Assessment of dietary intake and nutritional status of children (under 5 years) in district Faisalabad

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Abstract

Adequate dietary intake is responsible to fulfill the body's need for proper functioning and growth especially during the early stages of life. The aim of this current study was to access the nutritional status and dietary intake of the children under the age of five years in district Faisalabad. Inadequate dietary intake, an unbalanced and insufficient diet in macronutrients and micronutrients, can result in malnutrition, stunting, wasting, under-weight, obesity, and an increased risk of other infectious diseases in children. Malnutrition is a severe health issue in poor nations such as Pakistan. This cross sectional study was carried out in Faisalabad district. Data was collected by a descriptive pre-designed food frequency questionnaire (FFQ) which contained different sections as Personal details of child Socio-demographical factors, Nutritional Awareness, Literacy level of mother, Health status of mother, Anthropometric measurements of child, Physical activity level of child, Dietary intake of child (Infants: 6 months to 1 year), Dietary intake of child (Toddlers: 1 to 3 years), Dietary intake of child (3 to 5 years), Food frequency questionnaire, Food choices of child and 24-hour dietary recall of the child. The nutritional status was assessed by anthropometric measurement of the children as weight, height and used this information in the determination of growth patterns of children by following WHO growth charts for weight for height (wasting) and height for age (stunting) also mid upper arm circumference measurements was also assessed. Sample of 150 children was selected by convenient sampling technique and their mothers were asked to fulfill the questionnaire by face to face interviews. The collected data showed that out of whole sample 29 (19.4%) children were found wasted and 77 (51.3%) were in the stunted category, also according to MUAC measurements 24 (16.0%) were having moderately wasting and 20 (13.3%) having

severe wasting due to many associated factors causing malnutrition. Data was tabulated and analyzed by using SPSS version 22.0 statistical tool.

Key Words: Malnutrition, Nutritional status, under 5 years

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Introduction

The nutritional status of a community particularly that of its vulnerable groups such as children, expecting women, and breastfeeding mothers, has been identified as an essential indication of national development, which is dependent on social development indices. The concept of 'Nutrition' emerges as a critical necessity for national growth.

Because of the enormous potential for growth and development, early childhood is a golden phase in an individual's life. The first five years of life, in particular, necessitate a well-balanced and healthy diet for the body. Parents should be aware of their child's needs because youngsters at this age are more vulnerable to malnutrition and infectious infections. Malnutrition, defined as a lack or excess of food intake, is a major health issue in many developing nations. The first type of malnutrition is under-nutrition, which includes stunting, wasting, and being underweight. The second category is a lack of micronutrients (vitamins and minerals), and the third is being overweight or obese. It has a significant impact on children's overall health (Badruddin et al., 2021).

Malnutrition is responsible for at least half of all childhood deaths worldwide. Malnutrition management in community settings include detecting malnutrition with a universally validated screening instrument and administering suitable therapies based on the degree of malnutrition. Malnutrition is identical with protein-energy malnutrition, which denotes a discrepancy between the availability of protein and energy and the body's requirement for both in order to sustain appropriate growth and function (Misbah etal., 2023). This imbalance encompasses both insufficient and excessive energy intake, with the former resulting in malnutrition (wasting, stunting, and underweight) and the latter in overweight and obesity.

Malnutrition is a wide word that encompasses both inadequate and excessive nutrition. Children are malnourished or undernourished if their diet lacks sufficient adequate protein for maintenance and growth, or if they are unable to utilize the food they eat owing to disease. People might be undernourished or over nourished if they consume too many calories (Barasi, 2015). Growth is a technique for assessing children's health and well-being and is one crucial indicator of their nutritional status. In general, child growth status is determined by length, height, weight, and age, and is evaluated using the combined markers of length/height for age (stunting), weight for length/height (wasting), and weight for age (underweight), among other things. Poor nutritional status, especially with children, is one of the most major risk factors for growth failure. Adequate nutrition during childhood is also linked to improved cognitive performance and the prevention of chronic diseases later in life. As the global burden of noncommunicable diseases (NCDs) grows in both developed and developing countries, the double burden of malnutrition, combining under nutrition and obesity, has also grown. Chronic malnutrition in childhood may raise the likelihood of acquiring a thrifty phenotype, which can contribute to poor health later in life, especially if the kid is also subjected to over nutrition. Malnutrition disorders, such as obesity associated to stunting, are known to increase growth retardation in children. Many

studies have shown that hunger and food insecurity are both causes of malnutrition and have a link to both overweight and growth failure (Kim *et al*., 2015). Nutritional status of a child is the important indicator of malnutrition and then it is interlinked with the infections and diseases. Often malnutrition is related with the protein energy malnutrition which is the form of malnutrition in which body is not supplied with the enough nutrition (in the form of protein and energy) for the proper growth and functioning of the child. So, by assessing children nutritional intake a clear idea can be obtain for not only prevailing health conditions and child morbidity and mortality but also an overall quality of life for entire population living in these conditions. Thus Protein energy malnutrition is the indication of stunting and wasting in children under than five years of age (Rahman and Biswas, 2009).

Currently 842 million children are facing the chronic malnutrition in term of undernourished or hunger based population. Globally, from a total of 150 million deaths of children under five years of age more than 50% (54%) are due to the malnutrition in young children (WHO, 2017). Every year, about 5 million children die in thirdworld nations from malnutrition-related causes, with nearly 162 million stunted, 51 million wasted, and 99 million underweight due to acute and chronic malnutrition. In South Asia, Pakistan has the second highest infant and child mortality rate (Mahmood et al., 2016).

In Pakistan, a developing country, over 40.2% of children are stunted, 17.7% are wasting, 28.9% are classified as underweight, and 9.5% are classified as overweight. Only around half of children of nursing age (up to 6 months) are exclusively breastfed in households with mild, moderate, or severe food insecurity (up to 36.9%). Women of reproductive age are particularly prone to malnourishment, with just 46.1% having normal BMI values ranging from 18.5 to 24.9 kg/m2. Household food poverty is highly associated with malnutrition among the most vulnerable family members, such as women and young children (GOP, 2019). Acute and chronic malnutrition can have both short and long-term implications, including an increase in the number of young children dying each year. Many macronutrient and micronutrient deficiencies, including a lack of vitamin and minerals, can put children at risk of malnutrition and infectious and communicable diseases. The nutritional condition of a kid aged 6 to 59 months can provide insight into the health of the entire population and can be a powerful predictor of child mortality due to poor dietary intake. In underdeveloped nations, malnourished children account for roughly onethird of the population (Raikhola, 2021).

Assessment of nutritional status of children by their dietary intake (Including both micronutrients and macronutrients) can be done by various methods. These methods are dietary history record, 24 hours recall, food frequency questionnaires and food weight record. These all methods considered as valid and accurate in assessing diet of an individual and population (Horiuchi *et al*., 2019).

Objectives of the study are given below.

