)	959
Division																	
Larkana	50 (21.0)	2 (0.8)	3 (0.8)	11 (2.3)	1 (0.2)	17 (7.9)	185 (63.3)	0 (0.0)	2 (0.6)	0 (0.0)	3 (0.5)	0 (0.0)	0 (0.0)	13 (2.7)	0 (0.0)	282 (98.9)	287
Sukkur	73 (28.5)	6 (2.6)	8 (2.7)	7 (2.8)	1 (0.8)	30 (13.8)	112 (48.1)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)	239 (100.0)	239
Hyderabad	84 (20.5)	6 (1.1)	14 (2.7)	20 (3.9)	21 (3.9)	95 (20.0)	211 (39.1)	1 (0.1)	0 (0.0)	0 (0.0)	4 (1.2)	2 (0.4)	24 (3.6)	10 (3.5)	0 (0.0)	462 (94.7)	492
Mirpur Khas	35 (15.6)	0 (0.0)	2 (0.7)	4 (3.1)	2 (1.0)	23 (8.9)	100 (49.0)	0 (0.0)	9 (3.4)	0 (0.0)	9 (3.4)	1 (0.4)	25 (12.2)	4 (2.4)	0 (0.0)	170 (80.7)	214
Karachi	504 (77.2)	15 (3.1)	8 (1.5)	12 (2.5)	17 (2.1)	2 (0.6)	0 (0.0)	1 (0.4)	0 (0.0)	1 (0.1)	31 (3.2)	0 (0.0)	1 (0.1)	81 (9.3)	0 (0.0)	641 (96.7)	673
S. Benazirabad	28 (10.2)	0 (0.0)	2 (0.8)	1 (0.5)	6 (2.2)	32 (13.8)	179 (70.4)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)	0 (0.0)	2 (1.1)	1 (0.4)	0 (0.0)	249 (98.3)	252

Table 10 shows the commonly utilized methods of water treatment reported by the households. Overall, 88.1% households did not treat water to make it safer, with more than 93.4% of the rural households did not treat their water. Urban households were more likely to use a water treatment method. The most frequently employed technique was boiling, followed by use of a filter, and straining through a cloth. The methods used for treating water in Sindh included: boiling: 6.8%; strain through a cloth: 2.2%; water filter: 2%; chlorination: 0.8%; solar disinfection: 0.8%; and let it stand and settle: 0.1%. People using an improved source of drinking water were less likely to treat it.

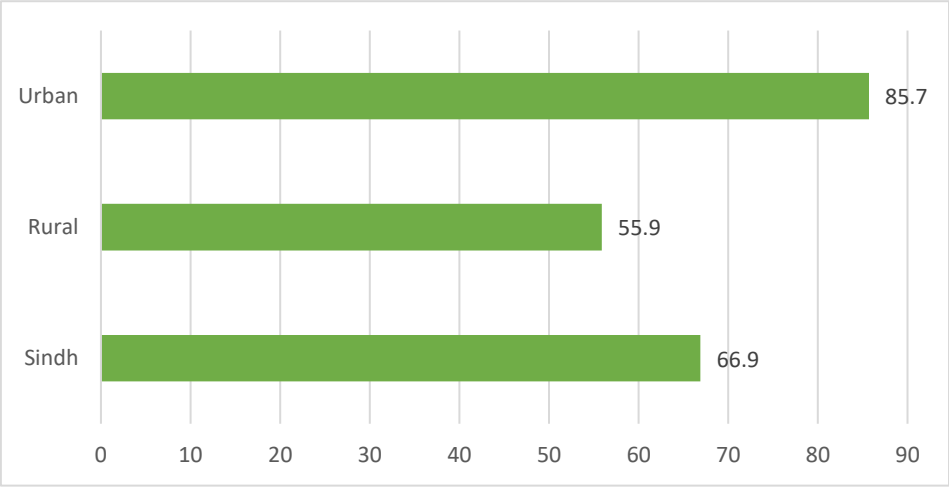
Table 10: Household water treatment

	Water treatment method used in the household n (%)								
	None	Boil	Add bleach/chlorine	Strain through a cloth	Use water filter	Solar disinfection	Let it stand and settle	Other specify	Number of households
SINDH	1875 (88.1)	162 (6.8)	18 (0.8)	51 (2.2)	50 (2.0)	1 (0.8)	0 (0.1)	0 (2.2)	2157
Sindh Rural	1110 (93.4)	35 (3.0)	5 (0.4)	29 (1.9)	19 (1.4)	0 (0.4)	0 (0.5)	0 (1.9)	1198
Sindh Urban	765 (79.1)	127 (13.4)	13 (1.6)	22 (2.6)	31 (3.1)	1 (1.6)	0 (0.5)	0 (2.6)	959
Division									
Larkana	286 (99.8)	0 (99.8)	0 (3.8)	1 (0.2)	0 (0.3)	0 (0.0)	0 (0.8)	0 (0.2)	287
Sukkur	220 (92.1)	7 (2.9)	4 (1.5)	8 (3.5)	0 (0.2)	0 (1.5)	0 (0.7)	0 (3.5)	239
Hyderabad	452 (90.6)	12 (3.4)	4 (0.8)	23 (4.7)	1 (0.5)	0 (0.8)	0 (0.5)	0 (4.7)	492
Mirpur Khas	199 (94.3)	3 (1.1)	4 (1.7)	7 (2.2)	1 (0.8)	0 (1.7)	0 (0.7)	0 (2.2)	214
Karachi	478 (71.8)	134 (19.8)	0 (2.1)	12 (1.5)	48 (6.6)	1 (0.0)	0 (0.7)	0 (1.5)	673
S. Benazirabad	240 (95.6)	6 (2.0)	6 (2.5)	0 (2.0)	0 (0.2)	0 (2.5)	0 (0.8)	0 (0.0)	252

Sanitation

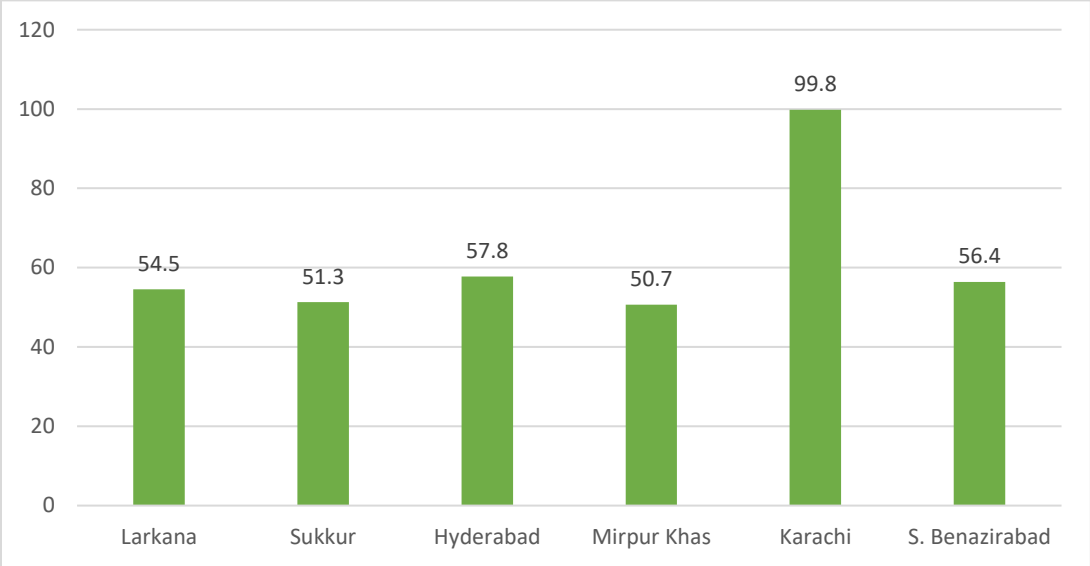
About 66.9% of households in Sindh had access to improved sanitation facilities including flushed to piped sewer system, septic tank, pit latrine, ventilated improved latrine and pit latrine with a slab. Only 55.9% of the households in rural areas used an improved facility as compared to households in urban settings (85.7%) (**Figure 5**).

Figure 5: Households using improved sanitation facilities (%)



The percentage of households with access to an improved sanitation facility was greatest in Karachi (99.8%) and lowest in Mirpur Khas (50.7%), Sukkur (51.3%), Larkana (54.4%), S.Benazirabad (56.4%) and Hyderabad (57.8%) (**Figure 6**).

Figure 6: Households using improved sanitation facilities by cities (%)



Flushed to sewer system (41.7%) was the most commonly used improved sanitation method. Only 29.1% of rural respondents reported using flush to piped sewer system. More rural respondents reported having no facility at all, or using bushes/open fields, compared to their urban counterparts.

Around 20.7% of households practiced open defecation. This was more common in rural areas (30.1%) than urban (4.5%). Amongst the cities of Sindh, Mirpur Khas (38.1%) had the highest rate of open defecation, followed by Hyderabad (31%) and Sukkur (23.4%) (**Table 11**). There was no practice of open defecation reported in Karachi. Open defecation is particularly harmful for women and girls, as they tend to go out at night, which exposes them to a heightened risk of gender-based violence.

Table 11: Household sanitation facilities

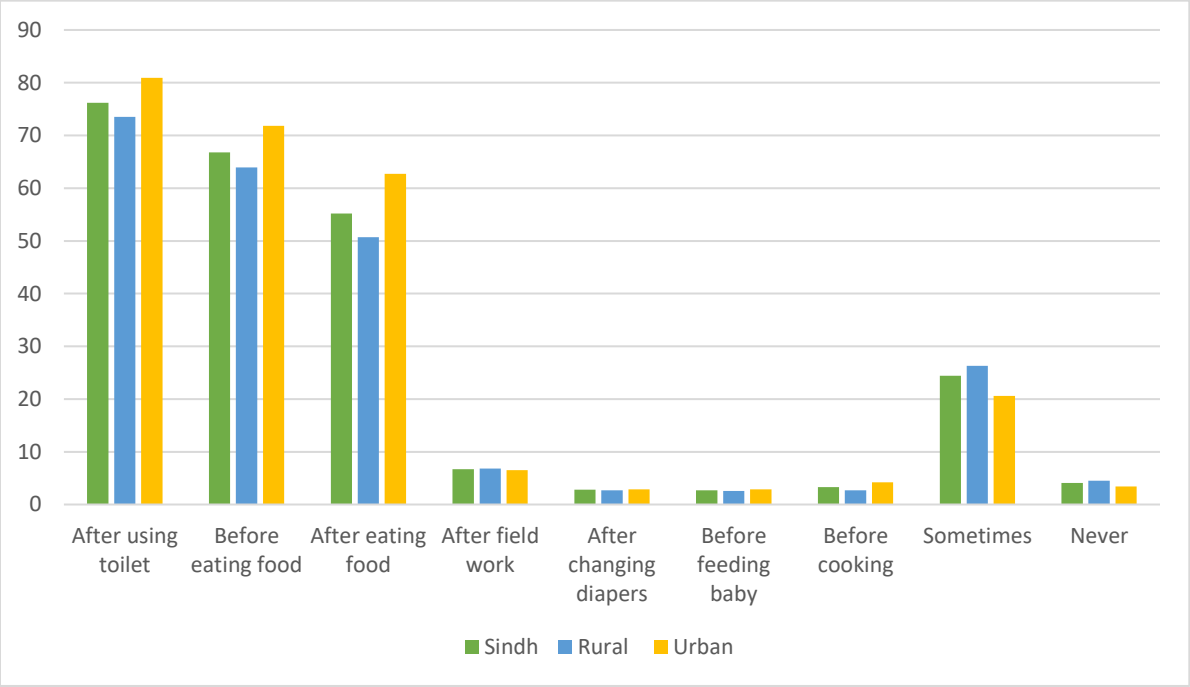
	Types of sanitation facilities n (%)												
	Flush to piped sewer system	Flush to septic tank	Flush to soakage pit latrine	Flush to somewhere else	Flush to unknown place/Not sure/DK where	Ventilated improved PIT latrine	PIT latrine with slab	PIT latrine without slab/open pit	Composting toilet	No facility/ bush/field/OD	Other	Improved sanitation facility	Number of households
SINDH	985 (41.7)	104 (4.8)	154 (7.9)	11 (0.7)	20 (0.7)	135 (7.6)	73 (4.3)	137 (6.6)	102 (5.0)	435 (20.7)	1 (0.0)	1471 (66.9)	2157
Sindh Rural	363 (29.1)	46 (3.9)	101 (9.0)	10 (0.9)	9 (0.5)	73 (7.4)	62 (6.0)	93 (7.7)	62 (5.2)	378 (30.1)	1 (0.0)	654 (55.9)	1198
Sindh Urban	622 (63.1)	58 (6.2)	53 (6.1)	1 (0.3)	11 (1.0)	62 (8.0)	11 (1.3)	44 (4.8)	40 (4.7)	57 (4.5)	0 (0.0)	817 (85.7)	959
Division													
Larkana	45 (15.1)	12 (4.7)	31 (12.7)	1 (0.7)	1 (0.3)	34 (14.8)	16 (6.9)	41 (15.6)	28 (9.7)	78 (19.4)	0 (0.0)	139 (54.5)	287
Sukkur	16 (8.4)	11 (4.2)	43 (18.1)	1 (0.8)	2 (0.7)	15 (5.6)	33 (14.2)	51 (21.7)	7 (2.9)	60 (23.4)	0 (0.0)	120 (51.3)	239
Hyderabad	165 (33.8)	35 (7.1)	28 (6.6)	7 (1.7)	14 (2.1)	33 (6.3)	7 (2.1)	25 (5.1)	23 (4.0)	154 (31.0)	1 (0.0)	282 (57.8)	492
Mirpur Khas	45 (19.7)	9 (3.0)	28 (11.8)	0 (3.0)	1 (0.3)	29 (13.7)	5 (2.2)	0 (0.0)	26 (11.1)	71 (38.1)	0 (0.0)	117 (50.7)	214
Karachi	650 (94.4)	13 (2.2)	1 (0.4)	0 (2.2)	0 (10.1)	1 (0.4)	7 (2.5)	1 (0.2)	0 (0.4)	0 (0.0)	0 (0.0)	672 (99.8)	673
S. Benazirabad	64 (23.5)	24 (8.7)	23 (8.5)	2 (0.7)	2 (0.5)	23 (13.2)	5 (2.1)	19 (5.3)	18 (8.3)	72 (29.3)	0 (0.0)	141 (56.4)	252

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 Sindh, 76.2% (rural: 73.5%; urban: 80.9%) of the women reported washing hands with soap/detergent after using toilet. Likewise, 66.8% women usually washed hands before eating food and 55.2% women reported hand washing practice after eating food. Only 2.8% women washed her hand after changing diapers or after cleaning the baby and only 3.3.% women washed hands before cooking. The handwashing practices in rural and urban areas was more or less similar (**Figure 7**).

Figure 7: Handwashing practices soap/detergent in Sindh (%)



At regional level 96.2% (rural: 95.8%; urban: 96.9%) of the households had no specific place for washing hands in their dwelling, plot, or yard. Seventy-one percent of the households in Sindh had water and soap for handwashing. Apart from water, 13.6% of the households had no cleaning agent to wash hands. This was more prevalent in rural areas (16.7%) compared to urban areas (8.2%) of Sindh (**Table 12**).

Table 12: Availability of water and soap for handwashing

	Where place for handwashing was observed	With no specific place for handwashing in the dwelling, yard, or plot	Number of households	Place for handwashing observed n (%)							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	
SINDH	2157 (32.8)	2064 (96.2)	2157	1536 (71.0)	34 (1.6)	241 (13.6)	70 (3.5)	9 (0.4)	174 (9.0)	23 (1.0)	2087
Sindh Rural	1198 (20.7)	1139 (95.8)	1198	746 (63.3)	27 (2.3)	172 (16.7)	42 (3.5)	8 (0.6)	144 (12.2)	22 (1.4)	1161
Sindh Urban	959 (12.1)	925 (96.9)	959	790 (84.2)	7 (0.5)	69 (8.2)	28 (3.4)	1 (0.1)	30 (3.4)	1 (0.1)	926
Division											
Larkana	287 (5.2)	274 (96.7)	287	158 (57.2)	4 (1.1)	59 (23.0)	14 (5.7)	2 (1.1)	37 (11.2)	3 (0.7)	277
Sukkur	239 (3.5)	232 (97.0)	239	147 (64.6)	8 (2.5)	47 (20.9)	12 (4.0)	3 (0.8)	15 (5.2)	4 (2.0)	236
Hyderabad	492 (7.8)	468 (95.6)	492	338 (72.5)	15 (3.0)	46 (10.6)	26 (5.0)	2 (0.3)	41 (7.7)	4 (0.8)	472
Mirpur Khas	214 (3.9)	209 (96.5)	214	121 (52.3)	4 (2.4)	33 (18.2)	11 (5.2)	1 (0.5)	39 (21.3)	0 (2.3)	209
Karachi	673 (8.8)	646 (96.6)	673	613 (93.2)	0 (93.2)	27 (5.1)	1 (0.1)	0 (9.5)	5 (1.2)	2 (0.3)	648
S. Benazirabad	252 (3.5)	235 (94.5)	252	159 (59.6)	3 (1.6)	29 (14.5)	6 (2.7)	1 (0.3)	37 (18.2)	10 (3.2)	245

Household food security

About 37.4% of the surveyed households were food secure, 34.1% faced severe food insecurity, 16.3% faced moderate and 12.1% faced mild food insecurity (**Table 13**). Household food insecurity was greater amongst children from rural areas (41.9% severe food insecurity, 30.5% food secure) as compared to urban areas (20.9% severe food insecurity, 49.3% food secure) (**Figure 8**). More than 50% of all the cities across Sindh, except Karachi, had moderate to severe food insecurity. Karachi was the only city with over 50% households that were food secure (58.2%).

Majority of the households (82.9%) had no external financial support from the government or from other entities. Only 17.1% 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 Sindh (%)

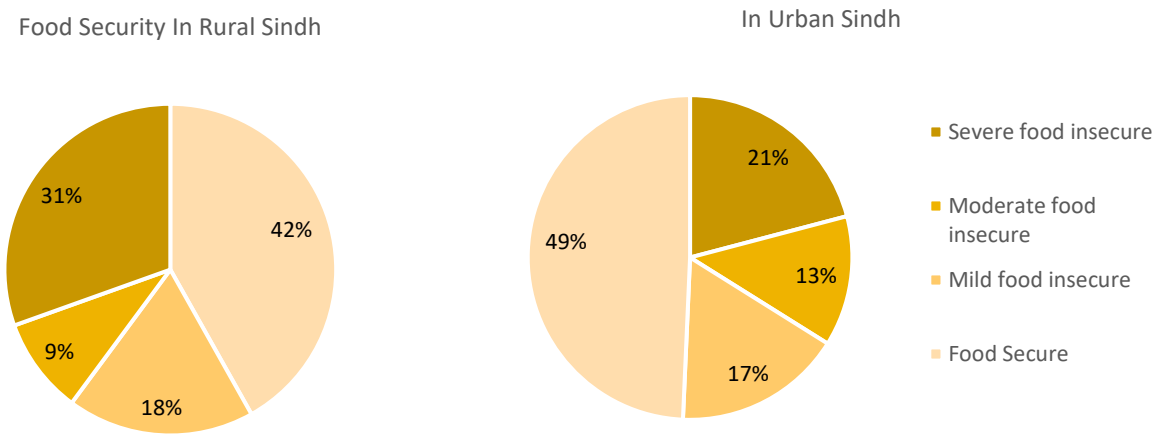


Table 13: Food insecurity status of households in Sindh

	Food Insecurity Status n (%)			
	Severe food insecure	Moderate food insecure	Mild food insecure	Food Secure
SINDH	686 (34.1)	342 (16.3)	271 (12.1)	856 (37.4)
Division				
Larkana	139 (51.2)	47 (16.5)	12 (3.7)	89 (28.6)
Sukkur	107 (41.4)	52 (22.0)	25 (11.4)	54 (25.2)
Hyderabad	214 (41.5)	86 (18.5)	69 (15.1)	123 (24.9)
Mirpur Khas	85 (44.5)	32 (15.0)	17 (6.8)	80 (33.7)
Karachi	67 (10.9)	79 (12.4)	121 (18.5)	405 (58.2)
S. Benazirabad	74 (32.2)	46 (16.8)	27 (8.7)	105 (42.3)

Household dietary diversity and source assessment

Among the surveyed households with school-age children, 6.7% of the households had lowest dietary diversity (consumption of ≤ 3 food groups), 24.1% had medium dietary diversity

(consumption of 4–5 food groups) and 69.3% had high dietary diversity (consumption of ≥ 6 food groups) according to food consumed in the last 24 hours. 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 (74.8%) compared to rural areas (66.1%). Over 50% households from all the included cities in Sindh had high dietary diversity, with 67.6% in Larkana, 58.7% in Sukkur, 73.9% in Hyderabad, 60.8% in Mirpur Khas, 73.3% in Karachi and 71.4% in S.Benazirabad (**Table 14**).

