Original Article

ASSESSING NUTRITIONAL STATUS OF SCHOOL CHILDREN OF A SINDH REGION ON SOCIO-DEMOGRAPHIC INDICATORS

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ABSTRACT:

BACKGROUND: Malnutrition is public health issue of school-age children. Inadequacy, availability, poor quality and lack of knowledge of balanced diet are major causes of under-nutrition. Current study aimed to assess the nutritional status and associated factors among primary school children of Thul-Town, Jacobabad, and Sindh.
METHODS: A cross-sectional study conducted on 210 children, equally divided boys and girls selected by simple random method. Anthropometrics measures, socio-demographic characteristics data were collected using pretested questionnaire. Using WHO-reference-2007, height, BMI and weight-for-age were measured for stunting, wasting and underweight respectively and BMI-for-age for overweight and obesity. Data analysis was done by using SPSS-21, WHO AnthroPlus and NutriSsurvey softwares. Dietary data was collected through a 24-hour recall and FFQ to determinefood choice and portion size. Chi-square test at 95% confidence interval (CI) was used to quantify independent variables of nutritional indices.
RESULTS: Prevalence of stunting, wasting, underweight, overweight and obese were found 10%, 14%, 11%, 0.5% and 0.5% respectively. Stunting was significantly associated with family size (p-0.037), monthly income (p-0.038) and pocket money (p-0.007). Wasting was significantly associated with decision making power (p-0.000), mother's education (p-0.000) and occupation (p-0.000). Underweight was associated with decision making power (p-0.002) and vit-C (p-0.028). Out of total children 79% were taking inadequate food servings. Generally it was pointed out that 71% children were taking insufficient of all nutrients as per RDA.
CONCLUSIONS: Low stunting, high wasting and medium underweight observed. Girls were more undernourished by all indices than boys. However, family size, monthly income, decision making power, education and occupation of mother were found significantly associated with nutritional status of children.
KEY WORDS: Nutritional status, Primary School Children, Thul; Jacobabad.

INTRODUCTION:

Malnutrition is defined as the shortage of sufficient nutrition resulting from deficient food, unbalanced nourishment through diet or incomplete absorption of nutrients[1].
Malnutrition is clinically expressed by insufficient availability of different macronutrients and micronutrients in the diet which is followed by recurrent or persistent infections. Nutritional status is the outcome of the complicated interchangeable effects of the diet, our general condition of health and

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residential environment[2].

This study aimed to determine nutritional status in study area and compare the analyzed age and gender specific z-scores relative to WHO growth references with primary school children at Thul-Town, Jacobabad, Sindh.

Assessing nutritional status and measuring child growth, anthropometric measures of height, BMI and weight-for-age are inexpensive, easy to perform and non-invasive procedures. Globally most used indices for nutritional status are stunting, wasting, underweight, overweight and obese[3]. Malnutrition causes half of all deaths and 28% of stunting in children globally. School-age children of the developing countries are 52% stunted and 34-62% underweight. It is estimated that if no interventions carried out, then close to one billion children will be physically and mentally impaired by 2020[4]. Following WHO-reference-2007, a study in Pakistan regarding estimation of prevalence of under-nutrition among primary school children showed stunting 8% and thinness 10% population in 2011[5]. In Pakistan 18.751 million children are enrolled in primary stage and out-of those 5 million are out of school[6-7]. Population of children 5-9 years contributes 49.3% of total Pakistan's Education system[8]. As today's children are the citizen of tomorrow's world, their survival, protection and development are prerequisite for the future development of humanity[9]. Under-nutrition is a major health problem among school-age children in developing countries. Studies show that health problems due to poor nutritional status in primary school-age children are most common factor of low school enrolment, high absence, early dropout, learning problems and unsatisfactory academic performance[3]. Associated factors including parent's education, income, and number of siblings, social behavior, environment and diseases contribute to under-nutrition. Primary school-children are most vulnerable to under nutrition due to their food insecurity, low energy intake, less access to food, inequitable distribution of food within households, improper food storage and preparation, dietary taboos and infections with pathogens[4]. The NNS-2011 demonstrated that stunting (43.7%), wasting (15.1%), underweight (31.5%) and micronutrients deficiency are endemic in Pakistan[10]. This study will fulfil the gap existing in the body of literature in connection to nutritional status, associated factors among primary school children. It will draw attention of policy makers to address associated factors and interventions regarding overcoming malnutrition in primary school children.

Methodology

A cross-sectional study was carried out in two Public Primary Schools of boys and girls of Thul, District Jacobabad. Based on 44% prevalence, the sample size calculated, was estimated at 105 for each boys and girls school. Children recruited randomly by lottery method from student's general register (G.R) under study of grade four and five. Students who had history of chronic illness or who were on leave/absent on the day of data collection were excluded. Questionnaire contained the socio-demographic characteristics of parents and children and healthcare practices, 24-hour recall and FFQ. Anthropometric measures calculated were height-for-age, BMI-for-age and weight-for-age. After calibration, anthropometer-rod and weighing-scale were standardized to the nearest 0.1 cm and 0.5kg respectively. Standardized cup, plate and glass were used to estimate amount of food consumed.