- To assess the children under five years old's nutritional status and food intake.
- To investigate the connection between dietary consumption and the incidence of malnutrition.
- To look into the root causes of malnutrition and how it affects kids' nutritional condition. **Methodology**

Study Design

The current study is a community-based crosssectional study (data collection from a population at a specific point in time). According to Kesmodel *et al*. (2018) the collecting of relevant information (data) at a certain point in time characterizes cross-sectional investigations. This

study was conducted in children below five years of age from district Faisalabad to evaluate the dietary intake and nutritional status of children. As a result, there is no time dimension in cross-sectional research because all data is obtained and most data refers to the time at or near the time of data collection. This research design was selected for the purpose of collecting dietary data from participants in order to analyze all the variables of dietary intake simultaneously without influencing the results.

Selection of Participants

Children under the age of five years and residents of district Faisalabad were taken from six different Tehsils of Faisalabad district through selective sampling technique. A list of hospitals was prepared having the study subjects and 150 children's were included in the study from 6 months to 5 years of age. The total sample was divided into 3 sub-groups (each group 50), Infants (6 months-1 year), Toddlers (1-3 years) and preschoolers (3-5 years).

Study Setting

The study was conducted in hospitals of six different Tehsils of Faisalabad district named Samundri, Chak jummra, Jaranwala, Faisalabad City, Tandlianwala and Faisalabad Sadar. Mothers from these hospitals were asked to answer the questions from questionnaire. Equal number of participants was taken from the Rural and Urban backgrounds. **Sampling Technique and Sample Size**

The data was collected from a convenient sampling technique including both male and female children. Sample size was 150 under five children Infants (6 months-1 year), Toddlers (1-3 years) and preschoolers (3-5 years). There are 50 children in each 3 sub-groups.

Selection criteria

Participants were recruited by obeying this following inclusion and exclusion criteria.

Inclusion Criteria	**Exclusion Criteria**
Children under the age of five (6 months to 5 years)	Children over 5 years or under 6 months of age
The babies who were started giving weaning foods by mothers or caretakers	Exclusively breastfed babies (if waning foods are not started yet)
Those children who were not received any specific nutritional assessment	Children who have recently undergone prior nutritional assessment
Healthy and active children	Children who have severe medical illness
Willingness of participant's parents/ caretakers	Whom parents are not willing to participate for study

Ethical Considerations

- The study was conducted with the consent of the participant's parents/caretakers with full confidentiality throughout the research period
- The rights of the respondents were respectful and researcher ensured to obey the rules and regulations
- Researcher ensured that study was not harmful for participants in any aspect

Approaches used in the study

The purpose of this study was to investigate the relationship between dietary consumption and nutritional status in children under the age of five. A survey was employed as the primary method for this investigation. The study focused on face-to-face interviews and the completion of questionnaires by asking mothers about their child's nutritional intake.

This methodology makes it easier to pick a broad group of children ranging in age from six months to five years to participate in the study. To perform this survey, a questionnaire containing various sections was pre-designed.

Data collection

Data was collected using a pre-structured and predesigned method such as the Food Frequency Questionnaire; the questionnaire will be divided into the following sections:

- Personal details of child
- Socio-demographical factors
- Nutritional Awareness
- Literacy level of mother
- Health status of mother
- Anthropometric measurements of child
- Physical activity level of child
- Dietary intake of child (Infants: 6 months to 1 year)
- Dietary intake of child (Toddlers: 1 to 3 years)
- Dietary intake of child (3 to 5 years)
- Food frequency questionnaire
- Food choices of child
- 24-hour dietary recall

Results:

Table 1: Personal and demographical information of child's households

Variables	Category	Frequency	Percent
Tehsil	Samundri	24	16.0
	Chak jummra	24	16.0
	Jaranwala	24	16.0
	Faisalabad City	30	20.0
	Tandlianwala	24	16.0
	Faisalabad Sadar	24	16.0
Residence	Urban	75	50.0
	Rural	75	50.0
Family system	Nuclear family	41	27.3
	Joint family	109	72.7
	Total	150	100.0
Father living away from home	Yes	35	23.3
	No	115	76.7
	Total	150	100.0
Father living away from home (time period: days)	No response	115	76.7
	>6 months	4	2.7
	15-30 days	14	9.3
	3-6 months	1	0.7
	7-15 days	12	10.6
Total no. of children	1.00	8	5.3
	2.00	34	22.7
	3.00	39	26.0
	4.00	35	23.3
	5.00	27	18.0
	6.00	7	4.7
	Total	150	100.0
No. of children under 5	1.00	73	48.7
	2.00	75	50.0
	3.00	2	1.3
	Total	150	100.0

50% were from rural and 50% from urban background

3/4th families were living in joint family system

In Table 1, personal and demographical information of children were analyzed. Table included various variables, residence, family system, day's father live away from home (time period; days), total number of children and number of children under the age of five years was taken.

Table 2: Socio-economical characteristics of child's household

Variables	Category	Frequency	Percent
Mother's employment status	Housewife	124	82.7
	employed	26	17.3
	Total	150	100.0
Mother's working hours	No response	124	82.7
	> 8 hrs.	2	1.3
	4 hrs.	2	1.3
	4-6 hrs.	4	2.7
	6-8 hrs.	18	12.0
Father's working hours	No response	5	3.3
	>8 hrs.	65	43.3
	4 hrs.	2	1.3
	6-8 hrs.	78	52.0
	Total	150	100.0
Father's occupation	No response	5	3.3
	abroad	4	2.7
	construction work	15	10.0
	office job	34	22.7
	related to agriculture	34	22.7
	self employed	58	38.7
	Total	150	100.0

4/5th mothers were housewives

1/3rd of the fathers were self employed

Half of the fathers were spending 6-8 hours on job

In Table 2, social and economic status of the households of children's was analyzed to know the association of economic status and child's health later in this chapter. This table included various variables like mother's employment status, mother's working hours (if employed), father's working hours and Father's occupation.

Table 3: Economic (Income) status of the child's household

Variables	Category	Frequency	Percent
Household income (Father's + Mother's	≤ 10,000	1	0.7
	10,000- 20,000	34	22.7
	20,000-30,000	48	32.0
	≥ 30,000	67	44.7
Monthly income spending on health (doctor fee/lab tests/ medicines)	1000-2000	108	72.0
	2000- 5000	34	22.7
	5000-10,000	8	5.3
Monthly income spending on food (Nutrition/ kitchen/diet)	1000-2000	7	4.7
	2000- 5000	23	15.3
	5000-10,000	43	28.7
	≥ 10,000	77	51.3

Approximately 50% household income was >30000
Income on health was about 3/4th %
Income >10000 spending on food was 50%

In Table 3, economic or income status of the household was analyzed. Different variables were discussed in table including, household income (Father's + Mother's), monthly income spending on health and monthly income spending on diet. A study was conducted in rural china in 2021.