Table 14: Household dietary diversity

	Household Dietary Diversity n (%)		
	Lowest dietary diversity (≤ 3 food groups)	Medium dietary diversity (4 and 5 food groups)	High dietary diversity (≥ 6 food groups)
SINDH	143 (6.7)	500 (24.1)	1514 (69.3)
Sindh Rural	82 (6.5)	318 (27.4)	798 (66.1)
Sindh Urban	61 (6.9)	182 (18.3)	716 (74.8)
Division			
Larkana	30 (8.8)	65 (23.5)	192 (67.7)
Sukkur	31 (12.6)	72 (28.8)	136 (58.7)
Hyderabad	20 (3.2)	115 (22.9)	357 (73.9)
Mirpur Khas	17 (8.0)	61 (31.2)	136 (60.8)
Karachi	40 (7.1)	125 (19.6)	508 (73.3)
S. Benazirabad	5 (2.5)	62 (26.1)	185 (71.4)

Child Profile

Sample characteristics

Table 15 provides the background characteristics for sampled children aged 5-9 months at regional and district levels. Overall sample included 2157 children of which 1198 (55.5%) participants were from rural and 959 (44.5%) of the participants were from the urban areas of Sindh. Of the total sample, 50.2% were boys and 49.8% were girls. The mean age of the included participants was 7.6 ± 1.5 years. Of the total sample, most of the children were from Karachi (31.2%) and least from Mirpur Khas (9.9%).

Table 15: Child characteristics

Child characteristics	n (%) Mean ± SD
SINDH	2157
Sindh Rural	1198 (55.5)
Sindh Urban	959 (44.5)
Division	

Child characteristics	n (%) Mean ± SD
Larkana	287 (13.2)
Sukkur	239 (11.1)
Hyderabad	492 (22.8)
Mirpur Khas	214 (9.9)
Karachi	673 (31.2)
S. Benazirabad	252 (11.7)
Gender	**2157**
Male	1095 (50.2)
Female	1062 (49.8)
Mean age	7.6 ± 1.5
Age	
5 Years	262 (12.1)
6 Years	471 (21.8)
7 Years	498 (23.3)
8 Years	533 (24.9)
9 Years	393 (17.9)

Schooling

In Sindh, 65.3% children had ever attended school, of whom 99.6% of the children were currently attending schools and only 3.2% 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 (54.8%), lack of female teachers in the school (5.4%), and unavailability of boarding schools (4.1%).

About 53.8% children went to public school, 44.5% went to private school, while the rest studied from Trusts/non-government organizations (NGOs) (1.3%) and Madrassas (religious schools) (0.4%). The main language of instruction in schools of Sindh was Sindhi (58.2%), Urdu (31.6%), and English (10.2%).

The survey showed that the time of commute to schools ranged from less than a minute to maximum 29 minutes. It took about less a minute to 32.3% of children to get to/from school, while it took 10 to 19 minutes to 26.5% of children to get to/from school, and it took 20 to 29 minutes to 23.8% to get to/from school (**Table 16**).

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

Schooling	n (%)
	2157
Ever attended school	
Yes	1440 (65.3)
No	717 (34.7)
Reasons for never attending school	
Domestic household chores unpaid	8 (0.9)
Child works for household unpaid	4 (0.5)
Child work for cash or food	4 (0.6)
Early girl marriage	3 (0.3)
No girl school/no female teacher available	42 (6.6)
No boarding school available	142 (19.6)
Not interested	434 (64.4)
Other	172 (21.1)
Type of school child attended	
Private	686 (44.5)
Public.	729 (53.8)
Madrassa	7 (0.4)
Trust (NGO)	17 (1.3)
Other specify	1 (0.1)
Currently attending school	
Yes	1435 (99.6)
No	5 (0.4)
Missed school for at least 1 month in last year	
Yes	45 (3.2)
No	1395 (96.8)
Main reason for not attending school regularly	
Domestic household chores unpaid	2 (4.9)
Child work for household unpaid	4 (7.0)
No girl school/no female teacher available	3 (5.4)
No boarding school available	3 (4.1)
Not interested	21 (54.8)
Other	12 (23.7)
Main language of instruction at school	
English	165 (10.2)
Urdu	505 (31.6)
Sindhi	770 (58.2)
Other	0 (0.0)
During school year, Child walk/ride bicycle to & from school	
0 days	593 (43.3)
1–2 days	130 (10.1)
3-4 days	717 (46.6)
5-6 days	593 (43.3)
During school year, Commute time (to get/from school)	

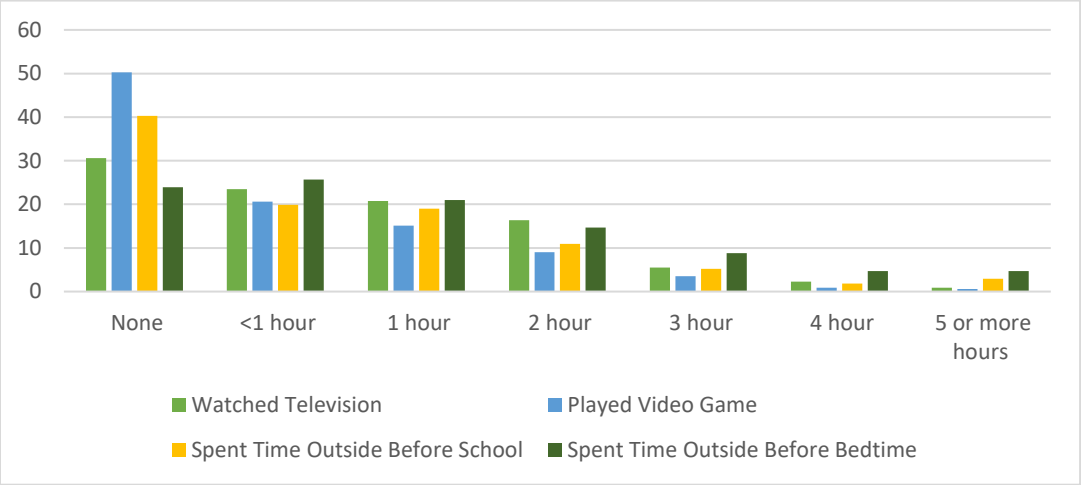
Schooling	n (%)
Less than 1 minute	444 (32.3)
10-29 minutes	746 (50.3)
30-49 minutes	211 (14.2)
50 or more minutes	39 (3.3)

Physical Activity and Sedentary Lifestyles among Children in School

On a school day, 30.6% of the children did not watch television, while 23.5% watched television for less than an hour, 20.8% watched for an hour, and 16.4% of the children watched television for two hours. About half of the surveyed children (50.3%) did not play video/ computer/tablets/mobile phone games or used a computer during the school days. About 20.6% of the children played games for less than an hour and 15.1% children played games for an hour on a school day (**Figure 9**).

Forty percent of children did not go outside before going to school, while 19.9% of children spent less than an hour and 19% children spent an hour outside before going to school. Twenty four percent of the children did not play outside the house on a school day before going to bed, while 25.7% of children played for less than an hour, and 20.8% children played for an hour before going to bed.

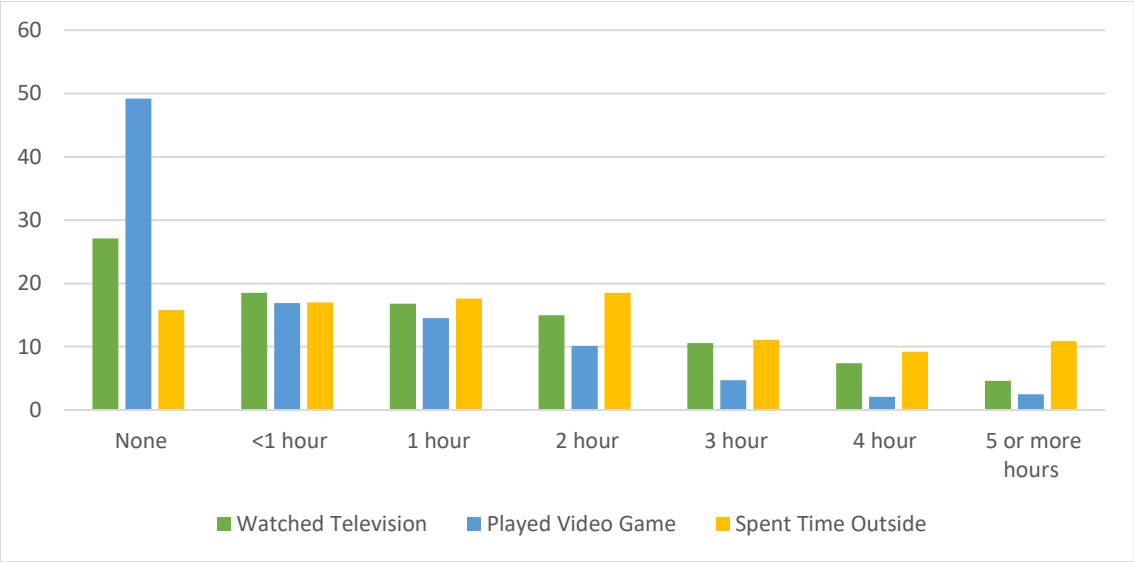
Figure 9: Physical activity and sedentary lifestyles during school days (%)



On a weekend, 27.1% of the children did not watch television, while 18.5% watched television for less than an hour, 16.8% watched for an hour, and 15% of the children watched television for two hours. Forty nine percent of the children did not play video/ computer/tablets/mobile phone games or used a computer on weekends. About 16.9% of the children played games and used computer (not for schoolwork) for less than an hour and 14.5% children played games for an hour on a weekend. Sixteen percent of the children did not spent time outside on a weekend, while 17% children spent less than an hour and 17.6% children spent an hour outside on a weekend (**Figure 10**).

The survey showed that the children were physically less active as about 59.2% of the children reported no physical activity of at least 60 minutes/day in last seven days. Only 9.3% children reported one day of physical activity of at least 60 minutes in the last seven days.

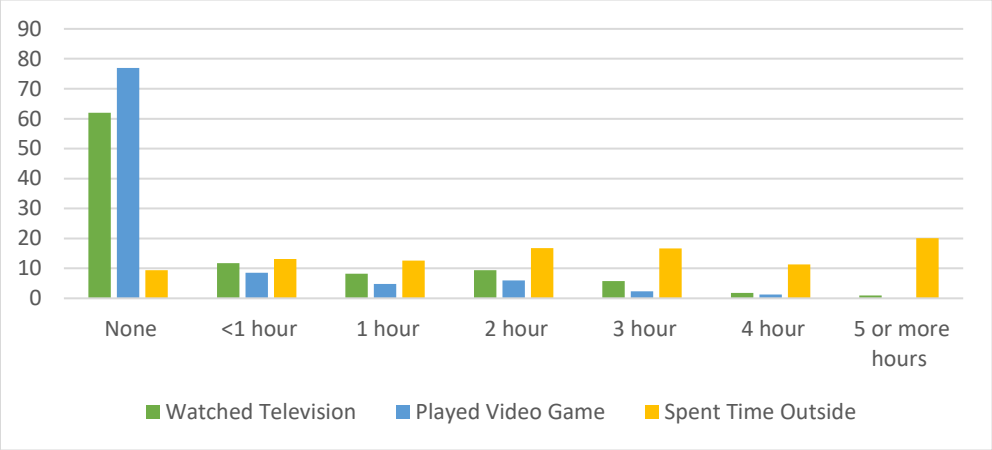
Figure 10: Physical activity on weekends (%)



Physical Activity and Sedentary Lifestyles among Children Out of School

Among the children who are out of school, 62% of the children did not watched television. Only 11.7% of the children watched television for less than an hour, 8.2% watched for an hour and 9.4% watched for at least two hours. Seventy seven percent of the children did not play video games. Only 8.5% children played video games for less than an hour and 6% of the children played for at least two hours. Majority of the children who were out of school spent their time outside. About 20.1% of the children spent their time outside for more than five hours (**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 Sindh was 33% with a slightly higher prevalence in boys (32.7%) than the girls (33.2%) (**Figure 12**). The prevalence was higher in rural (34.8%) than in urban areas (29.9%) (**Figure 13**). Stunting was lowest (19.9%) amongst children aged five years and highest (30.5%) amongst those aged nine years of age (**Table 17**). In contrast to other districts of Sindh, S. Benazirabad (45.3%), Larkana (39.6%), Sukkur (35.9%), and Hyderabad (33.3%) had the highest prevalence of stunted children.

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

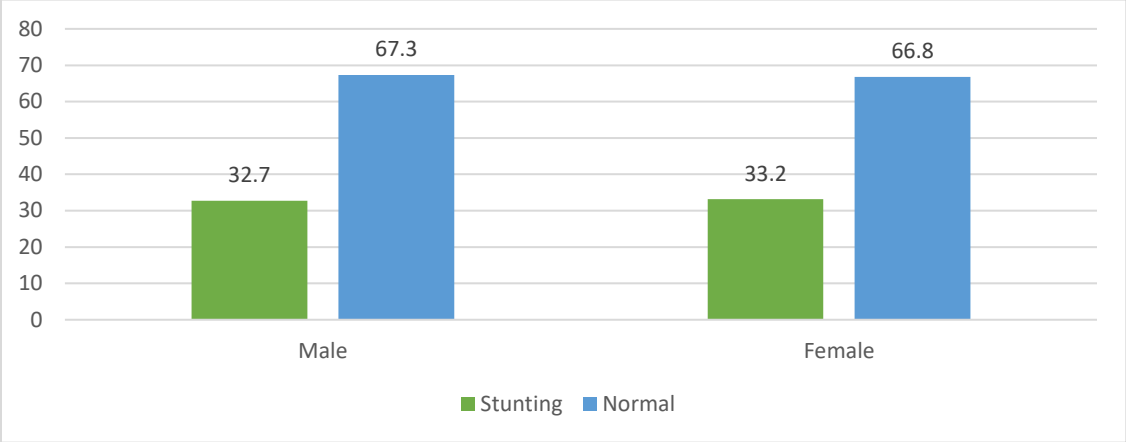


Figure 13: Prevalence of stunted children in Sindh- by setting (%)

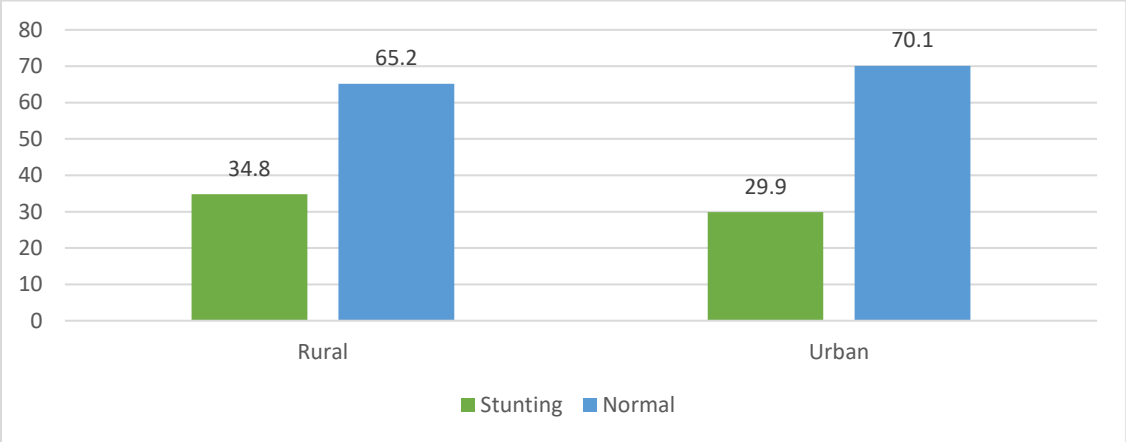


Table 17: Nutrition status of children – stunting

	Height for age n (%)	
	Normal (- ≥2SD)	Stunting (-<2SD)
Sindh	1766 (67.0)	875 (33.0)
Division		
Larkana	219 (60.4)	147 (39.6)
Sukkur	187 (64.1)	98 (35.9)
Hyderabad	394 (66.7)	203 (33.3)
Mirpur Khas	198 (72.0)	83 (28.0)
Karachi	600 (75.2)	208 (24.8)
S. Benazirabad	168 (54.7)	136 (45.3)
Gender		
Male	899 (67.3%)	434 (32.7%)
Female	867 (66.8%)	441 (33.2%)
Age		
5 Years	258 (76.1%)	80 (23.9%)
6 Years	429 (72.5%)	158 (27.5%)

	Height for age n (%)	
	Normal (- ≥2SD)	Stunting (-<2SD)
7 Years	368 (64.8%)	206 (35.2%)
8 Years	417 (65.6%)	226 (34.4%)
9 Years	294 (58.6%)	205 (41.4%)

Underweight

Underweight prevalence (exceeding minus two standard deviations) in Sindh was 22.7% (**Figure 14**) with slightly higher prevalence amongst girls (74%) than boys (68.2%) (**Figure 15**). Underweight prevalence was highest amongst children aged 9 years (20.4%) compared to children of other age groups. Underweight prevalence was highest in S. Benazirabad (28.1%), with least in Larkana (19%) (**Table 18**).

Figure 14: Prevalence of underweight children in Sindh- by gender (%)

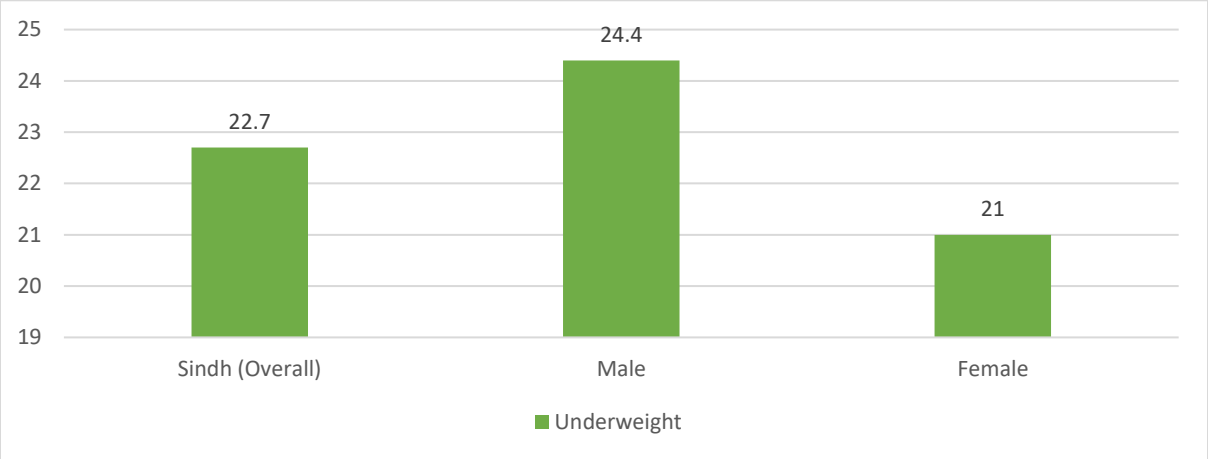


Figure 15: Prevalence of underweight children in Sindh- by setting (%)

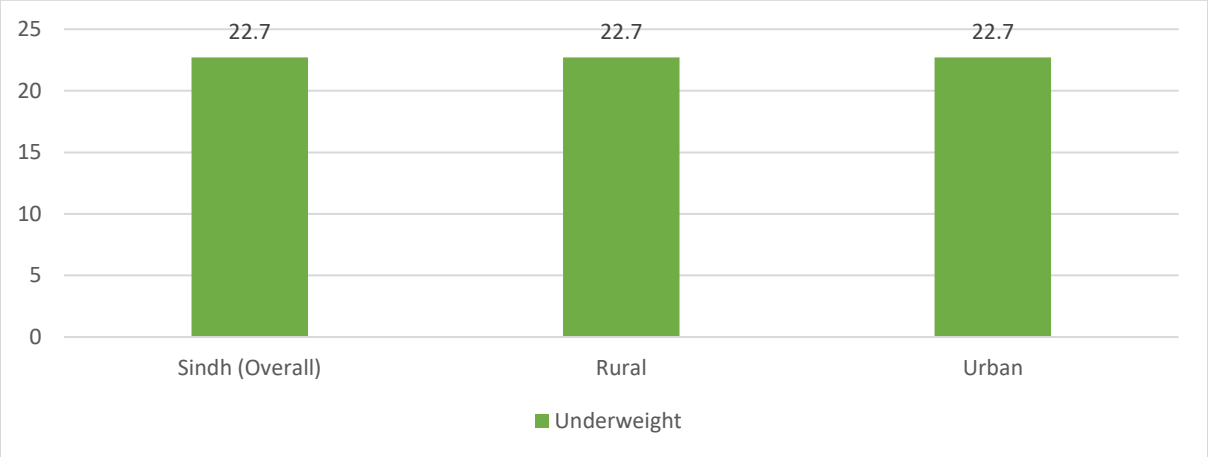


Table 18: Nutrition status of children – underweight

	BMI-for-age z-score % (n)	
	Underweight (- <2SD)	Normal (-2<BAZ<+1)
SINDH	614 (22.7)	1809 (71.1)
Division		
Larkana	72 (19.0)	284 (78.6)
Sukkur	60 (23.0)	209 (73.7)
Hyderabad	113 (19.3)	452 (77.0)
Mirpur Khas	78 (26.9)	198 (71.5)
Karachi	207 (23.8)	471 (62.0)
S. Benazirabad	84 (28.1)	195 (65.5)
Gender		
Male	336 (24.4%)	874 (68.2%)
Female	278 (21.0%)	935 (74.0%)
Age		
5 Years	61 (18.4%)	248 (75.4%)
6 Years	123 (20.8%)	405 (72.0%)
7 Years	126 (21.7%)	399 (70.9%)
8 Years	168 (24.3%)	436 (71.5%)
9 Years	136 (27.0%)	321 (66.8%)

Overweight/Obesity

The overweight/obesity prevalence among children 5-9 years was 6.2% with slightly higher prevalence amongst boys (7.4%) than girls (5%) (**Figure 16**). Prevalence was slightly higher in urban areas (7.6%) than in rural areas (5.4%) of Sindh (**Figure 17**). When looking at the age distribution, overweight/obesity prevalence was highest amongst children aged 9 years of age (8.2%) and lowest amongst those aged six years of age (6.8%). Overweight prevalence was found to be highest in Karachi (14.2%) and least in Mirpur Khas (1.6%) (**Table 19**).