RELIABILITY AND VALIDITY OF DATA:

The questionnaire adopted was already used in a study at Ethiopia[4]. Tool was modified and translated in local language (Sindhi) and pre-tested in other than sample population and corrected accordingly. Tool was filled by trained data collectors and back translated into English.

DATA ANALYSIS PLAN:

Chi-square tests applied to see association of outcome variables in SPSS-21. Nutritional status and associated factors are demonstrated in frequency tables and graphs. Continuous variables are described in mean±SD. WHO AnthroPlus software used to assess the anthropometric measures with mean z-scores according to Nutrisurvey2007 software used to

calculate 24-hour recall and food frequency choice and portions for caloric contribution of each meal by converting weekly and monthly intake into daily consumption according to food pyramid recommended dietary servings per day.

ETHICAL CONSIDERATIONS:

Proposal approved by the Internal Review Board of Health Services Academy. Written consent from fathers and assent from children obtained, after information about the nature and purpose of the study.

RESULTS:

Data was collected from 210 children (50/50% boys/girls) of public schools of Thul-Town,

Table 1: WHO-reference-2007 guideline

Standard Deviation (SD)/Z-score	Indicators		
	Height-for-age	**BMI-for-age**	**Weight-for-age**
<-3SD	Severely stunted	Severely wasted	Severely underweight
<-2SD	Stunted	Wasted	Underweight
=-2SD to +2SD	Normal	Normal	Normal
>2SD	--	Overweight	--
>3SD	--	Obese	--

Table 2. Demographic and Socio-economic characteristics of parents

Demographic and Socio-economic characteristics of parents		
Variable	**Category**	**Frequency (%)**
Decision making power in family:	Father	197 (93.8)
	Mother	7 (3.3)
	Brother	5 (2.4)
	Joint	1 (0.5)
Family type:	Nuclear	131 (62.4)
	Joint	79 (37.6)
Family size:	=7	12 (5.7)
	>7	198 (94.3)
Father's Education:	No formal education	56 (26.7)
	Primary school	55 (26.2)
	Secondary school	12 (5.7)
	High School	43 (20.5)
	College & above	44 (21.0)
Mother's Education:	No formal education	128 (61.0)
	Primary school	55 (26.2)
	Secondary school	7 (3.3)
	High School	12 (5.7)
	College & above	8 (3.8)
Profession/Occupation of father:	Business	41 (19.5)
	Agriculture	5 (2.4)
	Service	42 (20.0)
	Labour	117 (55.7)
	Other	5 (2.4)
Profession/Occupation of mother:	House wife	191 (91.0)
	Service	5 (2.4)
	Dressmaking	14 (6.7)
Average monthly income:	Less than Rs.10,000	54 (25.7)
	Rs.10,001 to 20,000	87 (41.4)
	Rs.20,001 to 50,000	58 (27.6)
	Rs.50,001 to 80,000	7 (3.3)
	Rs.80,001 & above	4 (1.9)

SOCIO-DEMOGRAPHIC CHARACTERISTICS:

Details of demographic and socio-economic characteristics are illuminated in **Table-2**. The study results showed that 196 (93.3%) of the study population lived in urban areas. Most of households had a family size of >7 family members 198 (94.3%) and 12 (5.7%) were ≤7. Most of fathers were laborer 117 (55.7%) and others belong to business 41 (19.5%) and service 42 (20%). Majority of mothers were house-wives 191 (91%) others 14 (6.7%) working as dressmaking and 5 (2.4) in government service.

Socio-demographic characteristics of children and healthcare practices:

Age of recruited children was 9-11years (mean 9.4528±0.71922) with 50/50% boys and girls. Birth order of 97 (46.2%) children was 1st-2nd, 65 (31%), 3rd-4th and ≥5th 48 (22.9%). Children using soap to wash hands after toilet were 64.8%.Classes of both boys and girls of 4th and 5th grade were well-ventilated and there was facility of drinking water and tuck shops nearby school premises (**Table-3**).

Table 3: Frequencies and percentages of socio-demographic characteristics and healthcare practices of children:

Variable	Category	Frequency (%)
Age:	9-10 years	120 (57.1)
	10-11 years	90 (42.9)
Number of siblings	=3	97 (46.2)
	>3	113 (53.8)
Birth space between this & earlier child:	<2 years	69 (32.9)
	=2 years	122 (58.1)
	1st Child	19 (9)
Personal hygiene		
Use of soap after toilet use	Yes	136 (64.8)
	No	74 (35.2)
Nail cutting	Twice a week	73 (34.8)
	Once a week	137 (65.2)
Dietary intake		
Meals/day	3 meals	139 (66.2)
	2 meals	71 (33.8)
Exclusive breastfeeding for 6 months	Yes	207 (98.6)
	No	3 (1.4)
Complementary food started	4th month	128 (61)
	5th month	70 (33.3)
	6th month	12 (5.7)
Beef as staple food	Yes	4 (1.9)
	No	206 (98.1
House characteristics:		
House occupied by the family:	Own	185 (88.1)
	Rent	25 (11.9)
House condition:	Pakka	165 (78.6)
	Katcha	45 (21.4)
Use of drinking water:	By filtration	7 (3.3)
	Without any treatment	203 (96.7)
Type of latrine:	Flush latrine	167 (79.5)
	Piped sewer latrine	37 (17.6)
	Field	6 (2.9)
School characteristics:		