Table 4: Examination of anthropometric measurements of child

Variables	Category	Frequency	Percent
Weight for height (wasting)	3rd	29	19.4
	15th	12	8.0
	50th	19	12.7
	85th	18	12.0
	97th	72	47.9
	Total	150	100.0
Status based on WFH (wasting)	Normal	121	80.6
	Wasted	29	19.4
	Total	150	100.0
Height for age (Stunting)	3rd	77	51.3
	15th	32	21.3
	50th	18	12.0
	85th	16	10.7
	97th	7	4.7
	Total	150	100.0
Status based on HFA (Stunting)	Normal	73	48.7
	Stunted	77	51.3
	Total	150	100.0
Mid upper arm circumference (MUAC) in cm	10.5 cm	20	13.3
	11.5 cm	24	16.0
	12.5 cm	35	23.3
	13.5 cm	71	47.3
	Total	150	100.0
Health status based on MUAC	Moderately wasting	24	16.0
	Normal	106	70.7
	Severe wasting	20	13.3
	Total	150	100.0

1/5th children were found wasted

Half of the children were found stunted

1/4th children were having MUAC wasting

In this Table 4, anthropometric measurements of the child are examined to investigate the health status of the child. For this purpose Weight for height (wasting), status WFH (wasting), height for age (Stunting), status based on HFA (Stunting), mid upper arm circumference (MUAC) in cm and health status based on MUAC was calculated.

Table 5: To estimate the characterization of physical activity level of child

Variables	Category	Frequency	Percent

Your child is active	No	9	6.0
	Yes	141	94.0
Child's sleep hours	>18 hrs.	34	22.7
	12-14 hrs.	39	26.0
	14-18 hrs.	77	51.3
Preferred mode of playing	Indoor	114	76.0
	Outdoor	36	24.0
Physical activity level	Extremely active	7	4.7
	Moderately active	81	54.0
	Sedentary	28	18.7
	Very active	34	22.7
Hours spend on playing	<2 hrs.	22	14.7
	2-6 hrs.	85	56.7
	6-8 hrs.	43	28.7
Hours spend on TV/ Mobile	<1 hr.	15	10.0
	>4 hrs.	25	16.7
	1-2 hrs.	45	30.0
	2-4 hrs.	65	43.3
Preferred game to play	Jumping/running	39	26.0
	Physical games	62	41.3
	Watching T.V or mobile	49	32.7
Activity level as compare to other kids	Almost same	99	66.0
	Less active	16	10.7
	Little more	29	19.3
	More active	6	4.0

Half of the children were sleeping for 14-18 hours; Playing for 2-6 hours
3/4th children preferred to play indoor; 40% were involved in physical games with other children
2/3rd mothers claimed their child is active as compare to other children of his/her age

In this Table 5, to estimate the characterization of physical activity level of child by examining the various variables like, active status of child, sleeping hours, mode of playing, physical activity level, playing duration, hours spend on TV/ Mobile, preferred game to play, activity level as compare to other children were included.

Table 6: Analysis of dietary intake of child (Infants: 6 months to 1 year)

Variables	**Category**	**Frequency**	**Percent**
Started solid food	No	1	2.0
	Yes	49	98.0
When started solid food (months)	3-6 months	14	28.0
	6-9 months	35	70.0

Satisfied with adding solid food along breastfeeding	No	1	2.0
	Yes	49	98.0
How many times a day child consume complementary food	1/day	1	2.0
	2-3/day	30	60.0
	2/day	18	36.0
	3-4/day	1	2.0
Milk alternative did you use	Formula milk	21	42.0
	Solid food	29	58.0
Preferred texture	Liquids	3	6.0
	Pureed	17	34.0
	Sliced foods	5	10.0
	Soft foods	25	50.0
Kid started chewing	No	6	12.0
	Yes	44	88.0

98% mothers had started complementary foods
3/4th mothers started from 6-9 months
Half (58%) mothers use solid foods and not formulas
Half of mothers were preferring soft food texture
2/3rd children were taking complementary foods 2-3 times per day

In this table, analysis of dietary intake of infants (first group, 6 months to 1 year) was done, where various variables were discussed regarding diet of an infant. These variables are starting of solid foods, in which month solid foods were introduced, frequency of complementary food, preferred texture, chewing of food.

Table 7: Analysis of dietary intake of child (Toddlers: 1 to 3 years)

Variables	**Category**	**Frequency**	**Percent**
Dietary intake of Toddler	Toddler	50	100
how many times a day your child consume complementary food	2-3/day	12	24
	3-4/day	38	76
milk alternative you use	formula milk	7	14
	solid food	43	86
is he/she expresses desire for any food	no	15	30
	yes	35	70
child mostly consume	pure vegetable	1	2
	single type	22	44
	variety of food	27	54
	potato/pasta/rice/meat	21	42

preferred commercial weaning food ingredients	pure vegetable	2	4
	Vegetable/potato/pasta	27	54
no. of ingredients in baby food	1 ingredient	5	10.0
	2 ingredient	11	22.0
	3 ingredient	20	40.0
	4 ingredient	14	28.0
preferred texture	semi solid	19	38
	solid	31	62

3/4th children were taking complementary foods 3-4 times per day

>3/4th (86%) mothers were giving solid foods and not formulas

Half of the children were taking variety of food

1/3rd mothers were giving 3 ingredients in baby foods

2/3rd preferred solid as texture for their babies

In this Table, analysis of dietary intake of infants (second group, 1 to 3 year) was done, where various variables were discussed regarding diet of a toddler. Various variables included frequency of complementary food, milk alternative, desire for specific food, preferred commercial food, and no. of ingredients in meal and preferred texture.

Table 8: Analysis of dietary intake of child (Preschooler: 3 to 5 years)

Variables	**Category**	**Frequency**	**Percent**
Drinks mil through	Bottle	15	30
	Normal cup	35	70
Still uses bottle for milk then how many time a day	2-3/day	21	42.0
	2/day	3	6.0
	3-4/day	3	6.0
	Once/day	23	46.0
Eats more happily	Commercially prepared foods	17	34.0
	Homemade foods	33	66.0
Eats food by	By spoon feeding	16	32
	By themselves	34	68
Preferred food group	Dairy	23	46
	Fruits/vegetables	19	38
	Meat	8	16
Eats in one time	>2 cup	2	4
	1 cup	34	68
	2 cup	14	28
Child usually have	Family food	39	78

	Specific food	11	22
How usually eats their meals	Separate	4	8
	With family	46	92

3/4th children used normal cups for milk drinking

≈ Half (46%) children were having milk through bottle one time per day

2/3rd children eat food by themselves

2/3rd children were having average intake of food; 1 cup/ meal

3/4th children were taking family foods, not specific

In this table, analysis of dietary intake of preschoolers (third group, 3 to 5 year) was done, where various variables were discussed regarding diet of a preschooler. Various variables included use of bottle, frequency of bottle use, like to eat, eat food by, preferred food group, quantity in one meal, child usually has and how child eats.