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

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

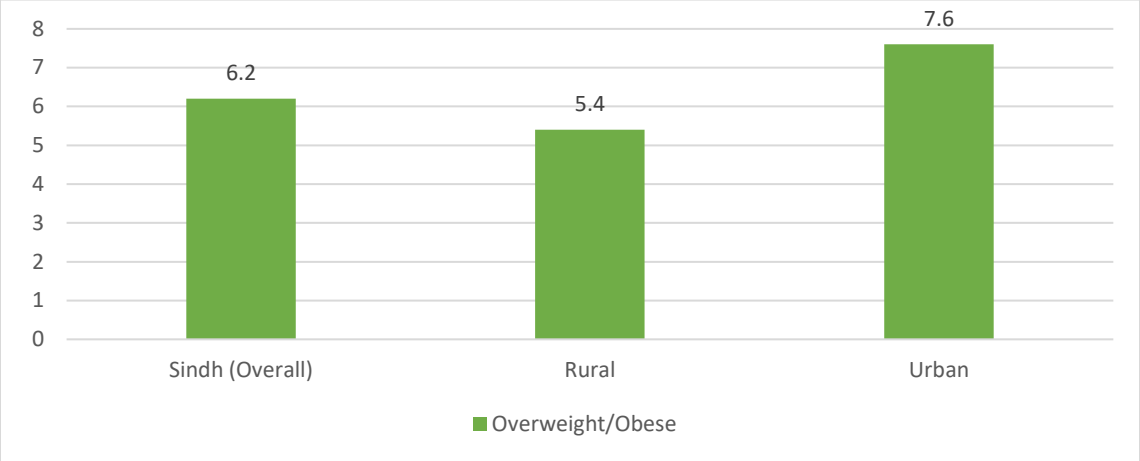


Table 19: Nutrition status of children – overweight/obesity

	BMI-for-age z-score % (n)	
	Normal (-2<BAZ<+1)	Overweight / Obese (+ 1SD)
SINDH	1809 (71.1)	190 (6.2)
Division		
Larkana	284 (78.6)	9 (2.4)
Sukkur	209 (73.7)	9 (3.3)
Hyderabad	452 (77.0)	27 (3.7)
Mirpur Khas	198 (71.5)	5 (1.6)
Karachi	471 (62.0)	120 (14.2)
S. Benazirabad	195 (65.5)	20 (6.4)
Gender		
Male	874 (68.2%)	107 (7.4%)
Female	935 (74.0%)	83 (5.0%)
Age		
5 Years	248 (75.4%)	26 (6.2%)
6 Years	405 (72.0%)	55 (7.2%)
7 Years	399 (70.9%)	44 (7.5%)
8 Years	436 (71.5%)	32 (4.3%)
9 Years	321 (66.8%)	33 (6.2%)

Anemia

We assessed the anemia status of children aged 5-9 years through the field spot hemoglobin test using the HemoCue equipment. The results revealed that 49.6% of the children were anemic with hemoglobin concentration <11 g/dl. Anemia prevalence was slightly higher (50.6%) among boys than girls (48.6%). Rural areas of Sindh had the higher prevalence of anemia (52.5%) compared to urban areas (44.4%) of Sindh (**Figure 18**). Anemia was found to be most prevalent among

children aged five (66.2%) and six (55.7%) years and the highest prevalence of anemic children was found in city of Larkana (56%) and S. Benazirabad (51.6%) (**Table 20**).

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

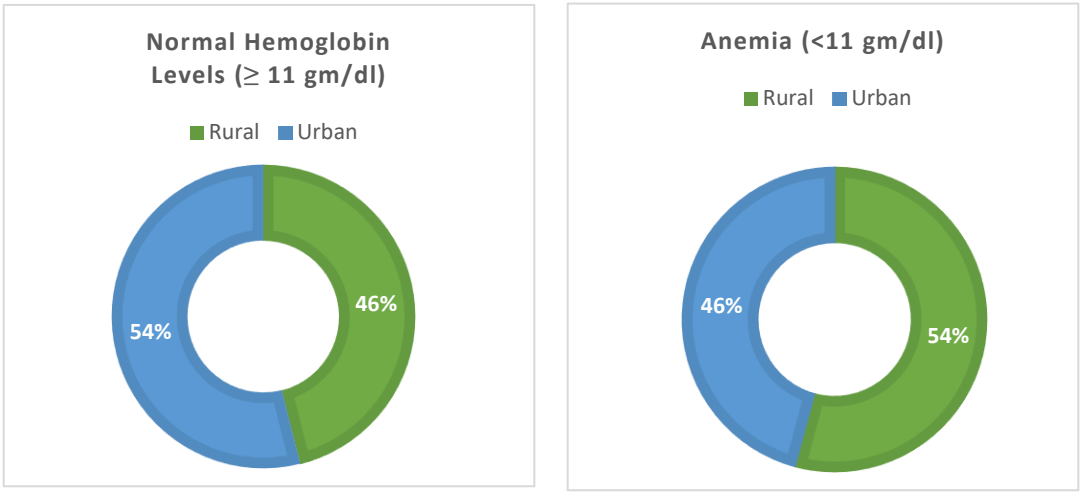


Table 20: Hemoglobin levels of children 5-9 years of age

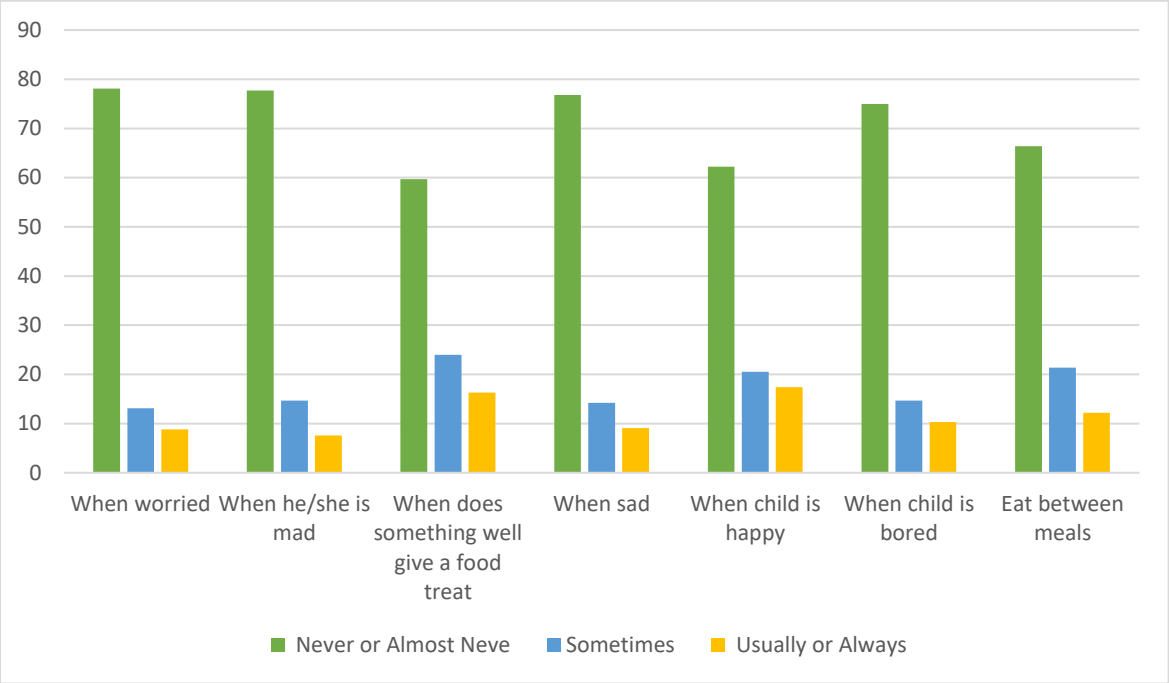
	Hemoglobin Levels % (n)	
	Anemia (<11 gm/dL)	Normal- non anemic (>= 11 gm/dL)
SINDH	914 (49.6)	934 (50.4)
Division		
Larkana	138 (56.0)	120 (44.0)
Sukkur	95 (44.4)	111 (55.6)
Hyderabad	214 (48.7)	234 (51.3)
Mirpur Khas	86 (47.6)	102 (52.4)
Karachi	271 (48.9)	258 (51.1)
S. Benazirabad	110 (51.6)	109 (48.4)
Gender		
Male	467 (50.6%)	472 (49.4%)
Female	447 (48.6%)	462 (51.4%)
Age		
5 Years	142 (66.2%)	77 (33.8%)
6 Years	227 (55.7%)	174 (44.3%)
7 Years	207 (48.9%)	215 (51.1%)
8 Years	203 (43.7%)	262 (56.3%)
9 Years	135 (40.5%)	206 (59.5%)

Child Meal Patterns

On a school day, about 52% of the children had breakfast every day, while 21% of the children never had breakfast. When not in school, 66.5% of the children had breakfast every day, while 16.4% children never had breakfast. Seventy four percent of the children never had lunch from outside and 42.9% of the children had a habit of having food on the table, while 21.2% of the children never had food on the table and 31.6% had food on the floor every day. Fifty two percent

of the children never had food in front of the television/mobile/tablet or any electronic device. Occasions of increased frequency of eating among school-aged children is given in **Figure 19.**

Figure 19: Occasions of increased frequency in meals (%)



Semi Quantitative Food Frequency

The results of the semi-quantitative FFQ showed that school age children had a very low intake of fruits, vegetables, meat and its alternatives which included red meat, poultry, seafood, and eggs (**Figure 20**). Grains were consumed more frequently in form of white bread, whole wheat bread, cereals, starchy foods, pulses, and legumes compared to other food groups. The mean water consumption was 37.4 ± 16.4 times per week. These practices were consistent across rural and urban dwellers (**Table 21**).

Consumption of dairy products were found to be less frequent in district of Karachi, the average consumption of fast foods or snacks was found to be high in the district of Hyderabad and S. Benazirabad. Consumption of meat and its alternatives was low across all the surveyed districts of Sindh. Grains consumption was higher in district of Sukkur and Karachi compared to other districts of Sindh. Beverage consumption (excluding water) was found to be higher in districts of Larkana, Sukkur, Mirpur Khas, and S. Benazirabad.

Figure 20: Food group consumption average numbers of time/week in districts of Sindh

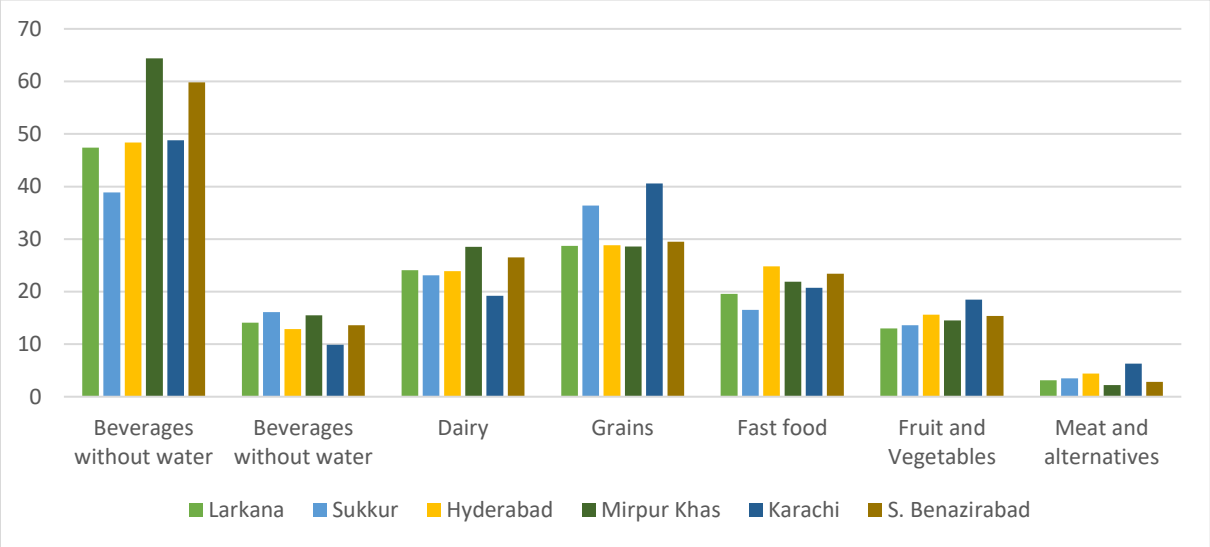


Table 21: Food group consumption average numbers of time/week

	SINDH Mean ± SD								
	Total	Rural	Urban	Larkana	Sukkur	Hyderabad	Mirpur Khas	Karachi	S. Benazirabad
Number of children 5-9 Years	2157	1198	959	287	239	492	214	673	252
DAIRY	23.4 ± 17.6	23.7 ± 16.9	22.8 ± 18.4	24.1 ± 16.2	23.1 ± 19.6	23.9 ± 17.4	28.5 ± 16.3	19.2 ± 17.9	26.5 ± 14.6
Full fat or semi-skimmed dairy products	7.8 ± 9.4	7.9 ± 9.4	7.7 ± 9.1	6.8 ± 9.1	9.6 ± 12.1	6.5 ± 8.0	8.2 ± 8.6	8.5 ± 9.9	8.5 ± 8.3
Whole milk cheese	0.0 ± 0.5	0.0 ± 0.4	0.1 ± 0.8	0.0 ± 0.0	0.1 ± 1.3	0.0 ± 0.5	0.2 ± 0.0	0.1 ± 0.6	0.1 ± 0.0
Hard fats	15.5 ± 13.6	15.8 ± 13.2	15.1 ± 13.8	17.3 ± 12.5	13.4 ± 13.0	17.4 ± 13.4	20.3 ± 12.8	10.6 ± 13.1	18.0 ± 13.1
FAST FOOD/JUNK FOOD/SNACKS	21.5 ± 10.1	21.2 ± 9.9	21.9 ± 10.4	19.6 ± 10.0	16.5 ± 9.1	24.8 ± 8.5	21.9 ± 9.7	20.7 ± 10.5	23.4 ± 10.1
French fries/chips	5.7 ± 3.4	5.7 ± 3.4	5.5 ± 3.5	5.2 ± 3.8	4.2 ± 3.7	6.9 ± 2.5	6.5 ± 2.7	4.6 ± 3.6	6.6 ± 2.7
Fried food	2.1 ± 2.8	1.8 ± 2.6	2.5 ± 3.0	1.1 ± 2.2	1.1 ± 2.0	2.5 ± 3.0	1.2 ± 1.9	3.1 ± 3.2	1.8 ± 2.4
Bakery	5.0 ± 2.7	5.0 ± 2.7	5.0 ± 2.8	4.7 ± 2.8	3.8 ± 2.6	5.7 ± 2.4	5.0 ± 2.6	4.8 ± 2.8	5.3 ± 2.7
Chocolate/candy	8.8 ± 4.7	8.8 ± 4.6	8.8 ± 4.9	8.6 ± 4.9	7.5 ± 4.2	9.7 ± 4.2	9.2 ± 4.9	8.1 ± 4.5	9.7 ± 4.9
MEATS & ALTERNATIVES	4.2 ± 4.2	3.6 ± 3.9	5.1 ± 4.4	3.1 ± 3.6	3.5 ± 3.7	4.4 ± 4.5	2.2 ± 2.9	6.3 ± 4.2	2.8 ± 3.0
Red meat	1.0 ± 1.6	0.8 ± 1.5	1.3 ± 1.8	0.7 ± 1.4	0.8 ± 1.6	0.9 ± 1.6	0.6 ± 1.1	1.6 ± 2.0	0.7 ± 1.0
Poultry	1.0 ± 1.4	0.9 ± 1.2	1.2 ± 1.5	0.7 ± 1.1	0.7 ± 1.1	1.0 ± 1.5	0.6 ± 0.9	1.6 ± 1.6	0.9 ± 1.2
Fish & seafood	0.7 ± 1.2	0.6 ± 1.2	0.7 ± 1.2	0.7 ± 1.3	0.8 ± 1.2	0.8 ± 1.4	0.3 ± 0.7	0.8 ± 1.3	0.4 ± 0.6
Eggs	1.5 ± 1.7	1.3 ± 1.6	1.9 ± 1.7	1.0 ± 1.5	1.2 ± 1.5	1.7 ± 1.8	0.7 ± 1.1	2.4 ± 1.6	0.8 ± 1.2
GRAINS	32.8 ± 22.1	32.6 ± 22.1	33.2 ± 21.3	28.7 ± 26.0	36.4 ± 27.2	28.8 ± 15.8	28.6 ± 11.9	40.6 ± 25.7	29.5 ± 13.9
White bread	4.0 ± 7.8	3.4 ± 7.4	5.0 ± 8.3	2.3 ± 6.4	5.6 ± 8.9	3.5 ± 7.3	1.3 ± 4.5	6.8 ± 9.6	1.5 ± 4.6
Wholewheat bread	16.0 ± 8.5	16.5 ± 8.0	15.2 ± 9.2	14.4 ± 9.9	13.5 ± 8.3	16.8 ± 7.1	18.2 ± 7.4	15.2 ± 8.5	18.8 ± 7.6
Breakfast cereals	5.1 ± 12.2	5.2 ± 12.4	5.0 ± 11.1	4.9 ± 13.3	10.5 ± 14.8	2.4 ± 8.1	1.8 ± 5.3	8.0 ± 15.8	2.3 ± 6.3
Other grains	2.2 ± 6.0	2.2 ± 6.0	2.0 ± 5.7	2.0 ± 6.0	2.1 ± 5.7	0.9 ± 4.1	2.3 ± 6.4	3.5 ± 7.0	1.9 ± 6.2
Starchy foods	3.1 ± 2.3	2.8 ± 2.1	3.6 ± 2.5	2.8 ± 1.9	2.5 ± 1.8	2.9 ± 2.2	2.4 ± 1.6	4.3 ± 2.8	2.4 ± 1.9
Pulses/legumes	2.5 ± 1.7	2.5 ± 1.6	2.4 ± 1.8	2.3 ± 1.8	2.2 ± 1.7	2.4 ± 1.7	2.5 ± 1.6	2.7 ± 1.8	2.6 ± 1.5
FRUITS & VEGETABLES	15.6 ± 9.6	15.3 ± 9.2	16.2 ± 10.1	13.0 ± 9.4	13.6 ± 9.7	15.6 ± 8.9	14.5 ± 8.8	18.5 ± 10.5	15.4 ± 8.2