Class room ventilation:	Yes	210 (100)
	No	0 (0)
Tuck shop in school premises or nearby?	Yes	210 (100)
	No	0 (0)
Pocket money/day	=Rs.10	118 (56.2)
	Rs.11-30	79 (37.6)
	Rs.31-50	10 (4.8)
	>Rs.50	3 (1.4)
Drinking water facility in school	Yes	210 (100)
	No	0 (0)
Latrine in school	Yes	105 (50)
	No	105 (50)
Hand washing facility in school	Yes	0 (0)
	No	210 (100)

FOOD INTAKE:

Children's dietary intake data was collected by using FFQ and calculated weekly and monthly intake to generate per day servings. Then total servings were classified as adequate or inadequate comparing with food pyramid recommendations.

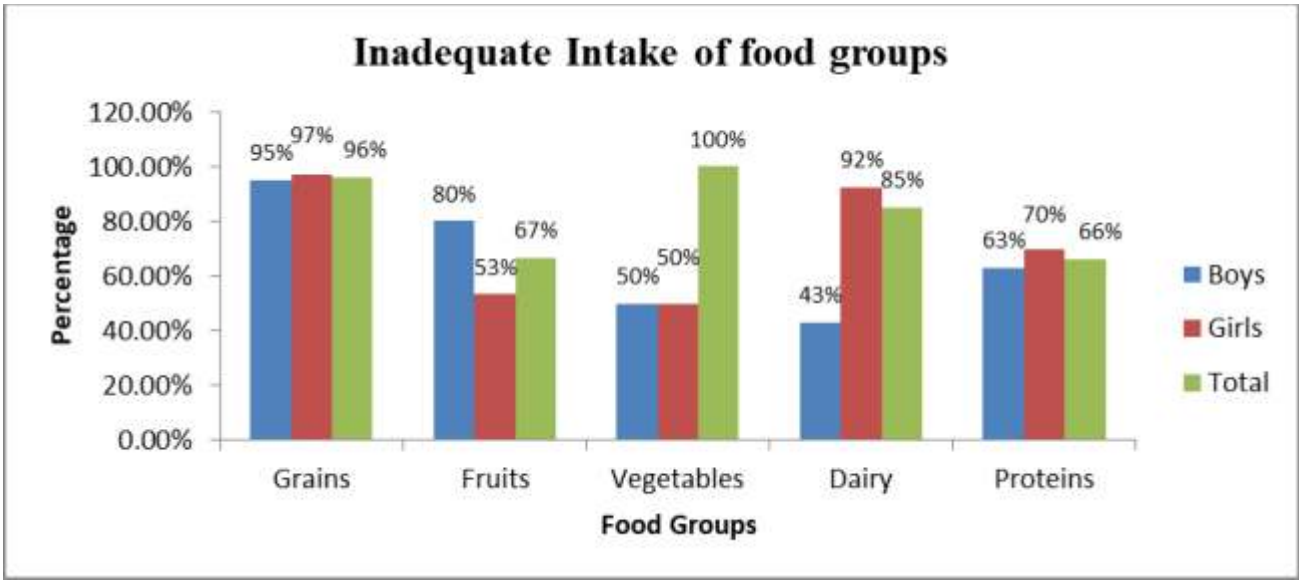

Figure-1: Inadequate intake percentages of food groups

Children were taking inadequate foods from grains 96%, fruits 67%, vegetables 100%, dairy 85% and proteins 66% (**Figure-1**).

ANTHROPOMETRIC MEASUREMENTS OF CHILDREN:

According to WHO-reference-2007 guideline, markers to measure nutritional status used were height, BMI and weight-for-age for stunting, wasting, underweight, overweight and obese.

NUTRITIONAL STATUS:

Children whose height, BMI and weight-for-age was <-3 standard deviation (SD) classified as severely stunted, severely wasted, severely underweight, children<-2 to -3SD classified as stunted, wasted, underweight. Children whose BMI-for-age ≥-2SD to +2SD, >+2SD to +3SD and >+3SD from median of the selected population were classified as normal weight, overweight and obese respectively (**Figure-3**).