Table 9: Common questions about dietary intake of children

Variables	**Category**	**6 months to 1 year**	**1 to 3 years**	**3 to 5 years**	**p-value**
	Once per day	4	9	9	0.031
How many times in a day your child uses bottle?	2 times per day	1	1	21	
	2-3 times per day	10	22	17	
	3-4 times per day	35	18	3	
What is the meal frequency of your child in a day?	2 meals per day	28	27	4	0.043
	3-4 meals per day	13	12	8	
	4-5 meals per day	8	7	23	
	> 5 meals per day	1	4	15	
Is your child's diet is diverse (variety of food groups)?	Yes	34	36	34	0.030
	No	16	14	16	
How many food groups are in your baby's daily diet?	One type	14	5	15	0.041
	2 types	22	10	20	
	2-3 types	8	26	4	
	4 types	6	9	11	
Your child usually remains sick due to which disease?	Diarrhea	26	16	6	0.023
	Fever	14	10	13	
	Gastric issues	4	16	26	
	Breathing and cough problems	6	8	5	
If child fell sick due to any condition, then how	Once per week	23	13	20	0.028
	2-3 times per week	5	12	14	

prolong the sickness remains?	3-4 times per week	5	15	8	
	5-6 times per week	17	10	8	
How many times in a month you visit doctor for child's health?	Once per month	32	23	36	0.019
	2-4 times per month	12	21	6	
	4-8 times per week	4	5	7	
	≥ 8 times per month	2	1	1	
Does your kid consume packed (unhealthy snacks) food daily?	Yes	10	32	35	0.021
	No	40	18	15	
Is your child is allergic to any food?	Yes	45	39	36	0.029
	No	5	11	14	
Your baby usually gets allergic to which food group mostly?	Cow's/ Buffalo milk	3	8	8	0.027
	Wheat /rice	0	1	4	
	Eggs/Nuts/Seeds	2	2	2	
	Any other	0	0	0	

Significant association i.e. p-value <0.05, between variables of all three child's age groups in commonly asked questions to mothers

Table 10: Food patterns of children by food frequency questionnaire (FFQ)

Major Food groups	Never Or less than 1 per month	1 to 2 times per month	Once Per week	2 to 4 per week	5 to 6 per week	Once Per day	2to 3 per day	4 to 6 per day
Vegetables		1	12	40	20	44	33	0
Fruits	33	47	30	22	6	11	1	0
Staple food (wheat, maize)	0	0	0	1	15	87	43	4
Rice	0	20	33	41	23	21	12	0
Pulses/lentils	1	1	20	69	35	21	3	0
White bread	13	7	45	36	6	23	20	0
Junk food (pizza, pasta, burger)	44	78	25	2	1	0	0	0
Candies, jam, honey	3	2	2	15	32	20	31	45

Fried food	4	60	16	23	36	8	1	2
Soft drinks	26	19	11	9	4	42	20	19
Milk	0	0	0	14	15	62	40	19
Yogurt	5	16	1	26	30	66	5	1
Chicken	4	58	26	27	20	7	0	0
Mutton/beef	67	42	25	10	4	2	0	0
Fish	74	49	11	1	0	0	0	0
Eggs	2	5	26	38	55	18	4	2
Snack food (chips, chocolate, biscuits)	1	1	13	37	19	50	23	6

Showed staple foods and vegetables were consumed on daily basis
Fruit consumption is very low i.e. 1/3rd (47%) taking 1-2 times per month
Dairy consumption is better >1/3rd (62%) were taking on daily basis
Meat intake is very less (≈ Half (67%) were taking once per month
Snacks items (biscuits, candies) consumption is high 1/3rd were taking on daily basis

Table 11: Tehsil wise comparison of demographical characteristics of child's household

		Tehsil						Pvalue
		Samundri	Chak jummra	Jaranwala	Faisalabad City	Tandlianwala	Faisalabad sadar	
In which family system do you live?	Nuclear family	6	7	9	9	5	5	0.043
	Joint family	18	17	15	21	19	19	
Does your husband live away from home?	Yes	11	9	4	4	2	5	0.026
	No	13	15	20	26	22	19	
How many	>6 months	1	0	0	1	1	1	0.041

days child's father spend away from family in a year?	15-30 days	2	3	0	3	3	3	
	3-6 months	2	1	3	0	2	3	
	7-15 days	4	3	2	1	4	1	
	None	15	17	19	19	14	16	
Total no. Of children	1.00	2	2	1	2	0	1	0.072
	2.00	5	2	7	5	5	10	
	3.00	7	10	6	9	3	4	
	4.00	5	6	3	8	8	5	
	5.00	4	4	6	5	6	2	
	6.00	1	0	1	1	2	2	
No. Of children under 5	1.00	6	7	8	16	8	16	0.011
	2.00	8	8	15	10	10	7	
	3.00	10	9	1	4	6	1	
Mother's employment status	Housewife	22	18	19	25	21	22	0.040
	Employed	2	6	5	5	3	2	

Table 12: Tehsil wise comparison of anthropometric measurements of children

		Tehsil						Pvalue
		Samundri	Chakjummra	Jaranwala	Faisalabad City	Tandlianwala	Faisalabad sadar	
Weight for height (wasting)	15th	1	2	2	4	1	1	0.065
	3rd	2	4	5	3	2	2	
	50th	2	4	7	4	2	2	
	85th	2	4	4	5	2	2	
	97th	8	16	16	25	8	8	

Status WFH (wasting)	Normal	13	25	29	38	13	13	0.031
	Wasted	2	5	5	3	2	2	
Height for age (Stunting)	15th	2	2	2	7	2	2	0.048
	3rd	13	15	15	8	18	8	
	50th	2	4	4	8	1	2	
	85th	2	5	5	5	2	2	
	97th	1	4	4	2	2	1	
Status based on HFA (Stunting)	Normal	7	15	15	22	7	7	0.036
	Stunted	13	15	15	8	18	8	
Mid upper arm circumference (MUAC) in cm	10.5 cm	2	4	4	6	2	2	0.059
	11.5 cm	1	3	3	4	1	1	
	12.5 cm	4	7	7	11	4	4	
	13.5 cm	8	16	16	24	8	8	
Health status based on MUAC	Moderately wasting	5	6	3	1	3	6	0.036
	Normal	12	21	17	35	9	12	
	Severe wasting	2	4	4	2	2	6	