	SINDH Mean ± SD								
	Total	Rural	Urban	Larkana	Sukkur	Hyderabad	Mirpur Khas	Karachi	S. Benazirabad
Green leafy Vegetables	2.1 ± 1.8	2.2 ± 1.8	2.0 ± 1.9	1.8 ± 1.8	2.0 ± 1.8	2.0 ± 1.9	2.2 ± 1.7	2.4 ± 1.9	2.4 ± 1.7
Other Vegetables	2.4 ± 1.7	2.4 ± 1.7	2.3 ± 1.8	2.3 ± 1.8	2.1 ± 1.7	2.3 ± 1.7	2.4 ± 1.7	2.6 ± 1.7	2.6 ± 1.6
Vitamin A rich fruits/vegetables	3.7 ± 3.5	3.6 ± 3.4	3.8 ± 3.7	3.5 ± 4.1	2.8 ± 3.5	3.2 ± 2.9	4.0 ± 3.9	4.2 ± 3.2	4.0 ± 3.5
Roots and tubers	2.5 ± 1.8	2.7 ± 1.7	2.2 ± 1.9	2.2 ± 1.9	2.0 ± 1.8	3.1 ± 1.5	2.6 ± 1.6	2.3 ± 1.9	3.0 ± 1.5
Fresh fruit	3.7 ± 3.8	3.4 ± 3.8	4.2 ± 3.7	2.3 ± 3.2	3.5 ± 3.9	4.1 ± 3.8	2.5 ± 3.3	5.1 ± 3.9	2.8 ± 3.2
Fruit juices	1.2 ± 3.1	0.9 ± 2.8	1.6 ± 3.6	1.0 ± 3.2	1.2 ± 3.5	0.8 ± 3.0	0.7 ± 2.5	1.9 ± 3.4	0.7 ± 1.7
BEVERAGES	50.5 ± 18.6	50.8 ± 18.7	49.8 ± 17.7	47.4 ± 20.7	38.9 ± 15.8	48.4 ± 17.4	64.4 ± 11.6	48.8 ± 15.7	59.8 ± 13.6
BEVERAGES without water	13.0 ± 8.4	13.5 ± 8.3	12.2 ± 8.2	14.1 ± 8.1	16.1 ± 13.3	12.9 ± 7.1	15.5 ± 6.9	9.9 ± 5.9	13.6 ± 7.4
Sodas	2.1 ± 4.7	1.9 ± 4.4	2.5 ± 5.1	2.2 ± 3.8	4.3 ± 8.8	2.2 ± 4.9	1.4 ± 2.4	1.7 ± 3.8	1.6 ± 2.1
Black Tea & coffee	1.7 ± 4.4	2.0 ± 4.6	1.2 ± 3.7	2.2 ± 4.8	2.0 ± 4.6	1.7 ± 4.0	2.9 ± 5.8	0.6 ± 2.4	1.9 ± 4.7
Milk tea	9.2 ± 5.1	9.6 ± 4.9	8.5 ± 5.1	9.7 ± 5.3	9.7 ± 5.3	9.0 ± 5.0	11.1 ± 4.8	7.6 ± 4.3	10.1 ± 4.7
Water	37.4 ± 16.4	37.3 ± 16.5	37.6 ± 15.7	33.3 ± 18.4	22.8 ± 13.4	35.5 ± 14.3	48.9 ± 7.6	38.9 ± 14.6	46.2 ± 10.3

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

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

	SINDH Mean ± SD					
	Wealth index quintile					
	Poorest	Poor	Middle	Rich	Richest	p-value
Number of children 5-9 Years	432	431	432	431	431	
DAIRY	23.2 ± 14.5	23.8 ± 17.1	22.1 ± 16.8	21.4 ± 19.2	26.8 ± 20.6	0.543
Full fat or semi-skimmed dairy products	6.7 ± 8.3	7.0 ± 9.0	7.0 ± 9.2	8.0 ± 9.3	10.9 ± 10.8	0.622
Whole milk cheese	0.0 ± 0.0	0.2 ± 0.0	0.0 ± 0.5	0.0 ± 0.1	0.2 ± 1.2	-
Hard fats	16.4 ± 11.9	16.8 ± 13.6	15.0 ± 12.8	13.4 ± 14.8	15.7 ± 15.0	0.675
FAST FOOD/JUNK FOOD/SNACKS	18.9 ± 9.8	20.3 ± 9.7	21.4 ± 9.8	23.4 ± 9.3	24.0 ± 10.5	0.036
French fries/chips	5.7 ± 3.3	5.6 ± 3.6	5.4 ± 3.7	5.8 ± 3.3	5.7 ± 3.0	0.756
Fried food	1.0 ± 1.8	1.3 ± 2.1	1.7 ± 2.3	2.6 ± 2.9	4.1 ± 3.5	0.036
Bakery	4.5 ± 2.8	4.8 ± 2.8	5.0 ± 2.6	5.5 ± 2.6	5.1 ± 2.6	0.064
Chocolate/candy	7.7 ± 4.9	8.6 ± 4.7	9.2 ± 4.3	9.5 ± 4.4	9.1 ± 4.9	0.010
MEATS & ALTERNATIVES	2.1 ± 2.6	2.6 ± 3.1	4.3 ± 4.1	5.9 ± 4.3	6.7 ± 4.3	0.005
Red meat	0.4 ± 0.9	0.6 ± 1.1	0.9 ± 1.5	1.4 ± 2.0	1.8 ± 2.0	0.002
Poultry	0.5 ± 0.7	0.5 ± 0.9	1.0 ± 1.4	1.5 ± 1.6	1.6 ± 1.5	0.199
Fish & seafood	0.4 ± 0.8	0.5 ± 0.9	0.9 ± 1.5	0.8 ± 1.3	0.9 ± 1.4	0.241
Eggs	0.8 ± 1.2	1.0 ± 1.4	1.5 ± 1.7	2.2 ± 1.8	2.3 ± 1.6	0.029

	SINDH Mean ± SD					
	Wealth index quintile					
	Poorest	Poor	Middle	Rich	Richest	p-value
Number of children 5-9 Years	432	431	432	431	431	
GRAINS	26.7 ± 17.1	29.4 ± 20.3	30.9 ± 22.4	35.0 ± 19.4	44.5 ± 26.7	0.038
White bread	1.9 ± 6.0	3.0 ± 7.2	3.2 ± 7.5	4.6 ± 8.2	7.7 ± 9.5	0.012
Wholemeal bread	16.3 ± 8.5	15.9 ± 8.6	15.8 ± 8.8	16.8 ± 7.6	15.3 ± 8.4	0.493
Breakfast cereals	2.7 ± 8.2	3.9 ± 10.1	5.0 ± 12.8	4.9 ± 12.0	9.9 ± 16.7	0.052
Other grains	1.2 ± 4.7	1.9 ± 5.6	1.6 ± 5.3	1.9 ± 5.5	4.6 ± 8.4	0.052
Starchy foods	2.2 ± 1.7	2.3 ± 1.8	3.0 ± 2.1	4.2 ± 2.6	4.2 ± 2.3	0.311
Pulses/legumes	2.4 ± 1.7	2.3 ± 1.7	2.3 ± 1.8	2.7 ± 1.7	2.7 ± 1.7	0.355
FRUITS & VEGETABLES	12.8 ± 7.4	12.8 ± 8.6	14.6 ± 9.3	18.7 ± 9.1	20.6 ± 10.2	0.902
Green leafy Vegetables	2.0 ± 1.8	1.9 ± 1.8	2.0 ± 1.9	2.5 ± 1.8	2.4 ± 1.8	0.529
Green leafy Vegetables	2.4 ± 1.7	2.1 ± 1.8	2.3 ± 1.8	2.7 ± 1.7	2.7 ± 1.6	0.059
Vitamin A rich fruits/vegetables	3.2 ± 3.6	3.2 ± 3.4	3.3 ± 3.3	4.2 ± 3.5	4.7 ± 3.4	0.719
Roots and tubers	2.6 ± 1.7	2.4 ± 1.8	2.4 ± 1.9	2.6 ± 1.7	2.6 ± 1.7	0.101
Fresh fruit	2.0 ± 2.6	2.5 ± 3.1	3.7 ± 3.8	5.0 ± 3.8	5.9 ± 3.9	0.008
Fruit juices	0.5 ± 2.2	0.7 ± 2.4	0.9 ± 2.8	1.7 ± 3.6	2.3 ± 4.1	0.375
BEVERAGES	52.7 ± 18.1	50.3 ± 20.1	48.0 ± 19.2	49.9 ± 17.0	51.4 ± 16.8	0.067
BEVERAGES without water	13.9 ± 7.6	14.3 ± 9.6	13.5 ± 8.3	11.8 ± 7.6	11.0 ± 7.7	0.450
Sodas	1.4 ± 3.2	2.0 ± 5.1	2.2 ± 4.5	2.1 ± 4.4	3.1 ± 6.1	0.044
Black Tea & coffee	2.8 ± 5.3	2.4 ± 5.2	1.5 ± 4.0	0.8 ± 2.9	0.6 ± 2.2	0.279
Milk tea	9.7 ± 5.0	9.9 ± 5.2	9.8 ± 4.6	9.0 ± 4.7	7.3 ± 5.1	0.470
Water	38.8 ± 15.9	35.9 ± 17.2	34.5 ± 16.9	38.1 ± 15.6	40.4 ± 14.4	0.012

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

Table 23: Food group consumption average numbers of time/week- by had ever attended school and Hemoglobin levels

	Have child ever attended school Mean ± SD			HB level Mean ± SD		
	Ever attended school	Never attended school	p-value	Anemia (<11 gm/dL)	Normal- non anemic (≥11 gm/dL)	p-value
Number of children 5-9 Years	4940	1012		2117	3233	
DAIRY	24.0 ± 18.3	22.2 ± 16.4	0.02	23.2 ± 17.6	23.6 ± 17.6	0.625
Full fat or semi-skimmed dairy products	8.6 ± 9.9	6.4 ± 8.3	<0.001	7.9 ± 9.6	7.5 ± 9.3	0.358
Whole milk cheese	0.1 ± 0.7	0.2 ± 0.0	0.003	0.0 ± 0.3	0.0 ± 0.4	0.372
Hard fats	15.4 ± 13.9	15.9 ± 13.0	0.441	15.3 ± 13.6	16.1 ± 13.3	0.207
FAST FOOD/JUNK FOOD/SNACKS	22.1 ± 10.3	20.2 ± 9.8	<0.001	21.0 ± 10.3	21.6 ± 9.9	0.160
French fries/chips	5.6 ± 3.5	5.8 ± 3.3	0.215	5.4 ± 3.5	5.8 ± 3.4	0.017
Fried food	2.4 ± 2.9	1.5 ± 2.5	<0.001	1.9 ± 2.7	2.1 ± 2.8	0.050
Bakery	5.2 ± 2.7	4.6 ± 2.8	<0.001	4.9 ± 2.8	5.0 ± 2.7	0.889
Chocolate/candy	9.0 ± 4.7	8.4 ± 4.7	0.002	8.7 ± 4.7	8.8 ± 4.6	0.968
MEATS & ALTERNATIVES	4.8 ± 4.3	3.0 ± 3.6	<0.001	3.8 ± 4.1	4.3 ± 4.1	0.018
Red meat	1.2 ± 1.8	0.7 ± 1.2	<0.001	0.9 ± 1.4	1.0 ± 1.6	0.008
Poultry	1.1 ± 1.4	0.7 ± 1.1	<0.001	0.9 ± 1.3	1.0 ± 1.4	0.042
Fish & seafood	0.8 ± 1.3	0.5 ± 1.0	<0.001	0.7 ± 1.3	0.7 ± 1.2	0.585
Eggs	1.7 ± 1.7	1.1 ± 1.5	<0.001	1.4 ± 1.7	1.5 ± 1.7	0.181
GRAINS	34.8 ± 23.7	29.0 ± 18.0	<0.001	33.8 ± 22.3	32.8 ± 22.3	0.370
White bread	4.5 ± 8.2	3.0 ± 6.8	<0.001	3.9 ± 7.8	3.8 ± 7.7	0.641
Wholemeal bread	15.9 ± 8.5	16.1 ± 8.4	0.611	16.4 ± 8.1	16.2 ± 8.0	0.542
Breakfast cereals	6.0 ± 13.5	3.5 ± 9.2	<0.001	5.7 ± 13.1	5.3 ± 12.1	0.473
Other grains	2.5 ± 6.5	1.5 ± 4.9	<0.001	2.1 ± 6.0	2.2 ± 6.0	0.654
Starchy foods	3.4 ± 2.4	2.5 ± 2.0	<0.001	3.1 ± 2.3	3.0 ± 2.3	0.769
Pulses/legumes	2.5 ± 1.7	2.4 ± 1.7	0.078	2.6 ± 1.7	2.4 ± 1.7	0.009
FRUITS & VEGETABLES	16.7 ± 9.9	13.6 ± 8.6	<0.001	16.1 ± 9.2	14.7 ± 9.7	0.003
Green leafy Vegetables	2.2 ± 1.8	2.0 ± 1.8	0.001	2.2 ± 1.9	2.0 ± 1.8	0.001
Green leafy Vegetables	2.4 ± 1.8	2.3 ± 1.7	0.163	2.5 ± 1.7	2.2 ± 1.8	<0.001
Vitamin A rich fruits/vegetables	3.9 ± 3.6	3.3 ± 3.4	<0.001	4.0 ± 3.6	3.3 ± 3.4	<0.001
Roots and tubers	2.6 ± 1.8	2.5 ± 1.8	0.158	2.6 ± 1.8	2.5 ± 1.8	0.287
Fresh fruit	4.2 ± 4.0	2.8 ± 3.3	<0.001	3.5 ± 3.7	3.7 ± 3.9	0.546
Fruit juices	1.4 ± 3.4	0.7 ± 2.4	<0.001	1.2 ± 3.3	1.1 ± 3.0	0.520
BEVERAGES	50.1 ± 18.6	51.1 ± 18.5	0.248	49.3 ± 19.7	51.5 ± 17.7	0.013
BEVERAGES without water	12.8 ± 8.2	13.4 ± 8.6	0.092	13.2 ± 8.0	13.0 ± 8.6	0.576
Sodas	2.3 ± 4.8	1.8 ± 4.4	0.013	2.2 ± 4.6	2.1 ± 5.3	0.674
Black Tea & coffee	1.4 ± 4.2	2.2 ± 4.7	<0.001	1.9 ± 4.6	1.5 ± 3.7	0.021
Milk tea	9.0 ± 5.0	9.5 ± 5.2	0.06	9.1 ± 4.9	9.4 ± 5.0	0.148
Water	37.3 ± 16.8	37.7 ± 15.7	0.656	36.1 ± 17.5	38.5 ± 15.7	0.002

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

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

	SINDH Mean ± SD					
	Mother education level					
	None	Primary	Middle	Secondary	Higher	p-value
Number of children 5-9 Years	1477	221	110	184	165	
DAIRY	23.9 ± 17.7	21.6 ± 16.3	19.4 ± 13.8	21.5 ± 16.8	26.7 ± 19.9	0.056
Full fat or semi-skimmed dairy products	7.6 ± 9.5	8.3 ± 9.5	7.2 ± 8.5	8.3 ± 8.3	10.0 ± 10.0	0.302
Whole milk cheese	0.0 ± 0.6	0.3 ± 0.0	0.0 ± 0.0	0.0 ± 0.2	0.1 ± 0.7	0.019
Hard fats	16.3 ± 13.3	13.3 ± 13.7	12.2 ± 12.0	13.2 ± 13.4	16.6 ± 15.4	0.003
FAST FOOD/JUNK FOOD/SNACKS	20.7 ± 10.1	22.2 ± 10.2	24.0 ± 8.7	23.6 ± 9.8	24.1 ± 10.5	0.033
French fries/chips	5.6 ± 3.4	5.7 ± 3.6	5.6 ± 3.5	5.6 ± 3.6	6.1 ± 3.1	0.799
Fried food	1.9 ± 2.8	2.0 ± 2.4	2.6 ± 2.6	2.5 ± 2.6	2.9 ± 3.0	0.541
Bakery	4.7 ± 2.8	5.5 ± 2.7	5.8 ± 2.6	5.8 ± 2.4	5.4 ± 2.5	<0.001
Chocolate/candy	8.5 ± 4.7	9.0 ± 4.8	10.0 ± 3.7	9.8 ± 4.6	9.8 ± 5.0	0.091
MEATS & ALTERNATIVES	3.9 ± 4.2	4.3 ± 4.3	5.3 ± 4.0	4.9 ± 3.7	5.7 ± 4.1	0.15
Red meat	0.9 ± 1.6	0.9 ± 1.6	1.2 ± 1.7	0.9 ± 1.3	1.5 ± 1.8	0.849
Poultry	0.9 ± 1.3	1.0 ± 1.3	1.3 ± 1.4	1.3 ± 1.5	1.4 ± 1.4	0.251
Fish & seafood	0.7 ± 1.2	0.8 ± 1.5	0.7 ± 1.3	0.6 ± 1.0	0.6 ± 0.8	0.225
Eggs	1.4 ± 1.6	1.6 ± 1.7	2.1 ± 1.7	2.1 ± 1.9	2.1 ± 1.7	0.056
GRAINS	32.7 ± 22.8	32.0 ± 23.1	29.4 ± 16.7	33.9 ± 17.9	36.3 ± 18.1	0.669
White bread	3.9 ± 7.7	3.0 ± 7.2	3.2 ± 7.5	4.8 ± 8.6	5.3 ± 8.7	0.074
Whole meal bread	15.8 ± 8.5	16.4 ± 8.3	15.7 ± 9.1	16.5 ± 8.3	17.5 ± 6.9	0.324
Breakfast cereals	5.5 ± 12.4	4.7 ± 13.4	2.5 ± 8.7	3.7 ± 10.8	4.8 ± 10.2	0.403
Other grains	2.4 ± 6.1	1.9 ± 6.5	1.1 ± 3.0	1.8 ± 5.2	1.8 ± 6.4	0.304
Starchy foods	2.8 ± 2.1	3.5 ± 2.5	4.1 ± 2.7	4.2 ± 2.7	4.3 ± 2.4	<0.001
Pulses/legumes	2.4 ± 1.7	2.6 ± 1.7	3.0 ± 1.6	3.0 ± 1.5	2.7 ± 1.7	0.097
FRUITS & VEGETABLES	14.7 ± 9.5	16.2 ± 10.2	18.8 ± 8.4	18.4 ± 9.1	19.0 ± 9.6	0.032
Green leafy Vegetables	2.0 ± 1.8	2.1 ± 1.8	2.7 ± 1.8	2.6 ± 1.8	2.5 ± 1.8	0.409
Green leafy Vegetables	2.3 ± 1.8	2.5 ± 1.7	2.9 ± 1.5	2.9 ± 1.5	2.6 ± 1.6	0.101
Vitamin A rich fruits/vegetables	3.5 ± 3.7	3.6 ± 3.1	4.8 ± 3.1	4.3 ± 3.2	4.0 ± 3.2	0.757
Roots and tubers	2.5 ± 1.8	2.7 ± 1.9	2.5 ± 1.8	2.8 ± 1.8	2.7 ± 1.7	0.135
Fresh fruit	3.4 ± 3.8	3.9 ± 3.9	4.2 ± 3.4	4.5 ± 3.7	5.3 ± 3.8	0.061
Fruit juices	1.0 ± 3.0	1.4 ± 3.8	1.7 ± 3.3	1.4 ± 2.6	1.8 ± 3.0	0.092
BEVERAGES	51.3 ± 18.8	48.3 ± 20.5	48.2 ± 15.1	46.9 ± 15.7	51.0 ± 16.5	0.041
BEVERAGES without water	13.6 ± 8.5	12.5 ± 8.3	12.3 ± 8.2	10.1 ± 6.6	11.7 ± 7.4	0.066
Sodas	2.1 ± 4.6	2.2 ± 6.2	2.4 ± 5.7	1.9 ± 3.6	2.6 ± 3.7	0.753
Black Tea & coffee	2.0 ± 4.8	1.2 ± 3.3	0.7 ± 2.5	0.5 ± 2.0	1.0 ± 4.0	0.001
Milk tea	9.5 ± 5.1	9.1 ± 4.8	9.1 ± 4.8	7.8 ± 5.2	8.2 ± 5.2	0.312
Water	37.7 ± 16.6	35.8 ± 17.5	35.9 ± 14.6	36.7 ± 15.0	39.3 ± 14.3	0.129

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 Sindh was 1282.3 ± 447.8 kcal (rural: 1260.3 ± 417.9 kcal; urban setting: 1320.2 ± 492.7 kcal). Details on different nutrient intake has been given in **Table 25**.

