

Prevalence and sociodemographic factors associated with stunting and thinness in adolescent females: A cross sectional study from Pakistan

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Abstract

Objective: To explore the prevalence and socio-demographic factors associated with stunting and thinness in adolescent females.

Method: The survey-based cross-sectional study was conducted in randomly selected schools of the Kotri Taulka of Jamshoro District in Sindh, Pakistan, from October to December 2019, and comprised healthy female adolescents aged 10-19 years. Data about demographic and anthropometric factors was collected using a pre-tested questionnaire. Data was analysed using SPSS 23.

Results: There were 393 subjects with mean age 14.93 ± 2.18 years, mean weight 45.9 ± 8.85 kg, and mean height 151.6 ± 6.25 cm. The prevalence of stunting and thinness was 127 (32.31%) and 42 (10.68%) respectively. Stunting was more frequent in participants with father's income ≤ 15000 Pak rupees ($p < 0.05$).

Conclusion: The increased prevalence of stunting and thinness in adolescent females needs to be addressed by the policy-makers.

Keywords: Stunting, Thinness, Adolescent, Females, Sindh, Pakistan. (JPMA 72: 471; 2022)

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Introduction

Nutrition plays a very important role in survival, growth and development at all stages of life. Human beings pass through different phases of age, including childhood, adolescence, adulthood and late adulthood.¹ Adolescence is a formative time, which determines the future health largely depending on nutritional sufficiency. Inadequate nutrition delays the physical and mental growth of the adolescents irrespective of gender. However, in some cultural settings, female adolescents are vulnerable to malnutrition. Prevalence of malnutrition is higher, irrespective of age and gender, but it is more common in female adolescents.² Higher malnutrition in females has been associated with a gender bias particularly common in under-developed countries.³ Very few studies in Pakistan have assessed the level of malnutrition in children even though literature has shown that adolescent females face multiple nutrition-related problems, including thinness and stunting⁴ anaemia⁵ and vitamin D deficiency.⁶ Previous studies on nutritional assessment in the Sindh province of Pakistan have focused on the under-5 age group.⁷⁻⁹ However, no previous focus on adolescent females.

According to the United Nations Children's Fund (UNICEF), the progress to reduce the number of thin and anaemic

adolescent girls has been slow. The UNICEF data about South Asian adolescent girls showed that 11% of girls aged 15-19 years were stunted, 39% were thin and 55% were anaemic.¹⁰ Poor nutrition is a hindrance in the way of South Asian girls to achieve proper growth and development. A small percentage, ranging 20-40%, meet their recommended dietary intake.¹⁰ A study observed that 27% of adolescent girls were stunted.¹¹ Another study found that the prevalence of stunting was higher in adolescent females (58.4%) than adolescent males (48.7%), and that factors, such as income, education level and sanitation, were associated with stunting and thinness.¹² A study summarising the data from the Bangladesh Demographic and Health Survey (BDHS) showed that in teenaged mothers, the prevalence of thinness was 32%.¹³

The increase in the prevalence of stunting and thinness in population is a matter of concern for all South Asian countries, including Pakistan, which is a developing country facing multiple challenges, like lack of access to healthcare facilities, socio-economic inequalities and increasing poverty.^{14,15} According to the United Nations Development Program (UNDP) in Pakistan, 4 out of 10 people live under multidimensional poverty 55.6% in rural areas and 9% in urban areas. Of this 55.6%, about 43% of the population of Sindh is living under multidimensional poverty.^{16,17}

The current study was planned to assess the prevalence of malnutrition and its associated socio-demographic factors in female adolescents.

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Subjects and Methods

The survey-based cross-sectional study was conducted in randomly selected schools of the Kotri Taulka of Jamshoro District in Sindh, Pakistan, from October to December 2019 after approval from the ethics review committee of the University of Sindh, Jamshoro.

The Jamshoro District is located on the right bank of Indus River, and Kotri is its headquarter. According to the census of 2017, the population of the district was 993,142.¹⁸ Kotri is an industrial and education city. Community livelihood depends on certain sectors, including services, industries, small business and daily-wage labour. The residents of Kotri are facing problems, such as poverty and other socio-economic inequalities.

For the purpose of the current study, the Director of Middle and High Schools as well as Director Colleges of Hyderabad were contacted permission to collect data. Meetings were subsequently held with the District Education Officer of Jamshoro to provide information and permission letters to access middle, high and higher secondary schools. The principals of the institutions were briefed about the study and were introduced to the well-trained team of data collectors from the Department of Physiology, University of Sindh, who subsequently interacted with students from class VI to class XII. The potential participants were briefed about the objectives of the project and written informed consent was obtained from all the participants who were aged >18 years, while written informed consent for participants aged <18 years was obtained from their parents.

According to census report 2020, the population of Kotri is 437,561.¹⁹ Open-Epi version 3 was used to calculate the sample size with 50%±5 of expected outcome at 95% confidence interval (CI) and with design effect 1 to ensure precision.²⁰

Out of the 15 public-sector girls schools in Kotri, 5 were randomly selected for data collection (Figure 1). Adolescent females with any medical condition, like frequent episodes of diarrhoea, fever, vomiting, physical disabilities, menstrual abnormalities and those on medication due to any other diseases were excluded. Healthy adolescent females aged 11-19 years and permanent residents of the studied area were included.