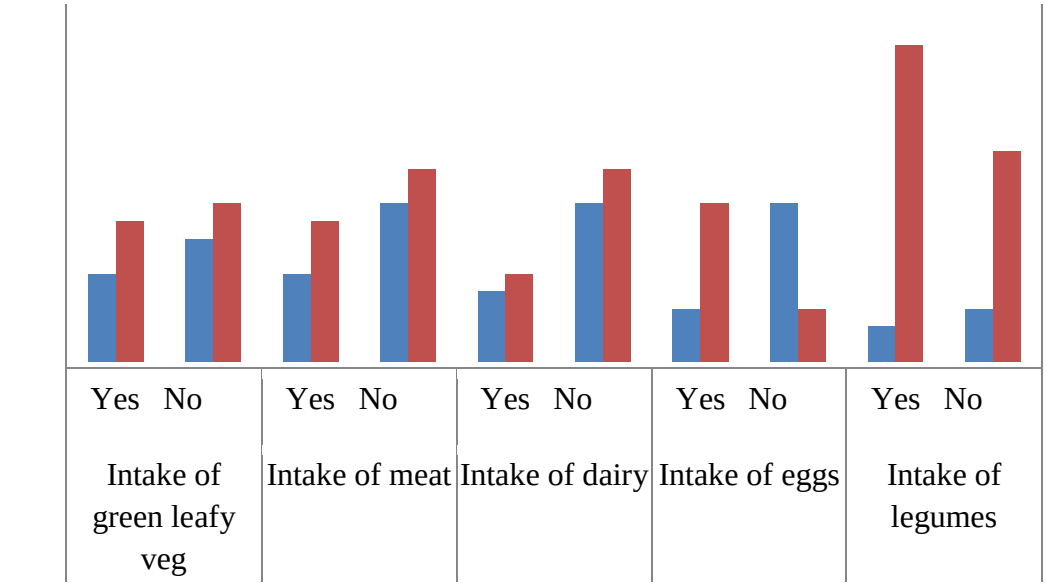
In the above table, study checked the association between Anthropometric measurements of child and different tehsils

Table 13: Association between dietary intake and effect on Wasting/stunting of children

		Effect on Wasting/stunting		p-value
		NO	YES	
Intake of green leafy veg	Yes	5	8	0.021
	No	7	9	

Intake of meat	Yes	5	8	0.032
	No	9	11	
Intake of dairy	Yes	4	5	0.051
	No	9	11	
Intake of eggs	Yes	3	9	0.033
	No	9	3	
Intake of legumes	Yes	2	18	0.047
	No	3	12	

Study showed significant association $p<0.05$ between the intake of nutrient and their effect on nutritional status of the children



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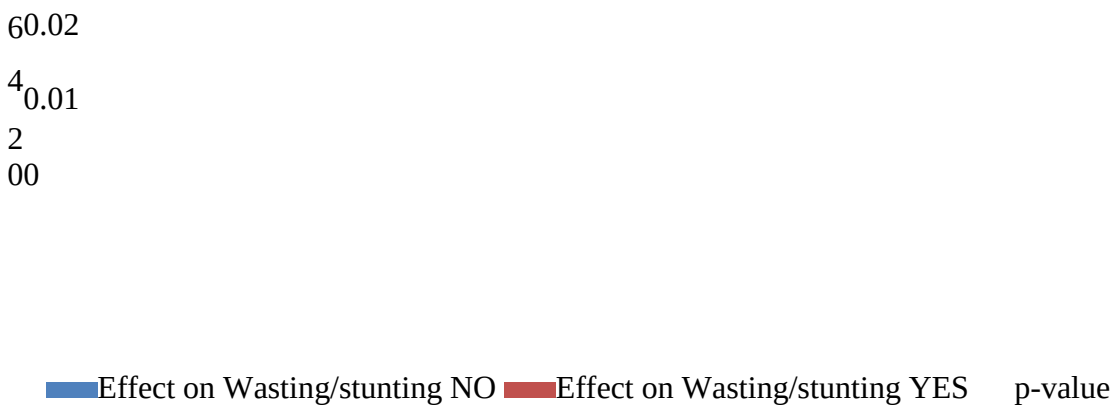

Figure: Graphical representation of association between dietary intake and Effect on Wasting/stunting of child

Table 14: Association between food choices and different age groups of child (infants, toddlers and preschoolers)

Food choices	**6 months to 1 year**	**1 to 3 years**	**3 to 5 years**
Cereals	21	7	7
Fruits	5	9	13
Vegies	3	7	10
Dairy	6	16	5
Meat/protein	9	8	3
Snacks	6	3	12

Chi-square value = 11.53 **p-value = 0.023**

Cereal and Dairy products consumption was relatively high in toddlers

Fruit consumption was relatively high in preschoolers

Meat consumption is high in infants as they were also breastfed

Snacks or unhealthy stuff was more consumed by preschoolers

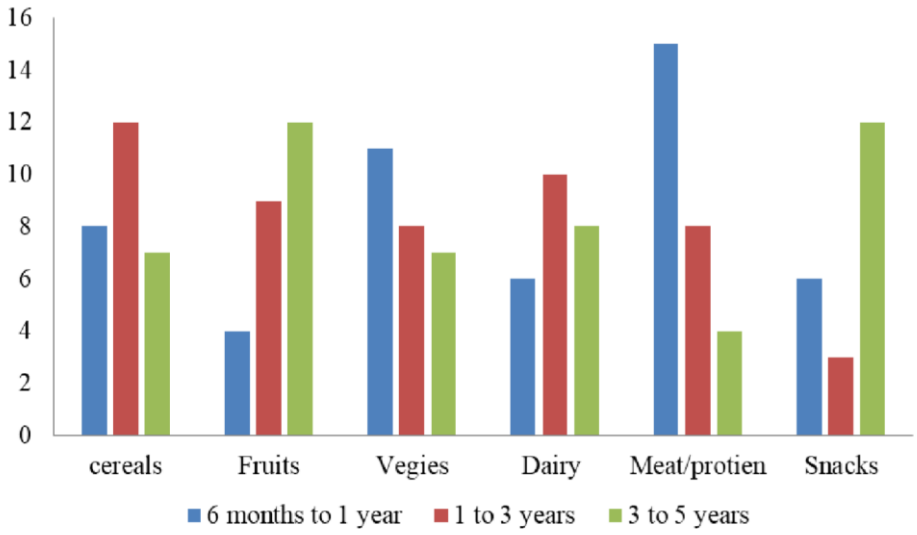

Figure: Graphical representation of association between food choices and different age groups of child (infants, toddlers and preschoolers)

Table 15: Comparison of malnutrition status and child age group

Status WFH (wasting) * Child group Cross tabulation					
		Child group			
		6 months to 1 year	1 to 3 years	3 to 5 years	Total
Status WFH (wasting)	Normal	46	45	35	126
	Wasted	4	5	15	24
Total		50	50	50	150

Comparison showed wasting was more prevalent in preschoolers then in toddlers and then in infants

Preschoolers > Toddlers > Infants

Table 16: Comparison of malnutrition status and child age group

Status based on HFA (Stunting) * Child group Cross tabulation		
	Child group	**Total**

		6 months to 1 year	1 to 3 years	3 to 5 years	
Status HFA (Stunting)	Normal	20	22	31	73
	Stunted	30	28	19	77
Total		50	50	50	150