Table 25: Nutrient intake in districts of Sindh

		SINDH Mean ± SD							
	Sindh	Rural	Urban	Larkana	Sukkur	Hyderabad	Mirpur Khas	Karachi	S. Benazirabad
Number of children 5-9 Years	2126	1185	941	282	225	486	214	669	250
Energy (kcal)	1282.3 ± 447.8	1260.3 ± 417.9	1320.2 ± 493.7	1217.8 ± 394.2	1248.9 ± 378.3	1257.1 ± 509.6	1243.2 ± 387.8	1345.4 ± 455.7	1349.3 ± 447.5
Protein (g)	31.6 ± 15.1	30.9 ± 13.0	32.9 ± 18.6	27.4 ± 9.6	29.2 ± 9.5	30.5 ± 15.3	30.4 ± 10.4	36.2 ± 21.2	32.3 ± 11.1
Total Fat (g)	47.6 ± 23.5	46.1 ± 21.8	50.1 ± 25.9	41.2 ± 17.1	45.6 ± 17.7	45.6 ± 26.4	44.0 ± 18.4	54.6 ± 26.2	49.3 ± 24.5
Fiber, total dietary (g)	20.4 ± 10.1	21.1 ± 9.8	19.3 ± 10.3	18.1 ± 8.8	21.0 ± 9.0	18.5 ± 10.2	24.7 ± 8.6	20.1 ± 10.7	23.7 ± 9.4
Carbohydrate (g)	186.0 ± 61.8	185.4 ± 58.7	187.1 ± 66.4	187.3 ± 61.1	186.2 ± 56.3	185.3 ± 69.5	188.2 ± 56.7	179.0 ± 54.7	201.1 ± 62.7
Calcium (mg)	329.3 ± 198.0	333.6 ± 186.8	322.0 ± 214.9	281.5 ± 143.1	333.5 ± 181.2	316.7 ± 166.9	349.2 ± 166.4	324.8 ± 239.5	412.3 ± 243.4
Iron (mg)	6.7 ± 3.6	6.6 ± 3.4	6.9 ± 4.0	6.0 ± 3.2	6.3 ± 2.8	6.5 ± 4.1	7.1 ± 3.0	7.3 ± 4.0	6.9 ± 3.3
Magnesium (mg)	178.6 ± 71.3	181.1 ± 68.4	174.4 ± 74.8	167.3 ± 61.5	180.6 ± 56.8	169.8 ± 73.8	196.2 ± 58.9	172.0 ± 67.2	210.3 ± 95.8
Phosphorus (mg)	629.1 ± 243.5	629.5 ± 225.9	628.3 ± 272.8	570.8 ± 197.6	624.0 ± 202.7	613.6 ± 256.2	657.9 ± 194.0	637.2 ± 287.2	701.1 ± 225.3
Potassium (mg)	1175.4 ± 514.4	1174.3 ± 488.0	1177.2 ± 554.2	1056.0 ± 418.0	1152.7 ± 427.7	1126.4 ± 534.7	1181.1 ± 460.1	1221.3 ± 530.6	1358.7 ± 611.8
Sodium (mg)	956.4 ± 600.2	933.1 ± 543.4	996.6 ± 696.2	800.3 ± 415.4	866.7 ± 421.5	870.6 ± 527.4	1012.1 ± 554.2	1115.2 ± 785.8	1000.2 ± 612.0
Zinc (mg)	4.9 ± 2.8	4.9 ± 2.4	5.0 ± 3.3	4.4 ± 1.6	4.7 ± 1.4	4.9 ± 3.2	5.1 ± 2.3	5.2 ± 3.7	5.3 ± 2.0
Copper (mg)	0.8 ± 0.7	0.8 ± 0.7	0.8 ± 0.7	0.7 ± 0.3	0.7 ± 0.3	0.8 ± 0.5	0.8 ± 0.3	0.9 ± 1.3	0.9 ± 0.4
Vitamin A (µg)	203.6 ± 486.3	192.1 ± 450.3	223.5 ± 545.5	143.4 ± 101.1	172.9 ± 119.6	174.4 ± 211.8	149.5 ± 115.4	294.2 ± 956.8	218.6 ± 195.0
Vitamin D (D2 + D3) (µg)	1.0 ± 2.1	1.0 ± 2.3	1.1 ± 1.7	0.9 ± 1.4	0.9 ± 1.4	1.0 ± 3.1	0.6 ± 0.7	1.5 ± 2.2	0.9 ± 1.6
Vitamin E (alpha-tocopherol) (mg)	1.7 ± 1.7	1.7 ± 1.7	1.8 ± 1.7	1.8 ± 1.5	1.6 ± 1.5	1.8 ± 1.9	1.2 ± 1.3	2.1 ± 1.9	1.5 ± 1.8
Thiamin (mg)	0.8 ± 0.4	0.8 ± 0.3	0.8 ± 0.4	0.8 ± 0.3	0.8 ± 0.3	0.8 ± 0.4	0.9 ± 0.3	0.7 ± 0.4	0.9 ± 0.3
Riboflavin (mg)	0.9 ± 1.0	0.9 ± 1.0	1.0 ± 1.0	0.7 ± 0.4	0.8 ± 0.5	0.9 ± 1.0	1.0 ± 0.6	1.0 ± 1.1	1.3 ± 2.1
Niacin (mg)	10.6 ± 5.1	10.8 ± 4.9	10.3 ± 5.6	9.8 ± 4.4	10.5 ± 3.7	10.0 ± 5.4	12.0 ± 4.0	10.4 ± 5.7	12.2 ± 5.9
Vitamin B-6 (mg)	0.9 ± 0.6	0.9 ± 0.6	0.9 ± 0.6	0.8 ± 0.4	0.8 ± 0.3	0.8 ± 0.7	0.9 ± 0.5	1.0 ± 0.7	1.0 ± 1.0
Folate, total (µg)	148.1 ± 91.5	146.4 ± 84.0	150.9 ± 103.9	131.3 ± 72.2	132.9 ± 65.4	151.2 ± 99.3	161.7 ± 83.8	148.4 ± 107.0	163.9 ± 81.0
L-ascorbic acid (mg)	28.2 ± 40.0	27.0 ± 38.7	30.3 ± 41.3	20.1 ± 25.6	20.9 ± 33.3	25.7 ± 44.4	29.6 ± 45.5	32.2 ± 36.2	40.9 ± 47.8
Fatty acids, total saturated (mg)	18149.7 ± 10192.6	17787.9 ± 9694.5	18773.4 ± 10885.3	15754.9 ± 6804.4	18380.5 ± 7338.7	17370.9 ± 11459.4	17426.9 ± 8499.6	19606.2 ± 10680.7	20296.2 ± 13389.4
Fatty acids, total monounsaturated (mg)	13856.8 ± 7303.1	13190.5 ± 6614.0	15005.6 ± 8293.7	12324.5 ± 5384.7	12810.9 ± 5155.2	13369.2 ± 8078.9	12110.2 ± 5558.6	16372.9 ± 8521.9	13805.9 ± 7024.1
Fatty acids, total polyunsaturated (mg)	7443.1 ± 5693.7	6795.3 ± 5338.9	8559.9 ± 6022.1	6411.7 ± 4659.8	5832.2 ± 3501.5	7952.7 ± 7264.3	6098.8 ± 4680.5	9109.5 ± 5176.0	6679.3 ± 5124.8
Cholesterol (mg)	78.5 ± 198.0	73.1 ± 211.8	87.8 ± 150.8	49.8 ± 41.9	64.5 ± 55.2	78.2 ± 168.1	41.9 ± 41.9	121.6 ± 357.3	67.0 ± 63.8

A significantly greater intake of energy, fats, sodium, vitamin A, 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 the households under middle wealth quintile (**Table 26**).

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

	SINDH Mean ± SD					
	Wealth index quintile					
	Poorest	Poor	Middle	Rich	Richest	p-value
Number of children 5-9 Years	429	419	427	424	427	
Energy (kcal)	1140.4 ± 369.6	1221.7 ± 410.3	1303.7 ± 429.0	1360.4 ± 511.2	1423.2 ± 457.3	0.002
Protein (g)	27.8 ± 9.3	28.6 ± 10.6	30.7 ± 12.2	34.3 ± 21.0	38.3 ± 18.9	0.261
Total Fat (g)	38.9 ± 17.0	42.7 ± 18.3	48.0 ± 22.3	53.6 ± 28.3	57.3 ± 25.5	0.002
Fiber, total dietary (g)	20.8 ± 9.9	20.2 ± 9.7	20.4 ± 9.9	20.1 ± 10.1	20.7 ± 11.0	0.377
Carbohydrate (g)	175.6 ± 57.2	185.8 ± 61.1	191.3 ± 62.3	188.1 ± 66.5	190.8 ± 60.4	0.012
Calcium (mg)	318.2 ± 176.7	320.9 ± 172.8	328.4 ± 184.3	339.9 ± 246.3	343.2 ± 216.5	0.822
Iron (mg)	6.1 ± 3.5	6.3 ± 3.3	6.6 ± 3.1	7.3 ± 4.0	7.6 ± 3.9	0.53
Magnesium (mg)	174.4 ± 69.3	175.9 ± 74.0	181.5 ± 69.3	179.3 ± 75.2	183.2 ± 66.5	0.769
Phosphorus (mg)	590.8 ± 200.1	607.3 ± 211.7	631.4 ± 228.5	650.5 ± 302.5	677.3 ± 273.5	0.242
Potassium (mg)	1067.1 ± 404.8	1124.8 ± 495.4	1186.2 ± 522.6	1246.9 ± 598.1	1282.2 ± 521.5	0.064
Sodium (mg)	812.0 ± 359.3	905.2 ± 556.5	948.0 ± 564.9	1021.3 ± 714.5	1137.7 ± 757.6	0.004
Zinc (mg)	4.8 ± 3.2	4.6 ± 1.7	4.8 ± 1.8	5.2 ± 3.8	5.5 ± 3.0	0.169
Copper (mg)	0.7 ± 0.3	0.8 ± 0.6	0.8 ± 0.3	0.9 ± 0.9	0.9 ± 1.3	0.151
Vitamin A (µg)	137.5 ± 108.3	156.5 ± 121.7	190.0 ± 162.5	271.2 ± 621.8	287.0 ± 995.0	0.016
Vitamin D (D2 + D3) (µg)	0.7 ± 1.2	0.8 ± 1.3	1.0 ± 2.0	1.3 ± 2.3	1.6 ± 3.5	0.743
Vitamin E (alpha-tocopherol) (mg)	1.4 ± 1.5	1.5 ± 1.6	1.7 ± 1.5	2.0 ± 2.1	2.2 ± 1.8	0.328
Thiamin (mg)	0.8 ± 0.3	0.8 ± 0.3	0.8 ± 0.3	0.8 ± 0.4	0.8 ± 0.4	0.822
Riboflavin (mg)	0.8 ± 0.5	0.9 ± 1.2	1.0 ± 1.2	1.0 ± 1.0	1.0 ± 1.1	0.056
Niacin (mg)	10.3 ± 4.4	10.4 ± 4.4	10.9 ± 5.9	10.4 ± 5.6	11.1 ± 5.4	0.649
Vitamin B-6 (mg)	0.8 ± 0.3	0.8 ± 0.4	0.9 ± 0.9	0.9 ± 0.6	1.0 ± 0.7	0.272
Folate, total (µg)	137.0 ± 77.0	141.1 ± 81.2	145.1 ± 76.8	156.6 ± 110.9	164.4 ± 112.0	0.453
L-ascorbic acid (mg)	19.8 ± 26.7	24.1 ± 37.5	28.5 ± 39.8	33.4 ± 45.5	37.7 ± 48.3	0.054
Fatty acids, total saturated (mg)	15436.8 ± 7900.9	16582.4 ± 7558.7	18971.4 ± 10806.4	19881.9 ± 12764.7	20606.0 ± 10681.1	0.031
Fatty acids, total monounsaturated (mg)	10942.0 ± 4924.7	12165.3 ± 5620.7	13951.7 ± 6645.3	15819.6 ± 9259.7	17316.5 ± 7726.5	0.001
Fatty acids, total polyunsaturated (mg)	5116.8 ± 4511.9	6299.1 ± 5057.2	7596.0 ± 5562.8	8925.9 ± 5776.4	9954.9 ± 5842.1	<0.001
Cholesterol (mg)	46.0 ± 47.7	53.6 ± 74.0	72.9 ± 102.3	103.2 ± 201.1	129.0 ± 415.2	0.075

A significantly greater intake of energy, proteins, total fats, fiber, carbohydrate, calcium, phosphorus, folate, and fatty acids (total saturated and mono-unsaturated) was found among males aged 5-9 years old compared to females (**Table 27**). By ever attended school, the survey showed greater intake of energy, proteins, total fats, carbohydrate, calcium, iron, phosphorus, potassium, sodium, zinc, copper, vitamins (A, B-6, D, E, riboflavin. Folate, L-ascorbic acid), fatty

acids (total saturated, mono-unsaturated, poly-unsaturated), and cholesterol among children who had ever attended school.

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

Nutrient Intake	SINDH Mean ± SD						
	Total	Gender			Have child ever attended school		
		Male	Female	p-value	Ever attended school	Never attended school	p-value
Number of children 5-9 Years	**2126**	**1085**	**1041**		**1419**	**707**	
Energy (kcal)	1282.3 ± 447.8	1310.7 ± 452.3	1253.5 ± 440.2	0.003	1327.4 ± 470.9	1197.3 ± 387.5	<0.001
Protein (g)	31.6 ± 15.1	32.4 ± 15.6	30.8 ± 14.4	0.016	33.2 ± 16.9	28.6 ± 10.3	<0.001
Total Fat (g)	47.6 ± 23.5	49.1 ± 23.6	46.0 ± 23.2	0.002	50.4 ± 25.6	42.2 ± 17.8	<0.001
Fiber, total dietary (g)	20.4 ± 10.1	20.9 ± 10.0	20.0 ± 10.2	0.047	20.3 ± 10.0	20.6 ± 10.3	0.577
Carbohydrate (g)	186.0 ± 61.8	189.1 ± 61.5	182.9 ± 61.8	0.021	188.8 ± 62.9	180.8 ± 59.3	0.004
Calcium (mg)	329.3 ± 198.0	338.1 ± 192.7	320.5 ± 202.6	0.040	336.2 ± 207.0	316.4 ± 180.4	0.024
Iron (mg)	6.7 ± 3.6	6.9 ± 3.5	6.6 ± 3.7	0.092	7.0 ± 3.8	6.2 ± 3.1	<0.001
Magnesium (mg)	178.6 ± 71.3	181.5 ± 69.8	175.8 ± 72.5	0.063	179.6 ± 68.5	176.8 ± 75.9	0.407
Phosphorus (mg)	629.1 ± 243.5	639.4 ± 234.6	618.6 ± 251.3	0.048	644.0 ± 259.6	601.0 ± 209.0	<0.001
Potassium (mg)	1175.4 ± 514.4	1192.6 ± 504.1	1158.0 ± 523.2	0.121	1211.5 ± 526.2	1107.3 ± 484.8	<0.001
Sodium (mg)	956.4 ± 600.2	968.8 ± 545.9	943.8 ± 649.3	0.337	1004.8 ± 661.4	865.2 ± 458.4	<0.001
Zinc (mg)	4.9 ± 2.8	5.0 ± 2.7	4.9 ± 2.8	0.251	5.1 ± 3.1	4.6 ± 2.0	<0.001
Copper (mg)	0.8 ± 0.7	0.8 ± 0.4	0.8 ± 1.0	0.578	0.8 ± 0.9	0.8 ± 0.5	0.019
Vitamin A (µg)	203.6 ± 486.3	203.3 ± 348.4	204.0 ± 592.0	0.972	233.6 ± 600.7	147.1 ± 108.5	<0.001
Vitamin D (D2 + D3) (µg)	1.0 ± 2.1	1.0 ± 1.9	1.1 ± 2.4	0.491	1.2 ± 2.4	0.8 ± 1.4	<0.001
Vitamin E (alpha-tocopherol) (mg)	1.7 ± 1.7	1.7 ± 1.7	1.8 ± 1.8	0.442	1.9 ± 1.8	1.5 ± 1.5	<0.001
Thiamin (mg)	0.8 ± 0.4	0.8 ± 0.3	0.8 ± 0.4	0.208	0.8 ± 0.4	0.8 ± 0.3	0.947
Riboflavin (mg)	0.9 ± 1.0	1.0 ± 0.9	0.9 ± 1.2	0.951	1.0 ± 1.2	0.8 ± 0.7	<0.001
Niacin (mg)	10.6 ± 5.1	10.8 ± 5.3	10.4 ± 5.0	0.070	10.7 ± 5.5	10.4 ± 4.5	0.135
Vitamin B-6 (mg)	0.9 ± 0.6	0.9 ± 0.7	0.9 ± 0.5	0.186	0.9 ± 0.7	0.8 ± 0.4	<0.001
Folate, total (µg)	148.1 ± 91.5	153.1 ± 96.3	142.9 ± 86.0	0.010	153.2 ± 98.2	138.3 ± 77.4	<0.001
L-ascorbic acid (mg)	28.2 ± 40.0	29.0 ± 42.2	27.4 ± 37.6	0.342	31.2 ± 42.7	22.6 ± 34.0	<0.001
Fatty acids, total saturated (mg)	18149.7 ± 10192.6	18905.2 ± 10041.5	17382.9 ± 10258.0	0.001	19068.5 ± 11194.9	16418.6 ± 7759.0	<0.001
Fatty acids, total monounsaturated (mg)	13856.8 ± 7303.1	14285.0 ± 7514.9	13422.2 ± 7045.8	0.006	14821.6 ± 8002.1	12039.3 ± 5315.1	<0.001
Fatty acids, total polyunsaturated (mg)	7443.1 ± 5693.7	7643.0 ± 6067.9	7240.2 ± 5285.0	0.102	8092.2 ± 6020.7	6220.2 ± 4795.8	<0.001
Cholesterol (mg)	78.5 ± 198.0	85.7 ± 252.4	71.2 ± 122.3	0.091	91.7 ± 242.3	53.5 ± 57.7	<0.001