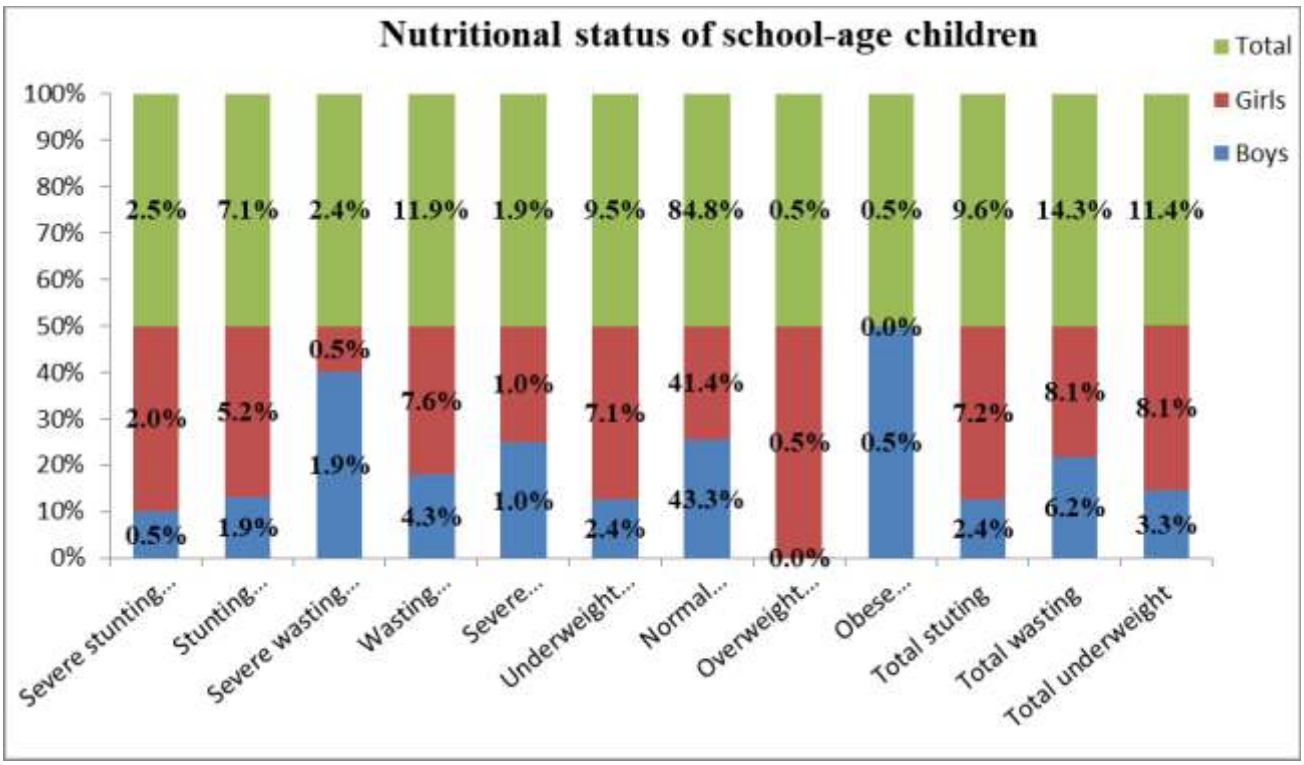

Figure-2: Frequency of stunting, wasting, underweight, normal weight, overweight and obese children (n=210)

PREVALENCE OF STUNTING, WASTING, UNDERWEIGHT, NORMAL AND OVER NOURISHED:

With mean (±SD) height-for-age in cm 135.8071 (±9.83134), the prevalence of total stunting in boys and girls was 5 (2.38%) and 15 (7.14%) out of 20 (9.52%) respectively. Severely stunted were 2.5% and stunted 7.14%. Children of age 10-11 years (11.1%) were more stunted than 9-10 years (8.3%).

With mean BMI-for-age 18.1400 (±2.11742), the prevalence of total wasting in boys and girls was 13 (6.19%) and 17 (8.09%) out of 30 (14.28%) respectively. Severely wasting children were 2.38% and wasting were 11.9%. Boys (1.9%) were more severely wasted than girls (0.47%) but overall wasted girls (8.09) were more than boys (6.19%).

With mean weight-for-age in kg 28.7119 (±7.02484) the prevalence of totals underweight in boys and girls was 7 (3.33%) and 17 (8.09%) out of 24 (11.42%) respectively. Severe underweight were 1.90% and underweight 9.52%. Girls at age 9-10 years were 2.41 times more likely to be underweight than boys.

The prevalence of total BMI-for-age with mean (±SD) 18.1400 (±2.11742) was (86%). A total of normal-weight, overweight and obese was 84.76%, 0.47% and 0.47% respectively.