Comparison showed Stunting was more prevalent in infants then toddlers and preschoolers Infants > Toddlers > Preschoolers

Table 17: Comparison of malnutrition status and child age group

Health status based on MUAC * child group cross tabulation					
		Child group			Total
		6 months to 1 year	1 to 3 years	3 to 5 years	
Health status based on MUAC	Moderate wasting	2	4	8	14
	Severe wasting	4	2	14	20
	Normal	44	44	28	116
Total		50	50	50	150

Comparison showed severe wasting based on MUAC values was more prevalent in infants then toddlers and preschoolers Preschoolers > Infants > Toddlers

Discussion

The current study was carried out in the district of Faisalabad to analyze the dietary intake and nutritional status of children under the age of five. 150 children under the age of five were recruited for this study from the district of Faisalabad, n=150, 50 (infants), 50 (toddlers), and 50 (preschoolers) from both rural (n=75) and urban (n=75) backgrounds. For all variables in the research data, descriptive data analysis was performed in the tables below. A pre-structured and pre-designed questionnaire was used to collect data in a survey study approach. Face-to-face interviews and questionnaire filling were

conducted by asking mothers about their child's dietary intake. From a total of 150 children (n=150), 124 mothers from all tehsils stated that they were housewives and did not do any work other than house chores (n=124; 82.7%), while the remaining 26 stated that they were employed and did various jobs, with the majority being in the teaching profession (n=26; 17.3%). Gaina et al. (2009) discovered a substantial link between mothers' employment and children's dietary patterns. They discovered that children with full-time working mothers were more prone to snack and skip supper. Children of parttime working mothers consumed greater meal portions. When compared to other children, children of full-time working mothers are more likely to be overweight, but not obese. Children of full-time employed mothers are more likely to be overweight, but not obese compared with other children. The impacts of parental absence, family economic situation, and neighborhood environment on rural children's well-being, particularly their physical well-being, were investigated in this study. One year later, 519 children aged five to nine from three rural districts in Henan Province were asked about their neighborhood, well-being, and health. The questioning centered on the financial position of the household. The findings of that study are strikingly comparable to those of the current study, as the neighborhood environment attenuated the impact of family economic status on children's well-being and nutritional status. In comparison to the findings of this study, the present study found that the economic condition of the home had a direct impact on the health of the kid (Zhou et al., 2021).

Many variables were included in this regards like mother's education, have basic knowledge about the child's nutrition, you play a role in intra-family decision making, you know the earlier and effective use of health services/basic medicines for your child and how you think to start solid foods to your baby were included. In comparison to current study, another study was conducted in Africa in 2021. In that study the goal was to conduct a systematic review to determine how nutrition education interventions for African women affected the nutritional status of their children under five years (that is the similarity with current study). Results showed in general, nutritional education programs are recognized with some significant improvements in food and nutrient consumption, knowledge, and dietary practices in complementary feeding of children. The result of that study was similar with the current study in light of mother's education and nutritional awareness in the wellbeing of their child's health (Jardi *et al*., 2021).

Anthropometric measurements of the child are examined to investigate the health status of the child. For this purpose Weight for height (wasting), status WFH (wasting), height for age (Stunting), status based on HFA (Stunting), mid upper arm circumference (MUAC) in cm and health status based on MUAC was calculated. In comparison to current study a research was conducted in Papua New Guinea (PNG) to assess the wasting and stunting in children. The prevalence of wasting, stunting, underweight, and overweight children under five is reported in this study, which also examines possible household and maternal socioeconomic factors that may contribute to malnutrition. This study was much similar with current study, as this study also use WHO 2006 growth charts to assess the nutritional status of the children under five same as current study. In results of that study, 13.8, 46.5, 18.2, and 18% of children were overweight, stunted, wasted, or underweight, respectively. But in current study percentages of wasting and stunting are 19.4 and 51.3%. Children from families that experienced food shortages were more likely to go hungry than children from families who didn't. Current study also associate the poor nutritional status with many factors just like that study (Pham *et al*., 2021). So this study is much similar with the current study in aim, methodology and results as well, only difference it measured the obesity as well but current study did not.

One of the studies estimated the impact of physical activity on child's health status. Additionally, they discover that the majority of health and non-cognitive developmental outcomes are affected nonlinearly by physical exercise. Based on research data, they determine the "optimal" amount of time that young children should spend exercising each day in order to reap the greatest health and noncognitive developmental benefits. In this study to investigate the cross-sectional relationships

between children's inactive time and physical activity in child care environments. In the supporting Healthy physical Activity, 124 toddlers and 118 preschoolers from 19 locations in Alberta and Ontario, Canada, participated. The qualities of a child care facility that are crucial for a child's sedentary and active behavior may differ depending on the child's age group. More time he/she spend on games as physical activity, keeps the children active and improve the process of development (Zhang *et al*., 2021). In this study, analysis of dietary intake of infants (first group, 6 months to 1 year) was done, where various variables were discussed regarding diet of an infant. These variables are starting of solid foods, in which month solid foods were introduced, frequency of complementary food, preferred texture, chewing of food. A study conducted for the assessment of dietary intake of children in infancy. A typical behavioral goal of that study was obesity or under nutrition prevention trials is to increase nutritional intake throughout the early years of life. They carried out a systematic analysis with the goal of enhancing supplemental food intake in infants (0–24 months). They also emphasized on the importance of balance and nutritious diet for infants for proper development (*Butler et al*., 2021). Current study checked the association between the dietary intakes of different groups of children. The results of this study was compared with p-value if the p-value is less than 0.05 than result was significant otherwise non-significant. According to the collected data out of 150 sample majority of the children were consuming vegetables on daily basis (44) or 2 to 4 times a week (40), fruit consumption is quite low which is 80 children were having fruit 1 to 2 times a month which was a very low ratio, 87 of the children were taking staple food on daily basis. According to Dresler *et al*. (2017) as the primary providers of food, parents or caregivers play a major role in influencing their children's food consumption patterns. Preference is a strong predictor of children's fruit and vegetable consumption. A study investigated that more consumption of unhealthy items intake is directly linked with the more social media promotion of these eating stuff. The promotion of unhealthy foods and drinks on social media and in advertising games has a big impact on kids' food choices and eating habits (Mc Carthy *et al*., 2022).

This study checked the association between Food choices and different groups of child. In which comparative study applied chi-square test to check the significant association between them. Current study checked the association between the Food choices and different groups of child. This study compared the result with p-value if the p-value was less than 0.05 than the result was significant otherwise non-significant. The above result of p-value showed there is significant association between the categorical variables. Overall result of this association is significant among three of the groups of the children. Current study checked the association between the dietary intakes and Effect. This study compared the result with p-value if the p-value was less than 0.05 than the result was significant otherwise non-significant. The next association was among the Intake of green leafy veg and Effect on wasting/stunting. The p-value showed the significance of the association among the variable and that p-value was 0.021. The next association was among the Intake of meat and Effect on Wasting/ stunting. The p-value showed the significance of the association among the variable and that p-value was 0.032. The next association was among the Intake of dairy and Effect on wasting/stunting. The p-value showed the significance of the association among the variable and that p-value was 0.054.