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

Table 28: Nutrient intake in Sindh- by maternal education

Nutrient Intake	SINDH Mean ± SD					
	Mother education level					
	None	Primary	Middle	Secondary	Higher	p-value
Number of children 5-9 Years	**1452**	**220**	**110**	**182**	**162**	
Energy (kcal)	1244.4 ± 423.7	1363.1 ± 503.8	1350.3 ± 455.8	1299.3 ± 430.6	1484.2 ± 527.8	0.001
Protein (g)	30.7 ± 13.3	31.9 ± 14.4	34.5 ± 23.0	32.0 ± 15.2	38.5 ± 24.3	0.256
Total Fat (g)	45.2 ± 21.6	52.0 ± 27.2	51.4 ± 22.2	50.0 ± 23.9	59.2 ± 31.3	<0.001
Fiber, total dietary (g)	20.9 ± 10.4	20.0 ± 8.5	18.8 ± 9.3	19.2 ± 9.4	19.4 ± 10.0	0.181
Carbohydrate (g)	183.0 ± 60.1	195.8 ± 66.8	189.6 ± 61.8	184.6 ± 57.9	201.2 ± 68.9	0.007
Calcium (mg)	317.6 ± 176.8	348.5 ± 200.6	329.3 ± 179.0	347.4 ± 195.0	401.6 ± 371.2	0.031
Iron (mg)	6.6 ± 3.6	6.8 ± 3.3	6.9 ± 3.9	6.9 ± 3.5	7.8 ± 4.2	0.492
Magnesium (mg)	178.4 ± 72.1	181.1 ± 74.6	178.0 ± 72.1	174.7 ± 60.8	182.0 ± 64.7	0.617
Phosphorus (mg)	618.0 ± 226.9	646.8 ± 257.4	648.3 ± 280.9	626.4 ± 224.8	707.9 ± 360.9	0.116
Potassium (mg)	1147.9 ± 482.4	1218.9 ± 580.4	1251.7 ± 604.1	1222.8 ± 562.4	1284.3 ± 573.1	0.084
Sodium (mg)	909.3 ± 511.5	1029.9 ± 684.7	1070.7 ± 754.4	982.6 ± 646.5	1224.0 ± 1012.8	0.012
Zinc (mg)	4.9 ± 2.6	4.9 ± 2.2	5.2 ± 5.0	4.8 ± 2.2	5.7 ± 3.9	0.985
Copper (mg)	0.8 ± 0.7	0.8 ± 0.4	0.8 ± 0.3	0.8 ± 0.4	0.9 ± 1.5	0.943
Vitamin A (µg)	185.0 ± 499.7	211.3 ± 194.3	211.8 ± 199.9	262.6 ± 410.1	312.9 ± 826.8	0.155
Vitamin D (D2 + D3) (µg)	1.0 ± 2.2	1.0 ± 1.5	1.4 ± 3.8	1.1 ± 1.6	1.4 ± 1.6	0.989
Vitamin E (alpha-tocopherol) (mg)	1.7 ± 1.7	1.7 ± 1.6	2.0 ± 2.3	1.6 ± 1.6	1.9 ± 1.6	0.522
Thiamin (mg)	0.8 ± 0.4	0.8 ± 0.3	0.7 ± 0.3	0.7 ± 0.4	0.8 ± 0.4	0.461
Riboflavin (mg)	0.9 ± 0.9	1.1 ± 1.9	0.9 ± 0.8	1.0 ± 0.8	1.1 ± 1.0	0.066
Niacin (mg)	10.6 ± 4.9	10.8 ± 6.2	10.5 ± 5.3	9.9 ± 4.7	11.4 ± 6.3	0.569
Vitamin B-6 (mg)	0.9 ± 0.6	0.9 ± 1.0	1.0 ± 0.7	0.9 ± 0.5	0.9 ± 0.5	0.306
Folate, total (µg)	146.2 ± 91.3	147.8 ± 84.9	137.5 ± 73.2	157.0 ± 107.3	164.8 ± 93.0	0.797
L-ascorbic acid (mg)	25.9 ± 37.9	28.5 ± 33.3	35.2 ± 58.7	37.7 ± 51.0	35.5 ± 38.6	0.300
Fatty acids, total saturated (mg)	17222.3 ± 9117.5	20209.1 ± 13075.1	19290.6 ± 9795.4	19143.0 ± 9831.3	22661.4 ± 14117.0	0.001
Fatty acids, total monounsaturated (mg)	13103.5 ± 6624.1	14738.4 ± 7553.6	15773.4 ± 8810.8	14343.5 ± 7266.6	18464.8 ± 10502.1	0.002
Fatty acids, total polyunsaturated (mg)	6912.8 ± 5269.8	8421.4 ± 7163.2	8698.6 ± 5744.1	7873.9 ± 5488.4	10067.7 ± 6516.1	0.003
Cholesterol (mg)	69.0 ± 121.7	75.1 ± 76.3	92.5 ± 128.8	127.4 ± 597.9	116.5 ± 118.0	0.311

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

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

	SINDH Mean ± SD							
	HB concentration			Food Insecurity Status				
	Anemia (<11 gm/dL)	Normal- non anemic (>= 11 gm/dL)	P-values	Severe food insecure	Moderate food insecure	Mild food insecure	Food Secure	p-value
Number of children 5-9 Years	906	918		675	330	270	849	
Energy (kcal)	1253.9 ± 449.1	1309.5 ± 460.0	0.009	1178.9 ± 394.5	1273.7 ± 449.7	1361.0 ± 466.4	1354.0 ± 462.6	0.001
Protein (g)	30.5 ± 14.6	32.7 ± 15.8	0.002	28.5 ± 12.7	30.3 ± 14.1	33.1 ± 14.2	34.5 ± 17.1	0.054
Total Fat (g)	46.2 ± 23.7	48.5 ± 24.4	0.041	41.4 ± 18.6	47.4 ± 22.9	52.4 ± 26.2	51.6 ± 25.4	<0.001
Fiber, total dietary (g)	20.1 ± 9.6	20.9 ± 10.8	0.071	20.2 ± 9.8	19.7 ± 9.5	20.4 ± 10.5	21.0 ± 10.4	0.529
Carbohydrate (g)	182.9 ± 62.4	189.6 ± 62.6	0.021	177.7 ± 58.5	185.5 ± 60.9	192.4 ± 63.2	191.7 ± 63.4	0.053
Calcium (mg)	321.9 ± 203.1	332.6 ± 193.6	0.251	302.7 ± 166.8	329.3 ± 170.8	333.5 ± 166.2	352.5 ± 241.1	0.019
Iron (mg)	6.5 ± 3.7	6.9 ± 3.6	0.051	6.3 ± 3.6	6.6 ± 3.5	7.0 ± 3.4	7.1 ± 3.7	0.256
Magnesium (mg)	174.7 ± 68.3	183.8 ± 77.0	0.007	171.7 ± 69.4	177.6 ± 65.9	183.3 ± 74.6	183.9 ± 73.2	0.187
Phosphorus (mg)	613.8 ± 246.4	645.6 ± 248.7	0.006	587.3 ± 207.6	626.5 ± 248.3	642.7 ± 221.5	664.0 ± 272.2	0.013
Potassium (mg)	1135.2 ± 494.7	1207.2 ± 541.2	0.003	1089.1 ± 456.7	1151.2 ± 489.1	1261.1 ± 514.8	1236.0 ± 560.0	0.054
Sodium (mg)	916.8 ± 573.0	978.8 ± 620.6	0.027	852.9 ± 464.9	885.1 ± 467.7	1030.1 ± 647.3	1058.2 ± 720.1	0.303
Zinc (mg)	4.8 ± 2.6	5.1 ± 2.8	0.042	4.8 ± 3.2	4.7 ± 2.0	4.9 ± 2.1	5.2 ± 2.7	0.830
Copper (mg)	0.8 ± 0.3	0.9 ± 1.1	0.011	0.8 ± 1.1	0.8 ± 0.3	0.8 ± 0.3	0.8 ± 0.5	0.371
Vitamin A (µg)	177.9 ± 184.8	232.4 ± 709.1	0.024	188.3 ± 664.0	185.5 ± 234.3	224.5 ± 338.9	218.5 ± 383.1	0.922
Vitamin D (D2 + D3) (µg)	1.0 ± 2.4	1.1 ± 2.0	0.655	0.8 ± 1.4	1.0 ± 3.3	1.3 ± 2.4	1.2 ± 2.0	0.454
Vitamin E (alpha-tocopherol) (mg)	1.7 ± 1.7	1.8 ± 1.8	0.332	1.6 ± 1.5	1.7 ± 1.8	1.9 ± 1.9	1.9 ± 1.8	0.271
Thiamin (mg)	0.8 ± 0.3	0.8 ± 0.4	0.314	0.8 ± 0.3	0.8 ± 0.4	0.8 ± 0.3	0.8 ± 0.4	0.654
Riboflavin (mg)	0.9 ± 0.8	1.0 ± 1.3	0.001	0.8 ± 0.7	0.9 ± 0.6	1.0 ± 1.1	1.1 ± 1.4	0.033
Niacin (mg)	10.4 ± 4.7	10.9 ± 5.7	0.02	10.2 ± 4.5	10.5 ± 4.9	10.4 ± 4.8	11.1 ± 5.8	0.482
Vitamin B-6 (mg)	0.8 ± 0.5	0.9 ± 0.8	0.003	0.8 ± 0.5	0.9 ± 0.6	0.9 ± 0.5	1.0 ± 0.8	0.385
Folate, total (µg)	141.0 ± 85.4	155.6 ± 99.8	0.001	140.8 ± 85.1	142.5 ± 89.6	153.7 ± 99.7	155.2 ± 94.4	0.772
L-ascorbic acid (mg)	25.0 ± 35.8	30.3 ± 44.0	0.005	23.0 ± 31.3	24.6 ± 38.1	33.8 ± 48.1	32.6 ± 44.2	0.523
Fatty acids, total saturated (mg)	17679.0 ± 9976.1	18560.6 ± 11073.8	0.074	16006.4 ± 8125.6	18437.0 ± 9677.5	19745.4 ± 11754.1	19461.8 ± 11195.4	<0.001
Fatty acids, total monounsaturated (mg)	13486.9 ± 7360.9	14194.3 ± 7620.4	0.044	11870.5 ± 5865.9	13902.2 ± 7351.5	15436.5 ± 7716.6	15129.0 ± 7830.1	<0.001
Fatty acids, total polyunsaturated (mg)	7142.6 ± 5816.4	7662.3 ± 5694.6	0.054	5940.0 ± 4803.1	7725.9 ± 6248.0	8982.7 ± 6363.8	8188.9 ± 5565.7	<0.001
Cholesterol (mg)	69.0 ± 82.4	82.3 ± 154.5	0.022	53.8 ± 64.7	73.5 ± 119.9	96.0 ± 202.2	97.5 ± 291.3	0.005

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

Table 30: Nutrient intake in Sindh- by nutrition status

	SINDH Mean ± SD									
	Height for age			BMI-for-age				HB concentration		
	Normal	Stunting	P-values	Underweight (- <2SD)	Normal (-2<BAZ<+1)	Overweight/ Obese (+ 1SD)	P-values	Anemic (<11 gm/dL)	Normal-non anemic (>= 11 gm/dL)	P-values
Number of children 5-9 Years	1,298	664		450	1,336	155		906	918	
Energy (kcal)	1300.9 ± 453.2	1281.8 ± 439.2	0.366	1303.8 ± 469.0	1284.5 ± 442.5	1362.9 ± 415.0	0.445	1253.9 ± 449.1	1309.5 ± 460.0	0.009
Protein (g)	32.3 ± 14.9	31.4 ± 16.0	0.255	31.5 ± 14.2	31.6 ± 14.9	37.1 ± 20.0	0.930	30.5 ± 14.6	32.7 ± 15.8	0.002
Total Fat (g)	48.6 ± 23.8	47.0 ± 23.3	0.143	48.0 ± 23.6	47.5 ± 23.4	54.4 ± 24.7	0.646	46.2 ± 23.7	48.5 ± 24.4	0.041
Fiber, total dietary (g)	20.5 ± 10.2	20.6 ± 10.0	0.931	20.4 ± 10.3	20.6 ± 10.1	20.7 ± 9.6	0.743	20.1 ± 9.6	20.9 ± 10.8	0.071
Carbohydrate (g)	187.4 ± 62.4	187.8 ± 60.9	0.894	189.7 ± 65.2	187.2 ± 61.5	184.6 ± 52.3	0.472	182.9 ± 62.4	189.6 ± 62.6	0.021
Calcium (mg)	332.3 ± 199.7	327.7 ± 198.8	0.631	330.9 ± 186.2	327.6 ± 198.7	354.4 ± 247.4	0.746	321.9 ± 203.1	332.6 ± 193.6	0.251
Iron (mg)	6.9 ± 3.7	6.7 ± 3.5	0.356	6.9 ± 3.4	6.8 ± 3.7	7.3 ± 3.4	0.609	6.5 ± 3.7	6.9 ± 3.6	0.051
Magnesium (mg)	180.1 ± 69.8	180.7 ± 75.2	0.874	181.3 ± 72.2	179.7 ± 72.2	184.2 ± 63.1	0.682	174.7 ± 68.3	183.8 ± 77.0	0.007
Phosphorus (mg)	635.2 ± 241.4	630.5 ± 251.8	0.691	632.2 ± 235.1	627.7 ± 238.6	694.8 ± 330.1	0.727	613.8 ± 246.4	645.6 ± 248.7	0.006
Potassium (mg)	1185.9 ± 507.7	1186.9 ± 527.1	0.969	1196.2 ± 541.3	1174.7 ± 503.9	1267.0 ± 524.5	0.457	1135.2 ± 494.7	1207.2 ± 541.2	0.003
Sodium (mg)	978.9 ± 643.9	945.3 ± 540.5	0.224	980.1 ± 594.1	951.7 ± 611.8	1083.4 ± 577.8	0.383	916.8 ± 573.0	978.8 ± 620.6	0.027
Zinc (mg)	5.0 ± 2.7	5.0 ± 3.1	0.737	4.9 ± 2.5	5.0 ± 2.9	5.4 ± 3.2	0.663	4.8 ± 2.6	5.1 ± 2.8	0.042
Copper (mg)	0.8 ± 0.6	0.8 ± 1.0	0.801	0.8 ± 1.0	0.8 ± 0.7	0.8 ± 0.4	0.406	0.8 ± 0.3	0.9 ± 1.1	0.011
Vitamin A (µg)	208.6 ± 433.9	199.2 ± 615.8	0.727	208.1 ± 472.1	199.8 ± 514.8	253.8 ± 489.4	0.752	177.9 ± 184.8	232.4 ± 709.1	0.024
Vitamin D (D2 + D3) (µg)	1.0 ± 1.6	1.1 ± 3.0	0.841	1.1 ± 2.0	1.0 ± 1.3	1.9 ± 6.6	0.271	1.0 ± 2.4	1.1 ± 2.0	0.655
Vitamin E (alpha-tocopherol) (mg)	1.8 ± 1.7	1.8 ± 1.9	0.749	1.7 ± 1.7	1.8 ± 1.7	2.1 ± 2.4	0.241	1.7 ± 1.7	1.8 ± 1.8	0.332
Thiamin (mg)	0.8 ± 0.4	0.8 ± 0.3	0.860	0.8 ± 0.3	0.8 ± 0.4	0.8 ± 0.3	0.892	0.8 ± 0.3	0.8 ± 0.4	0.314
Riboflavin (mg)	1.0 ± 0.9	1.0 ± 1.3	0.694	0.9 ± 1.0	1.0 ± 1.1	1.0 ± 1.1	0.851	0.9 ± 0.8	1.0 ± 1.3	0.001
Niacin (mg)	10.7 ± 5.1	10.7 ± 5.3	0.958	10.8 ± 5.6	10.6 ± 5.1	11.0 ± 5.2	0.697	10.4 ± 4.7	10.9 ± 5.7	0.02
Vitamin B-6 (mg)	0.9 ± 0.6	0.9 ± 0.7	0.649	0.9 ± 0.8	0.9 ± 0.6	1.0 ± 0.8	0.782	0.8 ± 0.5	0.9 ± 0.8	0.003
Folate, total (µg)	150.1 ± 94.7	149.1 ± 87.8	0.814	151.5 ± 98.8	147.8 ± 87.2	162.2 ± 114.5	0.475	141.0 ± 85.4	155.6 ± 99.8	0.001
L-ascorbic acid (mg)	28.4 ± 39.4	29.2 ± 42.2	0.691	28.1 ± 39.4	28.0 ± 41.1	35.4 ± 30.1	0.952	25.0 ± 35.8	30.3 ± 44.0	0.005
Fatty acids, total saturated (mg)	18445.0 ± 9905.0	18060.6 ± 11023.5	0.450	18429.8 ± 10778.9	18035.9 ± 10036.3	20589.2 ± 11252.0	0.495	17679.0 ± 9976.1	18560.6 ± 11073.8	0.074
Fatty acids, total monounsaturated (mg)	14152.6 ± 7257.9	13852.0 ± 7545.2	0.398	14201.6 ± 7339.7	13765.4 ± 7189.2	16277.1 ± 8331.1	0.273	13486.9 ± 7360.9	14194.3 ± 7620.4	0.044
Fatty acids, total polyunsaturated (mg)	7730.2 ± 6097.4	7280.4 ± 4999.7	0.081	7732.7 ± 6194.7	7397.5 ± 5588.4	8856.9 ± 5527.7	0.309	7142.6 ± 5816.4	7662.3 ± 5694.6	0.054
Cholesterol (mg)	84.5 ± 242.2	70.0 ± 87.3	0.055	73.7 ± 95.0	78.3 ± 229.8	105.5 ± 122.3	0.546	69.0 ± 82.4	82.3 ± 154.5	0.022

Compared to the recommended daily allowance (RDA), 87.9% (rural: 88.6%; urban: 85.9%) of the children in Sindh had a lower energy intake. More than half of school-aged children had inadequate intake of dietary fiber (74.8%), calcium (98.4%), iron (96%), potassium (98.1%), sodium (68.9%), zinc (95.2%), and micronutrients such as vitamin A (85.3%), vitamin D (99.4%), vitamin E (98.4%), folate (70.8%), and L-ascorbic acid (65.4%) (**Table 31**).

Table 31: Inadequate nutrient intake in Sindh

	Total n (%)	SINDH n (%)							
		Rural	Urban	Larkana	Sukkur	Hyderabad	Mirpur Khas	Karachi	S. Benazirabad
Number of children 5-9 Years	2126	1185	941	282	225	486	214	669	250
Energy (kcal)	1865 (87.6)	1055 (88.6)	810 (85.9)	262 (92.0)	209 (92.4)	418 (85.0)	193 (91.1)	568 (84.5)	215 (86.3)
Protein (g)	88 (4.4)	37 (3.4)	51 (6.1)	17 (6.9)	11 (4.7)	24 (5.0)	3 (1.0)	25 (4.2)	8 (3.4)
Total Fat (g)	760 (34.7)	393 (32.5)	367 (38.6)	77 (26.2)	68 (30.0)	172 (35.7)	32 (14.6)	345 (52.2)	66 (27.9)
Fiber, total dietary (g)	1594 (74.8)	867 (72.8)	727 (78.2)	244 (87.6)	167 (73.9)	398 (82.2)	127 (58.3)	497 (73.9)	161 (61.2)
Carbohydrate (g)	72 (3.5)	30 (2.4)	42 (5.4)	7 (2.6)	3 (1.3)	27 (5.2)	3 (1.5)	29 (5.3)	3 (0.9)
Calcium (mg)	2085 (98.4)	1167 (98.6)	918 (98.0)	282 (100.0)	221 (98.3)	482 (99.2)	212 (99.3)	650 (97.9)	238 (94.6)
Iron (mg)	2038 (96.0)	1144 (96.5)	894 (95.0)	276 (97.6)	218 (96.8)	470 (96.4)	205 (96.1)	630 (94.5)	239 (95.5)
Magnesium (mg)	466 (21.8)	244 (20.7)	222 (23.6)	56 (19.5)	48 (20.3)	141 (28.7)	29 (12.7)	161 (25.0)	31 (13.0)
Phosphorus (mg)	584 (27.2)	331 (27.8)	253 (26.2)	81 (27.8)	62 (28.3)	160 (33.1)	42 (17.4)	183 (27.8)	56 (21.9)
Potassium (mg)	2081 (98.1)	1167 (98.5)	914 (97.3)	281 (99.7)	223 (99.1)	476 (98.0)	212 (99.1)	651 (97.6)	238 (95.0)
Sodium (mg)	1440 (68.9)	834 (70.9)	606 (65.5)	233 (82.0)	166 (73.4)	361 (75.3)	137 (65.0)	374 (55.8)	169 (68.5)
Zinc (mg)	2019 (95.2)	1143 (96.4)	876 (93.2)	274 (97.0)	221 (98.1)	463 (95.0)	207 (96.6)	615 (92.4)	239 (95.9)
Copper (mg)	157 (7.9)	83 (7.8)	74 (8.1)	19 (7.6)	11 (5.0)	57 (11.7)	10 (4.2)	51 (8.2)	9 (6.1)
Vitamin A (µg)	1795 (85.3)	1026 (87.1)	769 (82.1)	262 (93.1)	196 (87.4)	425 (87.1)	194 (90.4)	515 (77.7)	203 (81.0)
Vitamin D (D2 + D3) (µg)	2114 (99.4)	1177 (99.3)	937 (99.4)	281 (99.8)	224 (99.7)	481 (98.6)	214 (100.0)	664 (99.1)	250 (100.0)
Vitamin E (alpha-tocopherol) (mg)	2091 (98.4)	1163 (98.2)	928 (98.7)	279 (99.0)	222 (98.7)	478 (98.2)	211 (98.9)	655 (97.8)	246 (98.5)
Thiamin (mg)	460 (20.5)	215 (17.8)	245 (25.1)	52 (19.0)	34 (14.9)	120 (23.0)	24 (9.2)	205 (30.1)	25 (10.5)
Riboflavin (mg)	473 (21.9)	262 (21.7)	211 (22.3)	76 (27.1)	56 (24.2)	135 (27.4)	22 (9.1)	150 (22.6)	34 (12.3)
Niacin (mg)	376 (17.3)	185 (15.4)	191 (20.5)	49 (17.3)	31 (14.8)	112 (21.3)	14 (5.4)	153 (23.8)	17 (7.6)
Vitamin B-6 (mg)	409 (19.3)	209 (17.8)	200 (21.9)	53 (19.5)	43 (19.8)	131 (27.4)	22 (7.5)	133 (20.1)	27 (12.0)
Folate, total (µg)	1496 (70.8)	843 (71.5)	653 (69.4)	218 (77.4)	180 (79.7)	340 (69.0)	135 (61.9)	470 (72.2)	153 (62.7)
L-ascorbic acid (mg)	1336 (65.4)	768 (67.2)	568 (62.2)	208 (73.7)	171 (75.8)	337 (71.9)	144 (67.4)	355 (56.1)	121 (49.8)

The survey reported significant inadequate intake of proteins, magnesium, phosphorus, 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 school (**Table 32**).