Association between nutritional status and socio-demographic characteristics:

Table 4: Association between nutritional status* what is your family size? Cross tabulation

Nutritional status	SD	What is your family size		Chi-Square value	P-Value
		=7 Members (%)	>7 Members (%)		
Stunting	**-3**	0	19 (100.0)	1.292	0.524
	-2	2 (5.9)	32 (94.1)		
Wasting	**-3**	1 (3.3)	29 (96.7)	1.976	0.372
	-2	2 (3.3)	59 (96.7)		
Underweight	**-3**	0	24 (100.0)	2.072	0.355
	-2	2 (5.3)	36 (94.7)		

Note: * = Significance level at p=value<0.05

Table 4; shows the results of the association between severely stunting and stunting with respect to statement "what is your family size". The results revealed severely stunting 100% and stunting 94.1% respectively in children of families which consisted on family size greater than 7 members. The chi-square ($\chi 2$) value was found to be 1.292 and p-value= 0.524 showed no significant association between severely stunting and stunting with size of family. Association between severely wasting and wasting with respect to statement "what is your family size"? The results illustrated 96.7% both severely wasting in children and 96.7% wasting in families of family size greater than 7. The chi-square ($\chi 2$) value was found to be 1.976 and p-value= 0.372 which showed no significant association between severely wasting and wasting with family size. Association between severely underweight and underweight with respect to statement "what is your family size". The results denoted severely underweight children 100% and underweight 94.7% respectively in families of greater than 7 members. The chi-square ($\chi 2$) value was found to be 2.072 and p-value= 0.355 and no significant association was found between severely underweight and underweight with statement "what is your family size"?

Table 5: Association between nutritional status* profession/ occupation of mother? Cross tabulation

Nutritional status	SD	Profession/ occupation of mother			Chi-Square value	P-Value
		House-wife (%)	Service/Job (%)	Dressmaker /Tailor (%)		
Stunting	**-3**	17 (89.5)	2 (10.5)	0	9.572	**0.048 ***
	-2	32 (94.1)	0	2 (5.9)		
Wasting	**-3**	29 (96.7)	0	1 (3.3)	7.095	0.131
	-2	52 (85.2)	4 (6.6)	5 (8.2)		
Underweight	**-3**	21 (87.5)	2 (8.3)	1 (4.2)	3.879	0.423
	-2	36 (94.7)	0	2 (5.3)		

Note: * = Significance level at p=value<0.05

Table 5; shows the results of the association between severely stunting and stunting with respect to "profession/occupation of mother". The results revealed severely stunting 89.5% and stunting 94.1% respectively in children whose mother was house-wife. The chi-square (χ2) value was found to be 9.572 and p-value= 0.048 that showed association between severely stunting and stunting with house-wife as a profession/occupation of mother statistically significant. Association between severely wasting and wasting with respect to statement "profession/occupation of mother". The results observed severely wasting in children 96.7% and wasting 85.2% respectively in children whose mother was house-wife. The chi-square (χ2) value was found to be 7.095 and p-value= 0.131 that showed no significant association between severely wasting and wasting with profession/occupation of mother as house-wife. Association between severely underweight and underweight with respect to statement "profession/occupation of mother". The results denoted severely underweight children 87.5% and underweight 94.7% respectively in children profession/occupation of mother as house-wife. The chi-square (χ2) value was found to be 3.879 and p-value= 0.423. that showed no significant association between severely underweight and underweight with "profession/occupation of mother".

Table 6: Association between nutritional status* birth order of child? Cross tabulation

Nutritional status	SD	Birth order of child			Chi-Square value	P-Value
		1st – 2nd n (%)	3rd – 4th n (%)	5th & above n (%)		
Stunting	**-3**	10 (52.6)	7 (36.8)	2 (10.5)	10.995	**0.027 ***
	-2	8 (23.5)	13 (38.2)	13 (38.2)		
Wasting	**-3**	11 (36.7)	9 (30.0)	10 (33.3)	4.940	0.294
	-2	23 (37.7)	24 (39.3)	14 (23.0)		
Underweight	**-3**	10 (41.7)	9 (37.5)	5 (20.8)	3.301	0.509
	-2	12 (31.6)	14 (36.8)	12 (31.6)		

Note: * = Significance level at p=value<0.05

Table 6; shows the results of the association between severely stunting and stunting with respect to "birth order of child". The results revealed severely stunting 52.6% in children with birth order as 1st or 2nd and stunting 38.2% in children with birth order as 3rd and above. The chi-square (χ2) value was found to be 10.995 and p-value= 0.027 that showed association between severely stunting with birth order as 1st or 2nd and stunting found statistically significant association birth order as 3rd and above. Association between severely wasting and wasting with respect to "birth order of child" revealed severely wasting in children 36.7% whose birth order was 1st or 2nd and wasting 39.3% in children those birth order was 3rd or 4th. The chi-square (χ2) value was found to be 4.940 and p-value= 0.294 that showed no significant association between severely wasting and wasting with birth order of child. Association between severely underweight and underweight with respect to "birth order of child". The results denoted severely underweight children 41.7% in children whose birth order was 1st or 2nd and underweight 36.8% in children with birth order as 3rd or 4th. The chi-square (χ2) value was found to be 3.301 and p-value= 0.509. It showed no significant association between severely underweight and underweight with "birth order of child".