Conclusions and Recommendations

Current study was conducted in district Faisalabad to assess the dietary intake and nutritional status of children under five. In this study, 150 children under the age of five years were recruited from district Faisalabad, n=150, 50 (infants), 50 (toddlers) and 50 (preschoolers) from both rural (n=75) and urban (n=75) backgrounds. Descriptive analysis of data was carried out in various tables below for all the variables of research data. The collected data showed that out of whole sample 29 (19.4%) children were found wasted and 77 (51.3%) were in the stunted category, also according to MUAC measurements 24 (16.0) were having moderately wasting and 20 (13.3%) having severe wasting. Data was tabulated and analyzed by using SPSS version 22.0 statistical tool.

There are a few recommendations listed below.

- Larger sample size studies are recommended in order to collect more diverse data.
- Parents and caregivers should be trained through programs to provide healthy and adequate nutrition to their children.
- Healthy eating patterns should be introduced in children through social media apps and TV, and the use of sugary and empty calorie foods should be limited.

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Appendix

QUESTIONNAIRE

Assessment of dietary intake and nutritional status of children (from 6 months to 5 years) in district Faisalabad

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I. Personal details of child:

Name of the child: ---------- Child's age: ------- (years) Child's gender: M/F

City/District: ---------- Tehsil: ---------- Residence: Urban/Rural

Any severe medical condition of child: ---------- (Current/ Past)

State of your (child's Mother) living: Widow, Divorced, Single parent, Couple **II.**

Socio-demographical factors:

1. In which family system do you live?

(a) Nuclear family (b) Joint family

2. Does your husband live away from home?

(a) Yes (b) No

3. How many days child's father spend away from family in a year?

(a) 7-15 days (b)15-30 days

(c) 3-6 months (d) ≥ 6 months

4. No. of children you have?

(a) Total children: ---------- (b) Under five years: --------

5. What is the child's mother employment status?

(a) Housewife (b) employed

6. What are child's mother working/job hours outside and the home away from your child?

(a) 4 hours/day (b) 6-8 hours/ day (c) >8 hours/day (d) 4-6 hours/day

7. What are father's working hours/ job hours outside the home?

(a) 4 hours/day (b) 6-8 hours/ day (c) >8 hours/day (d) 4-6 hours/day

8. What is the occupation of child's father?

(a) Self- employed (b) Related to agriculture

(c) Specific office job (d) any others

9. What is your household income (Father's + Mother's if both are employed)?

(a) ≤ 10,000 (b) 10,000- 20,000 (c) 20,000-30,000 (d) ≥ 30,000

10. How much of the monthly income is spending on health (doctor fee/lab tests/ medicines)?

(a) 1000-2000 (b) 2000- 5000 (c) 500010,000 (d) ≥ 10,000

11. How much of the monthly income is spending on food (Nutrition/ kitchen/diet)?

(a) 1000-2000 (b) 2000- 5000 (c) 500010,000 (d) ≥ 10,000

III. Nutritional Awareness

12. How many times you visited health care professional for your child's health?

(a) Weekly (b) monthly

(c) Frequently (d) rarely

13. Do you have received nutritional advice ever from health care professionals?

(a) Yes (b) No

14. If yes, then who guided you regarding nutritional needs and heath of your baby?

(a) School nutrition supervisor (b) medical doctors

(c) From DHQ/THQ (d) TV/social media

IV. Literacy level of mother:

15. What is your (child's mother) education level?

(a) Primary (b) Middle

(c) Metric/ Inter (d) Graduation/Post graduation

16. Do you have basic knowledge/understanding of NUTRITION for primary care of your baby?

(a) Yes (b) No

(c) To some extent (d) learning from environment

17. Do you play a role in intra-family decision making in favor of child's health care need?

(a) Mostly my decision (b) Me and my husband decides

(c) My decision is not preferred (d) Depends on entire family

18. Do you know the earlier and effective use of health services/basic medicines for your child?

(a) Most often (b) Usually do not know

(c) Rarely know (d) entirely depends on doctor

19. Why you think to start solid foods to your baby?

(a) Decided on your own (b) Doctors' advice

(c) Low milk production (d) Influence by relatives/ media

V. Health status of mother:

20. Do you have any sever medical condition, currently or in past?

(a) Yes (b) No

21. If YES then specify your disease/condition?

(a) Diabetes (b) Hyper/Hypotension

(c) Malnutrition (d) any other……

22. How do you feel lethargic or irritant about your daily chores?

(a) Usually not (b) Most often

(c) Rarely (d) depends on work

23. Do you consider your-self as an active mother?

(a) Yes (b) No

VI. Anthropometric measurements of child:

24. Weight in kgs. ---------- **25.**

Height in ft. and inches ----------

26. Height in cm ----------

27. Health status based on Wasting percentile scale ---------- **28.**

Heath status based on Stunting percentile scale ----------

29. Mid upper arm circumference (MUAC) value ----------

VII. Physical activity level of child:

Child's age	(a) 6 months to 1 year	(b) 1 to 3 years	(c) 3 to 5 years

30. Do you consider your child as an active kid?

(a) Yes (b) No

31. How many hours your child sleeps in 24 hours (day and night time)?

(a) ≤ 12 hours (b) 12-14 hours

(c) 14-18 hours (d) ≥ 18 hours

32. What is her/his most preferred mode of playing?

(a) Indoor (b) Outdoor

33. What is the physical activity level of your child?

(a) Sedentary (b) Moderately active

(c) Very active (d) extremely active

34. How much time he/she spend on playing? (Other than T.V or mobile games)

(a) ≤ 2 hours (b) 2- 6 hours

(c) 6-8 hours (d) ≥ 8 hours

35. How much time he/.she spend watching TV or mobile games?

(a) ≤ 1 hour (b) 1- 2 hour (c) 2-4 hour (d) ≥ 4 hours

36. What game he/she usually preferred to play?

(a) Watching T.V or mobile games (b) Jumping/Running

(c) Physical games with their friends a (d) other

37. In comparison to other children (his/her age fellows), your kid is?

(a) Less active (b) Almost same

(c) Little more (d) more active

VIII. Dietary intake of child (Infants: 6 months to 1 year):

38. Have you started other solid food along with breast feeding?

(a) Yes (b) No

39. When did you start giving solid foods to your baby other than breast milk?

(a) 3-6 months (b) 6-9 months

(c) 9-12 months (d) after 12 months

40. Are you satisfied with adding solid food (quality/quantity wise) to your baby's diet along with exclusive breastfeeding?