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

Nutrient Intake	SINDH n (%)						
	Total	Gender			Have child ever attended school		
		Male	Female	p-value	Ever attended school	Never attended school	p-value
Number of children 5-9 Years	2126	1085	1041		1419	707	
Energy (kcal)	1865 (87.6%)	939 (86.2%)	926 (89.0%)	0.080	1213 (85.4%)	652 (91.9%)	<0.001
Protein (g)	88 (4.4%)	37 (3.3%)	51 (5.5%)	0.029	64 (5.0%)	24 (3.2%)	0.098
Total Fat (g)	760 (34.7%)	396 (36.3%)	364 (33.1%)	0.173	538 (36.8%)	222 (30.8%)	0.013
Fiber, total dietary (g)	1594 (74.8%)	802 (73.2%)	792 (76.4%)	0.135	1056 (74.8%)	538 (74.8%)	0.991
Carbohydrate (g)	72 (3.5%)	35 (3.1%)	37 (3.9%)	0.410	47 (3.5%)	25 (3.6%)	0.916
Calcium (mg)	2085 (98.4%)	1064 (98.4%)	1021 (98.5%)	0.834	1389 (98.4%)	696 (98.5%)	0.799
Iron (mg)	2038 (96.0%)	1039 (95.9%)	999 (96.1%)	0.831	1348 (95.1%)	690 (97.7%)	0.006
Magnesium (mg)	466 (21.8%)	217 (19.4%)	249 (24.1%)	0.018	326 (22.9%)	140 (19.5%)	0.107
Phosphorus (mg)	584 (27.2%)	274 (24.0%)	310 (30.4%)	0.003	404 (27.6%)	180 (26.4%)	0.593
Potassium (mg)	2081 (98.1%)	1066 (98.3%)	1015 (97.9%)	0.472	1381 (97.6%)	700 (98.9%)	0.070
Sodium (mg)	1440 (68.9%)	708 (66.8%)	732 (71.1%)	0.053	904 (64.9%)	536 (76.4%)	<0.001
Zinc (mg)	2019 (95.2%)	1029 (95.1%)	990 (95.4%)	0.737	1330 (94.0%)	689 (97.5%)	0.001
Copper (mg)	157 (7.9%)	63 (5.9%)	94 (9.9%)	0.003	104 (8.2%)	53 (7.3%)	0.528
Vitamin A (µg)	1795 (85.3%)	906 (84.2%)	889 (86.4%)	0.186	1156 (82.2%)	639 (91.1%)	0.000
Vitamin D (D2 + D3) (µg)	2114 (99.4%)	1081 (99.4%)	1033 (99.3%)	0.821	1409 (99.3%)	705 (99.5%)	0.611
Vitamin E (alpha-tocopherol) (mg)	2091 (98.4%)	1064 (98.1%)	1027 (98.7%)	0.326	1391 (97.9%)	700 (99.2%)	0.032
Thiamin (mg)	460 (20.5%)	225 (19.1%)	235 (21.9%)	0.144	326 (22.1%)	134 (17.3%)	0.017
Riboflavin (mg)	473 (21.9%)	207 (19.0%)	266 (24.8%)	0.004	306 (21.2%)	167 (23.3%)	0.316
Niacin (mg)	376 (17.3%)	179 (15.4%)	197 (19.2%)	0.033	268 (18.8%)	108 (14.4%)	0.021
Vitamin B-6 (mg)	409 (19.3%)	194 (18.0%)	215 (20.7%)	0.173	278 (19.8%)	131 (18.5%)	0.508
Folate, total (µg)	1496 (70.8%)	749 (70.0%)	747 (71.5%)	0.511	975 (69.1%)	521 (73.9%)	0.041
L-ascorbic acid (mg)	1336 (65.4%)	678 (65.2%)	658 (65.6%)	0.857	834 (61.5%)	502 (72.6%)	<0.001

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

Table 33: Inadequate nutrient in Sindh- by wealth quintiles

Nutrient Intake	SINDH n (%)					
	Wealth index quintile					
	Poorest	Poor	Middle	Rich	Richest	p-value
Number of children 5-9 Years	429	419	427	424	427	
Energy (kcal)	401 (93.7%)	382 (91.0%)	393 (91.9%)	360 (83.3%)	329 (75.6%)	0.177
Protein (g)	23 (4.7%)	16 (3.9%)	16 (4.7%)	19 (4.6%)	14 (4.1%)	0.598
Total Fat (g)	123 (27.4%)	110 (24.8%)	136 (32.3%)	169 (40.5%)	222 (52.4%)	0.431
Fiber, total dietary (g)	333 (75.7%)	326 (77.5%)	316 (74.6%)	309 (73.2%)	310 (72.2%)	0.581
Carbohydrate (g)	15 (3.2%)	15 (3.4%)	10 (2.7%)	19 (4.8%)	13 (3.5%)	0.868

Nutrient Intake	SINDH n (%)					
	Wealth index quintile					
	Poorest	Poor	Middle	Rich	Richest	p-value
Number of children 5-9 Years	429	419	427	424	427	
Calcium (mg)	424 (99.0%)	415 (99.2%)	420 (98.3%)	413 (97.7%)	413 (97.7%)	0.771
Iron (mg)	415 (96.9%)	407 (96.7%)	417 (97.7%)	402 (94.7%)	397 (93.3%)	0.901
Magnesium (mg)	93 (19.9%)	96 (22.9%)	96 (23.5%)	99 (22.8%)	82 (19.7%)	0.321
Phosphorus (mg)	120 (27.1%)	121 (28.6%)	120 (28.9%)	118 (25.9%)	105 (25.1%)	0.659
Potassium (mg)	426 (99.3%)	415 (99.0%)	418 (98.0%)	412 (97.2%)	410 (96.6%)	0.672
Sodium (mg)	344 (80.9%)	307 (73.3%)	291 (68.4%)	268 (63.7%)	230 (54.9%)	0.018
Zinc (mg)	416 (96.7%)	409 (97.6%)	411 (96.3%)	397 (94.2%)	386 (90.4%)	0.467
Copper (mg)	40 (9.4%)	36 (9.0%)	22 (5.9%)	34 (8.7%)	25 (6.2%)	0.883
Vitamin A (µg)	399 (93.0%)	382 (92.2%)	358 (85.1%)	332 (76.1%)	324 (77.4%)	0.687
Vitamin D (D2 + D3) (µg)	426 (99.5%)	419 (100.0%)	424 (99.1%)	421 (99.1%)	424 (99.1%)	-
Vitamin E (alpha-tocopherol) (mg)	421 (98.2%)	413 (98.6%)	424 (99.4%)	416 (97.9%)	417 (97.6%)	0.690
Thiamin (mg)	81 (17.8%)	73 (16.9%)	78 (18.1%)	114 (25.5%)	114 (25.3%)	0.756
Riboflavin (mg)	109 (24.3%)	95 (22.4%)	95 (23.0%)	93 (19.7%)	81 (19.4%)	0.551
Niacin (mg)	76 (15.9%)	66 (15.7%)	67 (16.5%)	90 (21.6%)	77 (17.2%)	0.950
Vitamin B-6 (mg)	83 (18.1%)	80 (19.7%)	82 (20.3%)	97 (23.2%)	67 (15.3%)	0.580
Folate, total (µg)	328 (75.9%)	313 (74.0%)	293 (70.4%)	281 (65.7%)	281 (66.2%)	0.571
L-ascorbic acid (mg)	314 (76.1%)	304 (72.5%)	267 (64.7%)	243 (58.8%)	208 (51.3%)	0.267

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

Table 34: Inadequate nutrient in Sindh- by maternal education

Nutrient Intake	SINDH n (%)					
	Mother education level					
	None	Primary	Middle	Secondary	Higher	p-value
Number of children 5-9 Years	**1452**	**220**	**110**	**182**	**162**	
Energy (kcal)	1311 (89.8%)	184 (82.5%)	94 (85.7%)	154 (86.6%)	122 (75.6%)	0.005
Protein (g)	59 (4.2%)	9 (5.1%)	5 (3.5%)	9 (6.2%)	6 (3.5%)	0.617
Total Fat (g)	469 (31.6%)	93 (41.4%)	38 (34.8%)	80 (43.8%)	80 (45.6%)	0.011
Fiber, total dietary (g)	1068 (73.9%)	168 (75.6%)	88 (78.9%)	146 (79.4%)	124 (74.3%)	0.621
Carbohydrate (g)	55 (4.0%)	4 (2.0%)	2 (0.8%)	6 (3.1%)	5 (3.2%)	0.193
Calcium (mg)	1433 (98.8%)	215 (97.6%)	107 (98.3%)	175 (97.4%)	155 (96.9%)	0.184
Iron (mg)	1402 (96.5%)	212 (96.3%)	105 (94.9%)	174 (95.7%)	145 (91.6%)	0.906
Magnesium (mg)	323 (22.3%)	46 (20.8%)	28 (21.7%)	34 (17.3%)	35 (23.1%)	0.646
Phosphorus (mg)	419 (28.6%)	65 (27.9%)	26 (21.2%)	39 (21.5%)	35 (22.9%)	0.841
Potassium (mg)	1433 (98.9%)	211 (95.5%)	106 (96.8%)	176 (96.8%)	155 (96.5%)	0.001

Nutrient Intake	SINDH n (%)					
	Mother education level					
	None	Primary	Middle	Secondary	Higher	p-value
Number of children 5-9 Years	**1452**	**220**	**110**	**182**	**162**	
Sodium (mg)	1042 (72.6%)	136 (63.6%)	62 (55.2%)	115 (63.8%)	85 (54.3%)	0.013
Zinc (mg)	1393 (95.9%)	208 (94.7%)	103 (93.8%)	171 (94.1%)	144 (91.1%)	0.430
Copper (mg)	107 (8.0%)	15 (7.3%)	9 (8.0%)	12 (7.0%)	14 (9.1%)	0.780
Vitamin A (µg)	1290 (89.1%)	171 (78.0%)	86 (80.3%)	135 (76.2%)	113 (70.5%)	<0.001
Vitamin D (D2 + D3) (µg)	1445 (99.4%)	219 (99.7%)	109 (98.1%)	181 (99.4%)	160 (99.1%)	0.513
Vitamin E (alpha-tocopherol) (mg)	1426 (98.3%)	218 (99.0%)	108 (97.2%)	179 (98.6%)	160 (98.7%)	0.425
Thiamin (mg)	296 (19.1%)	49 (20.5%)	28 (23.8%)	51 (28.3%)	36 (23.1%)	0.658
Riboflavin (mg)	348 (23.5%)	51 (22.0%)	20 (15.6%)	28 (15.9%)	26 (16.2%)	0.637
Niacin (mg)	248 (16.9%)	40 (16.7%)	22 (19.0%)	34 (18.7%)	32 (19.8%)	0.945
Vitamin B-6 (mg)	280 (19.4%)	40 (17.7%)	22 (18.5%)	31 (16.8%)	36 (25.1%)	0.588
Folate, total (µg)	1047 (72.2%)	154 (70.1%)	77 (69.4%)	120 (67.7%)	98 (61.5%)	0.573
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 35**).

Table 35: Inadequate nutrient in Sindh- by nutrition status

Nutrient Intake	SINDH 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- non anemic (>= 11 gm/dL)	P-values
Number of children 5-9 Years	1,298	664		450	1,336	155		906	918	
Energy (kcal)	1116 (86.0)	596 (89.1)	0.092	379 (84.1)	1180 (88.2)	135 (85.5)	0.048	807 (88.1)	793 (86.6)	0.403
Protein (g)	65 (5.2)	23 (2.9)	0.025	10 (1.9)	61 (4.7)	13 (8.6)	0.017	37 (4.4)	44 (5.1)	0.545
Total Fat (g)	474 (35.4)	226 (33.1)	0.354	160 (35.2)	453 (32.8)	77 (49.6)	0.409	335 (34.8)	306 (33.7)	0.664
Fiber, total dietary (g)	965 (73.7)	503 (76.7)	0.186	338 (73.7)	993 (74.4)	119 (78.9)	0.812	688 (76.3)	673 (72.6)	0.108
Carbohydrate (g)	40 (3.3)	22 (3.1)	0.819	14 (3.3)	41 (3.1)	6 (3.7)	0.867	31 (3.7)	35 (3.7)	0.995
Calcium (mg)	1274 (98.4)	648 (98.1)	0.537	442 (98.5)	1312 (98.4)	147 (95.8)	0.908	890 (98.7)	900 (98.3)	0.402
Iron (mg)	1235 (95.4)	642 (96.4)	0.349	432 (96.4)	1276 (95.5)	149 (96.1)	0.467	877 (96.3)	873 (95.7)	0.550
Magnesium (mg)	264 (20.3)	150 (22.6)	0.295	94 (21.8)	279 (20.6)	36 (23.5)	0.651	196 (20.9)	213 (23.6)	0.221
Phosphorus (mg)	316 (24.2)	213 (32.1)	0.001	112 (25.7)	372 (27.5)	39 (24.3)	0.534	247 (26.5)	269 (29.1)	0.267
Potassium (mg)	1273 (98.3)	646 (97.6)	0.359	439 (97.4)	1313 (98.5)	146 (95.3)	0.180	889 (98.4)	895 (97.7)	0.320
Sodium (mg)	847 (66.3)	464 (71.2)	0.046	298 (69.0)	909 (68.6)	90 (58.7)	0.875	634 (71.7)	619 (68.0)	0.126
Zinc (mg)	1226 (94.7)	635 (95.7)	0.377	425 (94.5)	1271 (95.4)	146 (95.1)	0.510	871 (96.1)	867 (94.9)	0.260

Nutrient Intake	SINDH 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- non anemic (>= 11 gm/dL)	P-values
Number of children 5-9 Years	1,298	664		450	1,336	155		906	918	
Copper (mg)	88 (7.3)	42 (7.0)	0.855	32 (8.0)	93 (7.3)	4 (2.8)	0.684	65 (7.5)	70 (8.1)	0.680
Vitamin A (µg)	1079 (84.1)	578 (87.2)	0.107	384 (88.1)	1129 (84.6)	127 (81.9)	0.080	775 (87.0)	775 (84.2)	0.122
Vitamin D (D2 + D3) (µg)	1291 (99.4)	661 (99.3)	0.808	448 (99.1)	1331 (99.7)	152 (96.5)	0.233	901 (99.4)	912 (99.1)	0.515
Vitamin E (alpha-tocopherol) (mg)	1281 (98.8)	651 (97.7)	0.076	443 (98.5)	1316 (98.7)	152 (96.2)	0.765	893 (98.5)	899 (98.0)	0.376
Thiamin (mg)	274 (19.9)	140 (20.4)	0.814	88 (19.1)	292 (20.5)	32 (19.4)	0.549	200 (19.8)	204 (21.9)	0.312
Riboflavin (mg)	260 (19.5)	161 (24.3)	0.028	86 (19.5)	300 (21.8)	30 (19.2)	0.359	214 (23.1)	206 (21.8)	0.539
Niacin (mg)	213 (16.3)	119 (17.4)	0.581	70 (15.8)	234 (16.9)	25 (16.4)	0.624	163 (16.9)	163 (17.9)	0.616
Vitamin B-6 (mg)	236 (17.9)	126 (19.5)	0.455	84 (17.8)	248 (18.5)	25 (18.9)	0.783	188 (20.3)	168 (19.0)	0.522
Folate, total (µg)	891 (68.6)	484 (73.4)	0.046	311 (69.7)	946 (70.6)	103 (67.8)	0.746	665 (73.3)	622 (68.0)	0.027
L-ascorbic acid (mg)	799 (64.2)	424 (65.3)	0.662	280 (65.5)	869 (66.3)	65 (45.1)	0.773	588 (68.4)	576 (64.3)	0.094

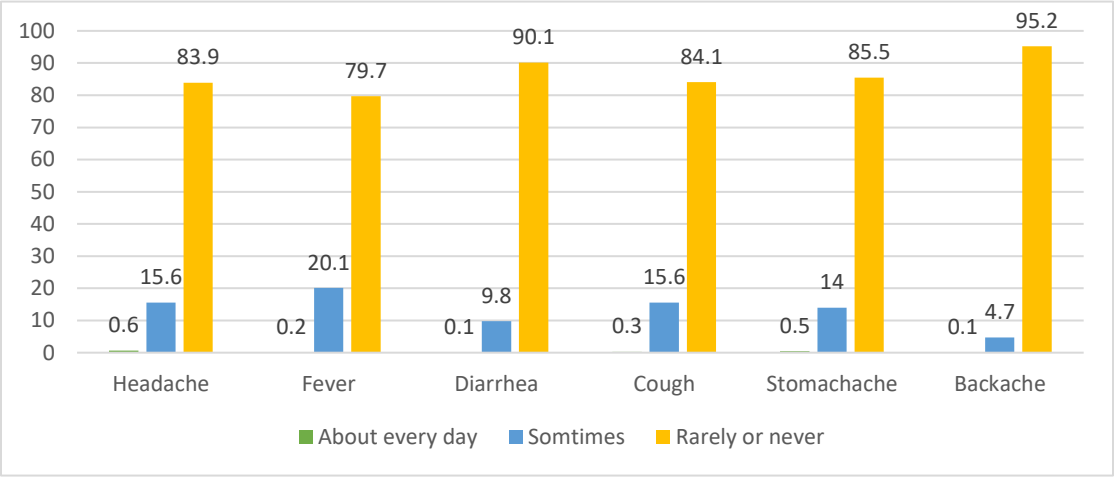
Child Health

General Health

Dehydration due to diarrhea, acute respiratory infections (ARI) and fever are the 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.

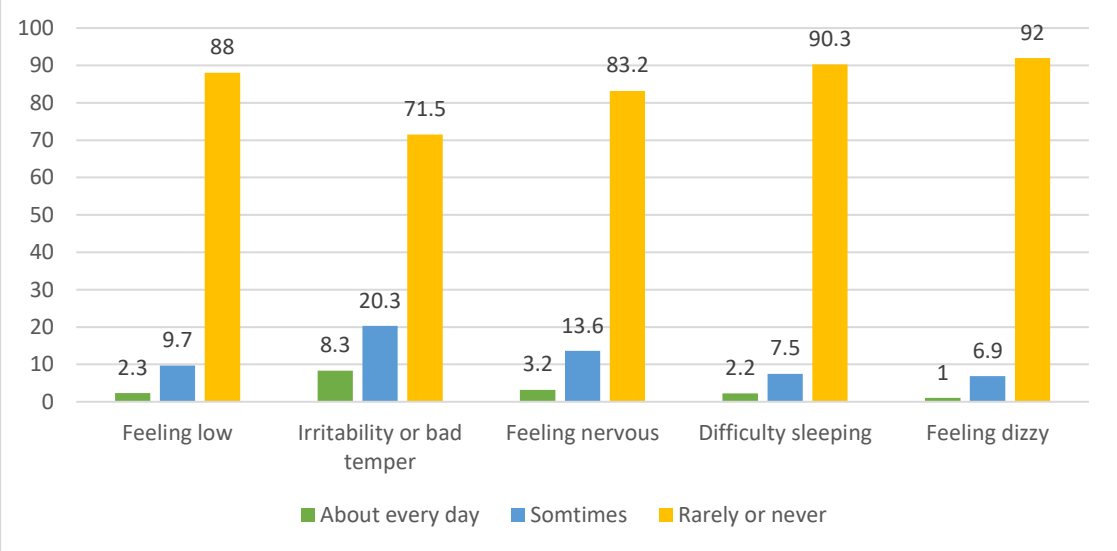
This survey collected information about episodes of diarrhea, fever, headache, cough, backache, and stomachache that occurred in the last six months of survey and majority of the surveyed children reported rare or no frequency of headache, fever, diarrhea, cough, stomachache, and backache in last six months (**Figure 21**).

Figure 21: 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, irritable or bad tempered, nervous, and dizziness. Few children reported to have these symptoms in months or in weeks (**Figure 22**).