Table 7: Association between nutritional status* is beef your staple food? Cross tabulation

Nutritional status	SD	Beef as staple food		Chi-Square value	P-Value
		Yes n (%)	No n (%)		
Stunting	-3	1 (5.3)	18 (94.7)	2.643	0.267
	-2	2 (5.9)	32 (94.1)		
Wasting	-3	1 (3.3)	29 (96.7)	2.813	0.245
	-2	3 (4.9)	58 (95.1)		
Underweight	-3	3 (12.5)	21 (87.5)	9.764	**0.008 ***
	-2	0	38 (100.0)		

Note: * = Significance level at p=value<0.05

Table 7; shows the results of the association between severely stunting and stunting with respect to statement "is beef your staple food"? The results revealed severely stunting 94.7% and stunting 94.1% in children whose beef was not staple food. The chi-square ($\chi 2$) value was found to be 2.643 and p-value= 0.267 that showed no significant association between severely stunting and stunting. Association between severely wasting and wasting with respect to "is beef your staple food?" Result revealed severely wasting 96.7% and wasting 95.1% in children who had beef as staple food in their diet. The chi-square ($\chi 2$) value was found to be 2.813 and p-value= 0.245 that showed no significant association between severely wasting and wasting with beef as a staple food. Association between severely underweight and underweight with respect to "beef as staple food". The results denoted severely underweight children 87.5% and underweight 100% in children whose staple food was not beef in comparison to children those had beef as staple food. The chi-square ($\chi 2$) value was found to be 9.764 and p-value= 0.008. It showed statistically significant association between severely underweight and underweight with "beef as staple food".

Table 8: Association between nutritional status* eating biscuits/toffee/chocolate in break time? Cross tabulation

Nutritional status	SD	Biscuits/toffee/chocolate in break time		Chi-Square value	P-Value
		Yes n (%)	No n (%)		
Stunting	-3	3 (15.8)	16 (84.2)	1.352	0.509
	-2	4 (11.8)	30 (88.2)		
Wasting	-3	4 (13.3)	26 (86.7)	0.494	0.781
	-2	6 (9.8)	55 (90.2)		
Underweight	-3	5 (20.8)	19 (79.2)	7.683	**0.021 ***
	-2	6 (15.8)	32 (84.2)		

Jacobabad, of grade 4 and 5.

Note:*=Significance level at p=value<0.05

Table 8; show the results of the association between severely stunting and stunting with eating biscuits/toffee/chocolate in school break time. The results disclosed severely stunting on average 84.2% and stunting 88.2% respectively in children who ate biscuits/toffee/chocolate in school break time. The chi-square (χ2) value was found to be 1.352 and p-value= 0.509 that showed no significant association between severely stunting and stunting with eating biscuits/toffee/chocolate in school break time? Association between severely wasting and wasting with "eating biscuits/toffee/chocolate in school break time". The results depicted severely wasting in children 86.7% and wasting 90.2% respectively in children who ate biscuits/toffee/chocolate in school break time. The chi-square (χ2) value was found to be 0.494 and p-value= 0.781 that viewed no significant association between severely wasting and wasting with eating biscuits/toffee/chocolate in school break time? Association between severely underweight and underweight with "eating biscuits/toffee/chocolate in school break time". The results showed severely underweight 79.2% and underweight 84.2% respectively in children those ate biscuits/toffee/chocolate in school break time. The chi-square (χ2) value was found to be 7.683 and p-value= 0.021 and found statistically significant association between severely underweight and underweight with statement "eating biscuits/toffee/chocolate in school break time."

Association between nutritional status and food frequency/day according to food pyramid:

Children took 53 different types of food in their three 139 (66.2%) and two 71 (33.8%) main meals of the day. Children having from grains 6-11 servings, fruits 2-4, vegetables 3-5, dairy 2-3 and proteins 2-3/day or more were categorized as adequate intake and having less as inadequate intake. Out of 210 children were taking ratio of adequate to inadequate food percentage from each food-group were 3.81:96.19%, 33.3:66.7%, 0.0:100%, 14.8:85.2% and 33.8:66.2% respectively. No significant association was observed. Furthermore, the "ratio of adequate to inadequate" food serving in boys and girls was 1:4.96 and 1:4.7 respectively and the "ratio of boys to girls" determined 1:4.83.

Association between nutritional status and snacks foods consumption:

The study findings demonstrated no significant association between nutritional status and snacks taken by children during school-break time. Insignificant results showed that children who were eating foods like(Chips/Samosa/Pakora) and(Biscuits/Toffee/Chocolate) in school recess were more stunted(10%, p=0.436 & 13%, p=0.726), wasted(14.2%, p=0.922& 17.4%, p=0.950) and underweight(11.6%, p=0.787& 21.7%, p=0.432) than those eating not(5 & 9.1%),(1.6 & 13.9%) and(10 & 10.2%). In contrast children taking rice/chickpeas/haleem were found less stunted (2.1%, p=0.250), wasted (8.3%, p=0.200) and underweight (8.3%, p=0.412) than those eating not 11.7%, 16.0%, and 12.3% respectively.