(a) Yes (b) No

41. How many times in a day your child eats complementary food along with breast feeding?

(a) Once per day (b) 2 times per day

(c) 2-3 times per day (d) 3-4 times per day

42. If your child's need does not fulfill with breast milk then which alternative did you use?

(a) Formula milk (b) solid food (c) any other----------

43. What texture you preferred in food?

(a) Soft food (b) pureed

(c) Sliced (d) liquids

44. Have your kid started chewing food?

(a)Yes (b) No

IX. Dietary intake of child (Toddlers: 1 to 3 years):

45. How many times in a day your child eats complementary food along with breast feeding?

(a) Once per day (b) 2 times per day

(c) 2-3 times per day (d) 3-4 times per day

46. If your child's need does not fulfill with breast milk then which alternative did you use?

(a) Formula milk (b) solid food (c) any other----------

47. Does your child express desire for specific food?

(a)Yes (b) No

48. Your child mostly consumes?

(a) Single type of food (b) variety of foods

49. What are the commercial weaning food ingredients, you often prefer for your baby?

(a) Pure-vegetable (b) Blend of meat,

(c) Vegetable-potato/pasta/rice (d) Potato/pasta/rice-meat **50.**

For baby food preparation what you prefer more according to baby's choice?

(a) Single ingredient puree (b) 2 ingredients puree

(c) 3 ingredients puree (d) 4 ingredients puree

51. What texture your child prefers in food?

(a) Semi solids (b) Solids

(c) Sliced (d) pureed

X. Dietary intake of child (3 to 5 years):

52. Usually your child drinks milk through?

(a) Bottle (b) Normal cup

53. If he/she still uses bottle than how many times a day?

(a) Once per day (b) 2 times per day

(c) 2-3 times per day (d) 3-4 times per day

54. What he/she eats more happily?

(a) Homemade food (b) Commercially prepared food

55. He/she eats food by?

(a) By themselves (b) By spoon feeding

56. What is most preferred food group of your child?

(a) Dairy (b) Fruits/Vegetables

(c) Meat group (d) other

57. How much he/she eats in one time?

(a) ½ cup (b) 1 cup

(c) 2 cup (d) > 2 cups

58. He/she usually have?

(a) Specific food (b) Family foods

59. He/she usually eats their meals?

(a) Separate (b) with family

60. Does your baby take?

(c) 3 meals only (b) 3 meals+ snacks

XI. Common questions about dietary intake of children:

Child's age	(a) 6 months to 1 year	(b) 1 to 3 years	(c) 3 to 5 years

61. How many times in a day your child uses bottle?

(a) Once per day (b) 2 times per day

(c) 2-3 times per day (d) 3-4 times per day

62. What is the meal frequency of your child in a day?

(a) 2 meals per day (b) 3-4 meals per day

(c) 4-5 meals per day (d) > 5 meals per day **63.** Is your child's diet is diverse (variety of food groups)?

(a)Yes (b) No

64. How many food groups are in your baby's daily diet?

(a) One type (b) 2 types

(c) 2-3 types (d) 4 types

65. Your child usually remains sick due to which disease?

(a) Diarrhea (b) Fever

(c) Gastric issues (d) Breathing and cough problems **66.** If child fell sick due to any condition, then how prolong the sickness remains?

(a) Once per week (b) 2-3 times per week

(c) 3-4 times per week (d) 5-6 times per week

67. How many times in a month you visit doctor for child's health?

(a) Once per month (b) 2-4 times per month (c) 4-8 times per week (d) ≥ 8 times per month

68. Does your kid consume packed (unhealthy snacks) food daily?

(a) Yes (b) No

69. Is your child is allergic to any food?

(a) Yes (b) No

70. Your baby usually gets allergic to which food group mostly?

(a) Cow's/ Buffalo milk (b) Wheat /rice

(c) Eggs/Nuts/Seeds (d) Any other ----------

XII. Food frequency questionnaire:

(For 6 months to 5 years old child)

Child's age	(a) 6 months to 1 year	(b) 1 to 3 years	(c) 3 to 5 years

Major Food groups	**Never Or less than 1 per month**	**1 to 2 times per month**	**Once Per week**	**2 to 4 per week**	**5 to 6 per week**	**Once Per day**	**2to 3 per day**	**4 to 6 per day**
Vegetables								
Fruits								
Staple food (wheat, maize)								
Rice								
Pulses/lentils								
White bread								
Junk food (pizza, pasta, burger)								
Candies, jam, honey								
Fried food								
Soft drinks								
Milk								
Yogurt								
Chicken								
Mutton/beef								
Fish								
Eggs								

Snack food (chips, chocolate, biscuits)								

XIII. Food choices of child:

Food groups	6months to 1 year	1 to 3 years	3 to 5 years
reals	(a) Bread (b) Rice (c) Noodles (d) Pasta (e) Bun (f) Muffin (g) Biscuits (h) Cakes	(a) Bread (b) Rice (c) Noodles (d) Pasta (e) Bun (f) Muffin (g) Biscuits (h) Cakes	(a) Bread (b) Rice (c) Noodles (d) Pasta (e) Bun (f) Muffin (g) Biscuits (h) Cakes
uits	(a) Apple (b) Banana (c) Oranges (d) Mango (e) Strawberry (f) Other-------	(a) Apple (b) Banana (c) Oranges (d) Mango (e) Strawberry (f) Other-------	(a) Apple (b) Banana (c) Oranges (d) Mango (e) Strawberry (f) Other-------
getables	(a) Potato (b) Tomato (c) Carrots (d) Other------	(a) Potato (b) Tomato (c) Carrots (d) Other------	(a) Potato (b) Tomato (c) Carrots (d) Other------
iry	(a) Milk (b) Yogurt (c) Cheese (d) Butter (e) Other-----	(a) Milk (b) Yogurt (c) Cheese (d) Butter (e) Other-----	(a) Milk (b) Yogurt (c) Cheese (d) Butter (e) Other-----
oteins	(a) Eggs (b) Chicken (c) Fish (d) Beans (e) Lentils (f) Nuts------ (g) Other-----	(a) Eggs (b) Chicken (c) Fish (d) Beans (e) Lentils (f) Nuts------ (g) Other-----	(a) Eggs (b) Chicken (c) Fish (d) Beans (e) Lentils (f) Nuts------ (g) Other-----

ts and oils/ Sugars	(a) Fry foods (b) Sugary foods (c) Candies/ (d) Jam/honey	(a) Fry foods (b) Sugary foods (c) Candies/ (d) Jam/honey	(a) Fry foods (b) Sugary foods (c) Candies/ (d) Jam/honey
ckaged foods	(a) Chips (b) Nimko (c) Other------	(a) Chips (b) Nimko (c) Other------	(a) Chips (b) Nimko (c) Other------

XIV. 24-hour dietary recall:

Food intake	Food items/ Quantity
Morning	
Snack	
Lunch	
Snack	
Dinner	