Figure 22: Frequency of mental health issues of children 5-9 years (%)



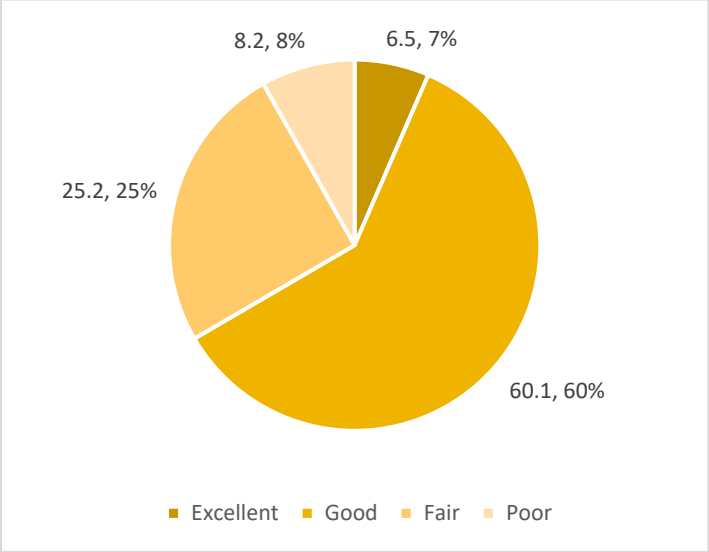
The survey showed significantly greater frequency of mental health issues among the children who were surveyed pre-lockdown compared to children who were surveyed post-lockdown. These children reported several episodes of feeling low, irritability/bad temper, nervousness, and difficulty sleeping in past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

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

Mental Health Issues	Sindh n (%)									
	Overall				Rural			Urban		
	Overall	Pre lockdown	Post lockdown	P-values	Pre lockdown	Post lockdown	P-values	Pre lockdown	Post lockdown	P-values
N	2157	869	1288		487	711		382	577	
Freq of Feeling low in last 6 months:										
About every day	40 (2.3%)	32 (4.5%)	8 (0.6%)	<0.001	25 (6.1%)	5 (0.7%)	<0.001	7 (1.7%)	3 (0.4%)	0.033
More than 1/week	43 (2.0%)	27 (3.1%)	16 (1.1%)	0.004	15 (2.4%)	9 (1.1%)	0.102	12 (4.4%)	7 (1.1%)	0.011
About every week	24 (1.4%)	11 (1.7%)	13 (1.2%)	0.469	8 (1.9%)	9 (1.6%)	0.792	3 (1.3%)	4 (0.5%)	0.274
About every month	127 (6.4%)	94 (11.6%)	33 (2.5%)	<0.001	61 (12.3%)	17 (2.0%)	<0.001	33 (10.2%)	16 (3.4%)	0.002
Rarely or never	1923 (88.0%)	705 (79.1%)	1218 (94.5%)	<0.001	378 (77.4%)	671 (94.5%)	<0.001	327 (82.3%)	547 (94.5%)	<0.001
Freq of Irritability or bad temper in last 6 months:										
About every day	177 (8.3%)	117 (13.8%)	60 (4.1%)	<0.001	65 (14.5%)	33 (4.0%)	<0.001	52 (12.7%)	27 (4.4%)	<0.001
More than 1/week	161 (8.0%)	59 (7.6%)	102 (8.3%)	0.624	39 (7.8%)	66 (9.9%)	0.250	20 (7.3%)	36 (5.7%)	0.416
About every week	72 (3.8%)	52 (7.1%)	20 (1.5%)	0.000	38 (7.6%)	12 (1.7%)	<0.001	14 (6.2%)	8 (1.1%)	<0.001
About every month	164 (8.4%)	100 (12.5%)	64 (5.4%)	<0.001	73 (15.5%)	33 (5.0%)	<0.001	27 (6.9%)	31 (6.2%)	0.715
Rarely or never	1583 (71.5%)	541 (59.0%)	1042 (80.7%)	<0.001	272 (54.7%)	567 (79.5%)	<0.001	269 (67.0%)	475 (82.6%)	<0.001
Freq of Feeling nervous in last 6 months:										
About every day	58 (3.2%)	41 (6.3%)	17 (1.0%)	<0.001	29 (7.1%)	10 (1.0%)	<0.001	12 (4.7%)	7 (0.9%)	0.002
More than 1/week	68 (3.3%)	37 (4.5%)	31 (2.4%)	0.017	26 (5.2%)	16 (2.4%)	0.022	11 (3.3%)	15 (2.4%)	0.504
About every week	40 (2.2%)	20 (2.5%)	20 (1.9%)	0.400	15 (3.2%)	17 (2.8%)	0.737	5 (1.3%)	3 (0.4%)	0.129
About every month	165 (8.1%)	107 (13.0%)	58 (4.5%)	<0.001	76 (15.5%)	31 (4.0%)	<0.001	31 (8.5%)	27 (5.2%)	0.094
Rarely or never	1826 (83.2%)	664 (73.6%)	1162 (90.2%)	<0.001	341 (68.9%)	637 (89.8%)	<0.001	323 (82.2%)	525 (91.0%)	0.001
Freq of Difficulties getting to sleep in last 6 months:										
About every day	46 (2.2%)	36 (4.4%)	10 (0.6%)	<0.001	26 (5.5%)	7 (0.8%)	<0.001	10 (2.3%)	3 (0.3%)	0.006
More than 1/week	28 (1.4%)	20 (2.4%)	8 (0.7%)	<0.001	12 (2.4%)	5 (0.7%)	0.046	8 (2.5%)	3 (0.6%)	0.050
About every week	23 (1.0%)	17 (1.8%)	6 (0.4%)	0.007	11 (1.9%)	2 (0.3%)	0.031	6 (1.6%)	4 (0.6%)	0.149
About every month	94 (5.1%)	65 (8.4%)	29 (2.7%)	<0.001	50 (10.8%)	9 (1.5%)	<0.001	15 (3.8%)	20 (4.6%)	0.616
Rarely or never	1966 (90.3%)	731 (83.1%)	1235 (95.6%)	<0.001	388 (79.5%)	688 (96.6%)	<0.001	343 (89.9%)	547 (93.9%)	0.050
Freq of Feeling dizzy in last 6 months:										
About every day	18 (1.0%)	6 (0.9%)	12 (1.1%)	0.792	5 (1.0%)	9 (1.5%)	0.437	1 (0.9%)	3 (0.3%)	0.391
More than 1/week	22 (1.3%)	14 (1.6%)	8 (1.0%)	0.319	9 (2.0%)	8 (1.6%)	0.718	5 (1.0%)	0 (0.0%)	.
About every week	33 (1.6%)	19 (2.1%)	14 (1.2%)	0.168	17 (3.0%)	5 (0.9%)	0.023	2 (0.5%)	9 (1.8%)	0.102
About every month	77 (4.1%)	35 (4.0%)	42 (4.1%)	0.929	22 (4.3%)	20 (4.0%)	0.808	13 (3.5%)	22 (4.4%)	0.599
Rarely or never	2007 (92.0%)	795 (91.3%)	1212 (92.6%)	0.384	434 (89.8%)	669 (92.0%)	0.262	361 (94.2%)	543 (93.5%)	0.743

When asked to rate the health of their child 6.5% of the caregivers rated it as excellent, 60.1% rated it as good. 25.2% rated it as fair and 8.2% rated their health as poor (**Figure 23**).

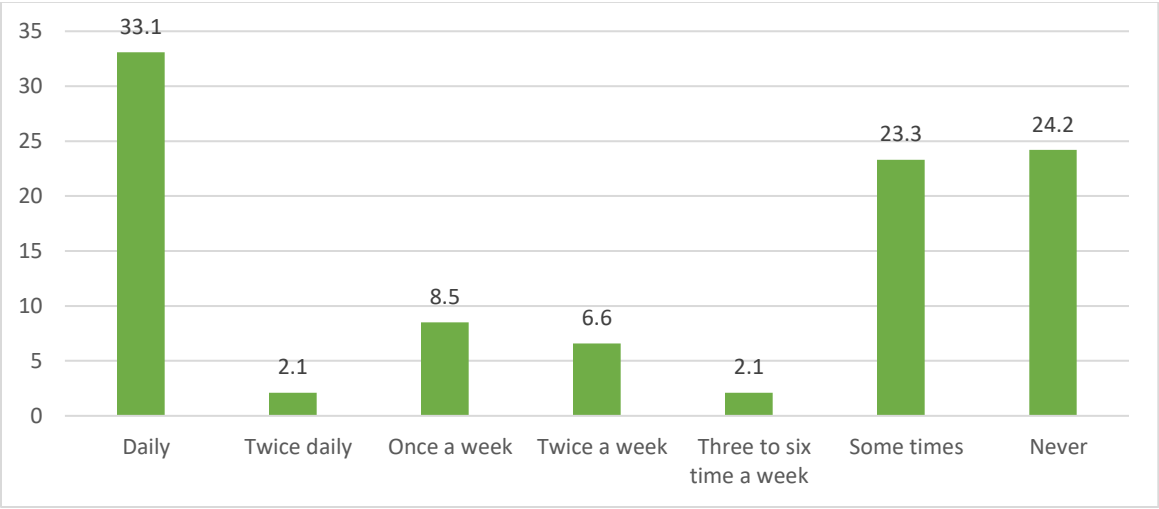
Figure 23: Opinion about overall child health (%)



Dental Health

About 33.1% of the children aged 5-9 years cleaned their teeth daily, 23.3% children cleaned their teeth occasionally, 24.2% of children never cleaned their teeth and only 2.1% of the children cleaned their teeth twice daily (**Figure 24**). Seventy three percent of the children used toothpaste, 11.1% of the children used Miswak (herb), while 16.1% of the children did not use anything to clean their teeth.

Figure 24: Frequency of cleaning teeth among children (%)



Twenty three percent of the children used beetle nuts, while 76.8% did not use tobacco. According to 55.9% of the children the health of their teeth was good, 88% of children had no dental issue in the last 12 months, and 94.9% of the children had never visited a dentist for a dental issue. Only 2.1% of the children had visited a dentist once in last 12 months due to pain in teeth or gums (63.3%) or due to bleeding in teeth/gums/mouth (12.7%). About 20.4% of the

children reported the need of a dental visit, but 74.3% of the children were unable to visit a dentist due to cost, while 12.6% did not want to spend money on a dentist (**Table 37**). Forty two percent of the children visited private dentists, 29.5% visited private/public dentist, and 13.6% children visited to public dentist for any dental issue.

Table 37: Dental Health of school aged children of Sindh

Dental Health Practices	Total	Rural	Urban
	% (n)		
	2157	1198	959
Frequency of cleaning teeth			
Daily	761 (33.1%)	309 (25.7%)	452 (45.8%)
Twice daily	41 (2.1%)	28 (2.7%)	13 (1.2%)
Once a week	166 (8.5%)	105 (9.5%)	61 (6.9%)
Twice a week	147 (6.6%)	86 (6.9%)	61 (6.1%)
Three to six time a week	47 (2.1%)	25 (1.9%)	22 (2.4%)
Sometimes	493 (23.3%)	298 (25.0%)	195 (20.3%)
Never	502 (24.2%)	347 (28.3%)	155 (17.2%)
Source used to clean teeth			
Toothpaste	1231 (72.7%)	525 (62.1%)	706 (88.4%)
Miswak	177 (11.1%)	129 (14.5%)	48 (6.1%)
Tooth Powder	3 (0.2%)	2 (0.3%)	1 (0.1%)
Other Specify	0 (0.0%)	0 (0.0%)	0 (0.0%)
Nothing	244 (16.1%)	195 (23.2%)	49 (5.5%)
Use of tobacco products			
Betel nuts	513 (23.0%)	315 (25.5%)	198 (18.6%)
Chewing tobacco/gutka	9 (0.5%)	8 (0.7%)	1 (0.1%)
Paan	8 (0.4%)	7 (0.6%)	1 (0.1%)
Cigarettes	2 (0.1%)	2 (0.2%)	0 (0.0%)
None of above	1640 (76.8%)	879 (74.1%)	761 (81.4%)
Opinion about dental health of child			
Excellent	103 (4.6%)	67 (5.3%)	36 (3.3%)
Very good	332 (16.2%)	182 (15.9%)	150 (16.5%)
Good	1244 (55.9%)	666 (54.3%)	578 (58.8%)
Average	276 (13.4%)	179 (14.9%)	97 (11.0%)
Poor	144 (6.9%)	71 (6.4%)	73 (7.8%)
Experienced any teeth problems during past year			
Have difficulty biting hard food	167 (8.0%)	89 (7.8%)	78 (8.3%)
Have difficulty in chewing	145 (6.8%)	80 (7.2%)	65 (6.2%)
Miss school for whole days	16 (0.8%)	10 (1.0%)	6 (0.5%)
Dissatisfied with appearance of teeth	52 (2.3%)	32 (2.6%)	20 (1.8%)
Avoids smiling and laughing	20 (0.8%)	10 (0.7%)	10 (0.9%)

Dental Health Practices	Total	Rural	Urban
	% (n)		
Other children make fun of teeth	11 (0.5%)	8 (0.6%)	3 (0.2%)
No such problem	1902 (88.0%)	1062 (88.3%)	840 (87.5%)
No. of visits to dentist during past 12 months			
Once	48 (2.1%)	22 (1.7%)	26 (2.7%)
Twice	28 (1.3%)	14 (1.2%)	14 (1.4%)
≥ 3 times	25 (1.15%)	13 (1.1%)	12 (1.3%)
Never	2045 (94.9%)	1142 (95.3%)	903 (94.2%)
Reason of last dental visit			
Pain with teeth, gums, or mouth	73 (63.0%)	35 (58.4%)	38 (69.5%)
Bleeding with teeth, gums, or mouth	16 (12.7%)	6 (9.9%)	10 (16.7%)
Correction/realignment/straightening of teeth	5 (6.3%)	3 (7.6%)	2 (4.6%)
Routine check-up of teeth	6 (5.5%)	3 (6.4%)	3 (4.2%)
Type of health care provider for teeth/gum care			
Public/private Doctor	31 (29.5%)	19 (34.6%)	12 (22.6%)
Private Dentist	49 (42.0%)	17 (31.9%)	32 (55.9%)
Public Dentist	17 (13.6%)	10 (14.3%)	7 (12.7%)
Dental Hygienist	3 (2.7%)	1 (1.9%)	2 (3.8%)
Nurse	3 (2.7%)	3 (4.7%)	0 (0.0%)
During past 12 months, child needed dental care but not get it			
Yes	22 (20.4%)	15 (26.1%)	7 (12.4%)
No	90 (79.6%)	41 (73.9%)	49 (87.6%)
Main reason for not getting dental care			
No dentist in the area	0 (0.0%)	0 (0.0%)	0 (0.0%)
Could not afford cost	17 (74.3%)	12 (73.0%)	5 (78.3%)
Did not want to spend the money	2 (12.6%)	2 (16.8%)	0 (0.0%)
Dentist is too far/no transport	1 (2.6%)	0 (0.0%)	1 (10.0%)
Child is afraid or does not like dentists	2 (10.6%)	1 (10.2%)	1 (11.7%)
Reason for child's dental visit			
Pain with teeth, gums, or mouth	16 (77.1%)	12 (82.1%)	4 (62.4%)
Bleeding with teeth, gums, or mouth	5 (19.6%)	2 (13.4%)	3 (37.6%)

Vision

Left Eye:
Among the survey children, 13% of the children had a weak sight in the left eye of which 7.7% children had an eyesight of 6/9, 3.5% had 6/12, 1.3% had 6/18, 0.3% had 6/24, and 0.2% had an eyesight of 6/60. Vision test was not performed in 0.6% children (**Table 38**).

About, 86.3% of the children had a good sight in the left eye. Among these, 32.1% of the children had an eyesight of 5/6, and 54.2% had an 6/6 eyesight.

Right Eye:
Among the survey children, 11% of the children had a weak sight in the right eye of which 6.8% children had an eyesight of 6/9, 2.4% had 6/12, 1.3% had 6/18, 0.3% had 6/24, 0.1% had 6/36, and 0.1% had an eyesight of 6/60. Vision test was not performed in 0.6% children.

About 88.5% of the children had a good sight in the right eye. Among these, 33.4% of the children had an eyesight of 5/6, and 55.1% had an 6/6 eyesight.

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

Table 38: Vision Test of school aged children

Vision Test	Sindh n (%)		
	Overall	**Rural**	**Urban**
N	**2082**	1154	928
Vision test of left eye:			
5/6	715 (32.1%)	349 (29.1%)	366 (37.2%)
6/6	1072 (54.2%)	645 (57.3%)	427 (49.0%)
6/9	160 (7.7%)	98 (8.6%)	62 (6.1%)
6/12	81 (3.5%)	37 (2.9%)	44 (4.4%)
6/18	26 (1.3%)	18 (1.5%)	8 (1.1%)
6/24	7 (0.3%)	5 (0.3%)	2 (0.4%)
6/36	0 (0.0%)	0 (0.0%)	0 (0.0%)
6/60	2 (0.2%)	1 (0.2%)	1 (0.2%)
Not performed	19 (0.6%)	1 (0.1%)	18 (1.6%)
Vision test of right eye:			
5/6	737 (33.4%)	365 (30.6%)	372 (38.1%)
6/6	1084 (55.1%)	654 (58.3%)	430 (49.6%)
6/9	149 (6.8%)	88 (7.4%)	61 (5.7%)
6/12	59 (2.4%)	26 (2.0%)	33 (3.2%)
6/18	27 (1.3%)	16 (1.3%)	11 (1.3%)
6/24	5 (0.3%)	3 (0.2%)	2 (0.4%)
6/36	1 (0.1%)	0 (0.0%)	1 (0.2%)
6/60	1 (0.1%)	1 (0.2%)	0 (0.0%)
Not performed	19 (0.6%)	1 (0.1%)	18 (1.6%)

DISCUSSION

The survey included households involving school aged children (5 to 9 years old) from Sindh. Majority of the households were found to be headed by men who lack of formal education. 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. The survey also showed that majority of the households in Sindh faced food insecurity which was higher among the rural dwellers compared to the urban dwellers. More than half of the surveyed household had a high dietary diversity, which was more common in households in urban areas compared to rural areas.

Schooling through public schools was mostly preferred in Sindh, and attending schools was found to have 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 causing an overall decrease in their physical activity on a school day.

The household survey reported 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 (10), 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. Within the existing poverty and food insecurity, the survey reported occasional incidence of diarrhea, fever, cough, and other health issues among the surveyed children. It also reported high prevalence of anemia and malnutrition such as stunting, underweight, and overweight/obesity among school aged children. The survey also highlighted issue of poor WASH practices, which included lack of clean drinking water, and lack of improved drinking water and sanitation facilities. Rural areas were found to have poor WASH practices compared to the urban areas of Sindh. The NNS 2018, also reported lack of access to water, sanitation and hygiene facilities in rural areas as compared to urban areas of Pakistan (10). Other than WASH practices, the findings highlight disparity in dietary intake (including micro and macronutrients) trends across different settings (rural vs. urban areas), different divisions, different sociodemographic status (wealth quintiles), household food insecurity status, and nutritional status (HAZ, BMI for age z-score, anemia).

This study reported 33% prevalence of stunting, 22.7% underweight, and 6.2% of overweight and obesity among school age children, with higher prevalence of stunting and underweight in rural areas and overweight in urban areas of Sindh. A recent systematic review focused on LMICs also reported 13.7% prevalence of stunting, 22.7% underweight, and 3.8% of obesity in Sindh among children 5 to 15 years old (17). 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 to food insecurity, poor living standards coupled with poverty, lack of education, and poor dietary intake (19). Intervention should also be implemented to reduce the prevalence of overweight and obesity among children living in urban areas through community mobilization and by imposing taxes on fast and junk food.

Based on the RDA (20), the survey reported high energy, protein, carbohydrate, and fat intake among school aged children, with significantly increased intake among richest and middle income 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 (21-24). Aziz et al. 2014 (22), also reported increased intake of carbohydrates among school aged children of Pakistan, while another study on lunch boxes also reported high intake of fats amongst 1,360 students of Karachi (25). For micronutrient intake, the survey showed inadequate intake of vitamins A, C, D, E, zinc, iron, folic acid, phosphorus, and magnesium. The results suggest need of community mobilization interventions including context-specific behavior change messages targeting school-aged children to encourage consumption of nutritious 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.

The current survey has several strengths. The 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. 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. However, results from the survey need to be interpreted in the light of limitations i.e., the study sample is not representative of the Pakistan's households in general, but rather of households that have children aged 5-9 years of age. Other limitations include recall biases, insufficient data to link nutrition status to school performance.

CONCLUSIONS

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 Sindh. It suggests implementation of large integrated programs to improve health and nutrition outcomes among children, especially who live in the rural areas of Sindh. 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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