Association between nutritional status and 24-hours recall food intake with recommended daily allowances (RDA):

Each child was asked about food intake in detail from 24 hours back to the time of data collection. Data was analysed and nutrients values report generated in NutriSurvey and compared with RDA. Children who were taking nutrients equal or more than RDA were classified as "sufficient intake" and taking less as "insufficient intake".

The mean energy intake was 2079.7186 (±874.2). Insufficient intake percentages were as total energy (kcal) 56.2%, protein 50.5%, fat 46.2%, carbohydrate 69.5%, dietary fibre 56.2%, vit-A 91.0%, vit-B1 84.8%, vit-B2 99.5%, vit-B6 11.0%, vit-C 89.5%, calcium 100%, iron 81.4% and zinc 86.2%.The study findings demonstrated significant association between underweight and Vit-C (p=0.028).

DISCUSSION:

Results of our study revealed stunting prevalence 9.52%. This finding is similar to studies in Rawalpindi, Pakistan 10.8%, however the study conducted at Hohoe Municipality, Ghana showed 12% stunting which is

consistant with the study due to socio-economic status of parents, a study results of Ethiopia carried out on same socio-demographic characteristics revealed stunting prevalence as 11.5% due to large family size. The prevalence of other study conducted in India was seen 9.2% the similarity can be due to the same family dominancy culture [11,12,13,14]. Stunting was lower to study results 18.5%, 24.5%, 19.6%, 21.8%, 60% [3,15,4,16,17] gender, family type, birth order >2, father and mother's education were the underlying determinants and higher to studies carried out at Lahore, Pakistan 8%, 8.2%, Ouagadougou, Burkina Faso 8.8% and Ethiopia 8.9% [5,18,19,20]. A study conducted at Varanasi, India showed stunting 9.2% which is in coherence with this study [14]. Results of this study is much less than the NNS-2011 prevalence 43.7% and developing countries 52% [10,4]. Little differences were noted because our study was conducted in public schools where actual age and registered age in G.R varies due to delay in school induction and the comparative study was conducted at private and public school and may be due to SES, cultural and dietary practices.

Wasting prevalence was found 14.28%. This result is similar to 13.7% [19], lower to 33.3%, 38.66% and 22.9% [3,12,13] and higher to 9.7%, 10% and 10.1% [15,5,18]. This study result is consistent with NNS 2011 prevalence 15.1% and close to study conducted in Lahore 10% [21,5]. Wasting relatively higher than other studies reflects an acute malnutrition which was not a problem 6 years back when numerous nutritional support programs were initiated after supreme flood in 2010 in study area.

Underweight prevalence was 11.42%, this is similar to 13% [12], lower to 14.9%, 24.7%, 15.9%, 28.9% and 84% [15,12,4,16,17], higher to 6.7%[18]. This is much lower than prevalence at India 35.4% and 52.6%[22,16].

Current study observed 0.5% children overweight and 0.5% obese. It is much lower regarding overweight to 7% and 3% [12] and 3% [19]. A study of QwaQwa showed 10% prevalence of overweight which is much higher than present study. That may possibly be due to respondent's age and trend difference [23]. A study of Hyderabad, India observed overweight 9.2% and obesity 4.4%, which is higher than our study, this could be due to private schools settings [16].

ASSOCIATION OF NUTRITIONAL STATUS WITH DEMOGRAPHIC CHARACTERISTICS OF PARENTS:

Children of nuclear family were insignificantly more stunted, wasted and underweight than joint families' children. This is inverse to study conducted in U.P, India [3]. This could be due to consumption of food diversity within joint families.

A major proportion (94.3%) of family size was greater than 7 and children in family were more likely to be stunted, wasted and underweight respectively. It is consistent with study findings where large family size was 1.4 times more likely to be stunted and 2.3 times to be underweight [22]. This supports that large family size makes the nutritional stuff scarcity. Another study denoted that children of family size >5 were 1.92 times more likely to be stunted and 1.71 times more likely to be wasted [13].

Mother's occupation as housewife showed negative effects on nutritional status regarding all indicators of children. Stunting was found statistically significant with chi-square value 9.572 (p-0.048). This finding is inconsistent with study of India and Ethiopia that inversely showed that parents in government service and those with high monthly income 50-80 thousand had more undernourished children. This could be consequences of having less attention to children due to lack of time.[3,20].

Percentage of literate/illiterate fathers and mothers was 73.3:26.7% and 39:61% respectively. Education ≥high school in fathers was 41.5% and in mothers was 9.5%. This figure is more than the study conducted in Varanasi, India [14]. Highest percentage of undernourished children was associated with the father's primary level education (26.2%) and mother's high school level (5.2%). This finding is in accordance with study results conducted in Abbottabad (Pakistan), Lahore (Pakistan), Tamilnadu (68.2%) and Ethiopia with secondary education and above (13.1%) [24,5,25,20]. A study of Bahawalpur supported that mother's education is more effective on child nutrition than father's because child-care is responsibility of mother[26].

ASSOCIATION OF NUTRITIONAL STATUS WITH DEMOGRAPHIC CHARACTERISTICS OF CHILDREN:

Children of age 10-11 years were more stunted than 9-10 years (p-0.451) but regarding underweight result was vice-versa (p-0.077). A study found maximum underweight children at age 9 [14]. Wasting prevalence was same in both age groups.

Stunting result is in-line with study conducted in Uttar-Pradesh, India [3]. Of study Bahawalpur, Pakistan showed increased anthropometric failure with increase in age [26]. Ratio of boys to girls regarding nutritional status was stunting 1:3, wasting 1:1.32 and underweight 2:44. A comparable results were found in Faisalabad where boys were more stunted with ratio of 1.21:1 stunting and underweight 4.87:1 [21].

Children as 1st or 2nd birth-order were significantly more stunted (p-0.027) while found more wasted and underweight statistically not significant. This is in-line with study of Addis Ababa, Ethiopia and Tamilnadu (71.4%)[4,25].

Children cutting nail once a week were found more stunted (10.2%) and underweight (12.4%) than those who cut twice a week 8.2% and 9.6% respectively. The result of study in Dhaka, Bangladesh determined that children not cutting the nail regularly were 3.632 times more likely to be underweight (p-0.029)[17].

History of exclusive breast feeding <6 months, living in rental house, not using soap after toilet use and taking inadequate food servings, children eating Chips/Samosa/Pakora were insignificantly more stunted and undernourished than those who ate Rice Chickpeas/Haleem in recess time. However, children not eating Biscuit/Toffee/Chocolate were found more undernourished than those who ate these items. This could be because of sweets add in weight gain. A study of England carried on primary school children showed positive association between fast food outlet near home and BMI z-scores particularly in girls [27]. A study of Kenya showed that potato chips (78.2%), and chocolate (69.3%) were preferred snacks by most of children that were not healthy snacks. Most children of this study used pocket money by their own will and consumed cheap and unhealthy foods. Other studies support this finding and revealed that availability of healthy foods could promote good dietary practices[28].

ASSOCIATION OF NUTRITIONAL STATUS WITH FOOD INTAKE:

Children taking inadequate food from all food groups were insignificantly more undernourished. Their stunting, wasting and underweight ratio of adequate to inadequate food intake was high with 1:5.66, 1:4.76 and 1:8.23 respectively. This is consistent QwaQwa study where all children had deficient from all nutrients and didn't meet 100% EAR(estimated average requirements) [23]. Present study showed that only 53.8% and 89% children had sufficient intake from fat and vit-B6 respectively, remaining all had insufficient from all nutrients. Another study of Ghana where stunting and underweight ratio of adequate to inadequate fruit consumption was 1:1.94 and 1:1.45 respectively[12].

24-hours recall food intake data showed that children taking sufficient energy (Kcal) were 92 (43.8%), the mean Kcal intake was 2079.7186 (±874.16069). Of 5 food-groups children were taking 53 food items with insufficient energy compared to RDA.Children taking insufficient energy from proteins and fats were more stunted and wasted, with insufficient carbohydrates were found more stunted, wasted and underweight.

Vitamin-A and iron deficiency observed in 91% and 81.4% children respectively, this is much higher than (38.7%) children of Ouagadougou, Burkina Faso[19].

CONCLUSIONS:

Malnutrition still exists as health problem in school-age children with scarce literature. This study found the prevalence of low stunting (<20%), high wasting (10-14%) and medium underweight (10-19%). Girls were more undernourished than boys. Furthermore, study identified that profession/occupation of mother, birth order of child, eating biscuits/toffee/chocolate in school break time and insufficient food intake are major determinant of under-nutrition in children. Food consumption was found inadequate from all food groups. Lack of healthy dietary knowledge and poverty are underlying cause of malnutrition.

Abbreviations:

WHO=World Health Organization, NNS=national nutritional survey, G.R=general register, SPSS=Statistical Package for the Social Sciences, SD=Standard Deviation, FFQ=Food frequency questionnaire, RDA=recommended daily allowance, BMI=body mass index.

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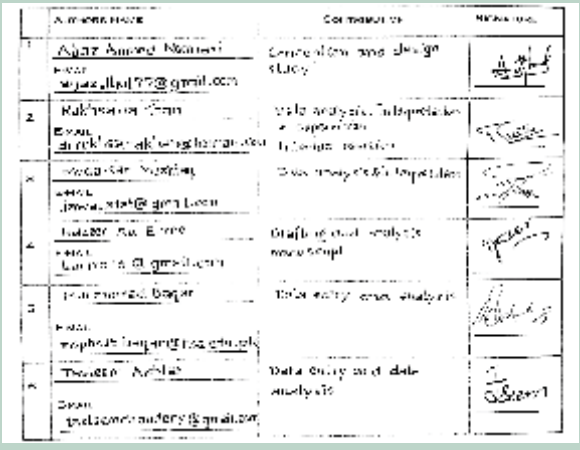

Submitted for publication: 16.02.2018

Accepted for publication: 10.11.2018
After Revision