Demographic and anthropometric data was collected using a pre-tested questionnaire that included age, father's income, parents' literacy profile, and family size.²¹⁻²³ The questionnaire was translated into Sindhi and Urdu languages, and it was completed during interviews with the subjects by the data-collectors. Anthropometric

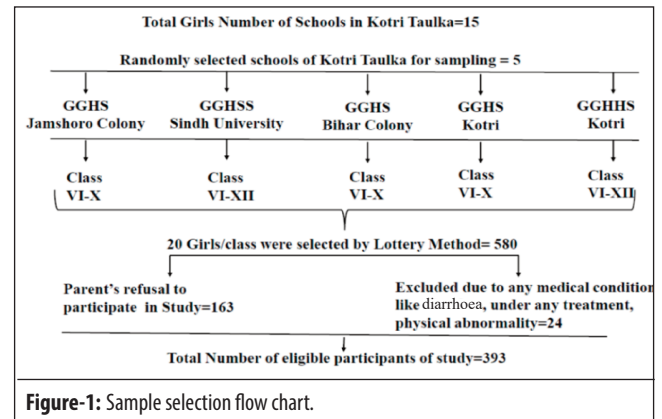


Figure-1: Sample selection flow chart.

measurements, including weight and height, were calculated. Omron scale (Model No. BF511) was used to measure the weight. Height and weight were measured to the nearest 0.1 cm and 0.1 kg respectively. Participants with Z score -2 and -3 were considered moderately and severely stunted respectively. Similarly, the participants with Z score -2 and -3 were considered moderately and severely thin.²⁴

The Z score and percentile of height for age and body mass index (BMI) for age were calculated using the World Health Organisation (WHO) Anthroplus software.²⁵ The data was processed using Microsoft Excel 2013 and data was analysed using SPSS 23. Mean, standard deviations, frequencies and percentages were calculated as appropriate. Chi-square test and binary logistic regression were used accordingly. $P < 0.05$ was considered significant.

Results

Of the 580 girls approached, 393 (67.75%) formed the final sample. The mean age was 14.93 ± 2.18 years, mean weight was 45.9 ± 8.85 kg, and mean height was 151.6 ± 6.25 cm. In the age group 11-13 years, the mean Height for Age Z score (HAZ) compared to -1.6 ± 1.2 in those aged 14-26 years and -1.6 ± 1.06 in those aged 17-19 years (Table 1). Age group-wise percentile distribution of the data was also noted, and similar distribution of data was done for BMI for Age Z Score (BAZ) (Table 2).

Overall prevalence of stunting was found in 127 (32.31%) subjects; 93 (23.66%) moderately stunted and 34 (8.65%) severely stunted. (Table 3, Figure 2). Overall prevalence of thinness was 42 (10.68%); 34 (8.65%) moderately thin, and

Table-1: Age-wise distribution and mean values of Weight, Height, HAZ and BAZ scores of adolescent females.

Age in years	#Samples	Weight kg (Mean±SD)	Height cm (Mean±SD)	HAZ Score (Mean±SD)	BAZ Score (Mean±SD)
11-13	104	35.6 ± 8.49	142.3 ± 9.58	-1.3 ± 1.26	0.6 ± 1.15
14-16	158	42.9 ± 9.4	149 ± 6.7	-1.6 ± 1.2	-0.4 ± 1.2
17-19	131	45.9 ± 8.85	151.6 ± 6.28	-1.6 ± 1.06	-0.9 ± 1.85

SD: Standard deviation, HAZ: Height for Age Z score, BAZ: Body mass index for Age Z score.

Table-2: Age-wise distribution of percentile of adolescent females.

Age (year)	Sample n (%)	HAZ percentile			BAZ percentile		
		15th n (%)	15th-85th n (%)	>85th n (%)	15th n (%)	15th-85th n (%)	>85th n (%)
11-13	104 (100)	64 (61.5)	36 (34.6)	2	36 (34.6)	57 (54.8)	11 (10.5)
14-16	158 (100)	123 (77.8)	35 (22.1)	0	57 (36)	90 (56.9)	11 (6.9)
17-19	131 (100%)	97 (74)	34(25.9)	0	56 (42.7)	63 (48)	9 (6.8)

HAZ: Height for Age Z score, BAZ: Body mass index for Age Z score.

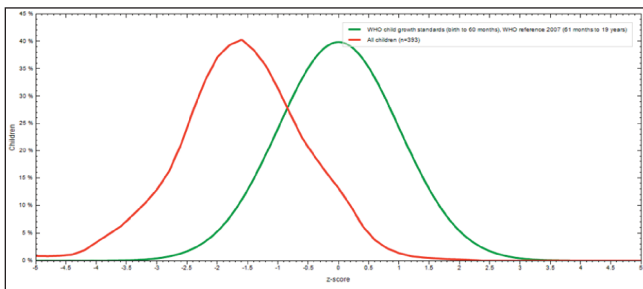


Figure-2 A: The comparison of height for age.

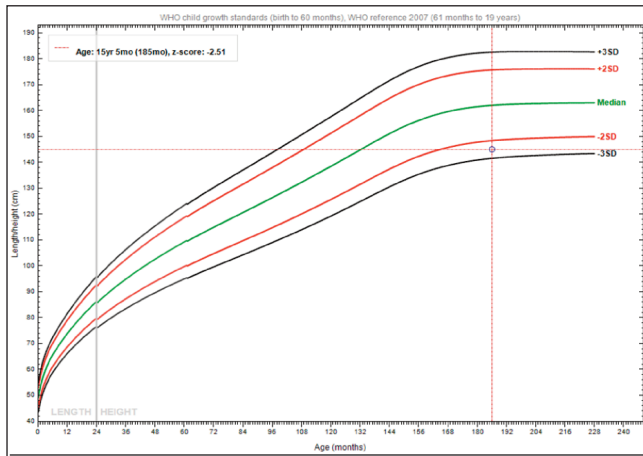


Figure-2 B: Comparison between a representative sample of moderately stunted participants.

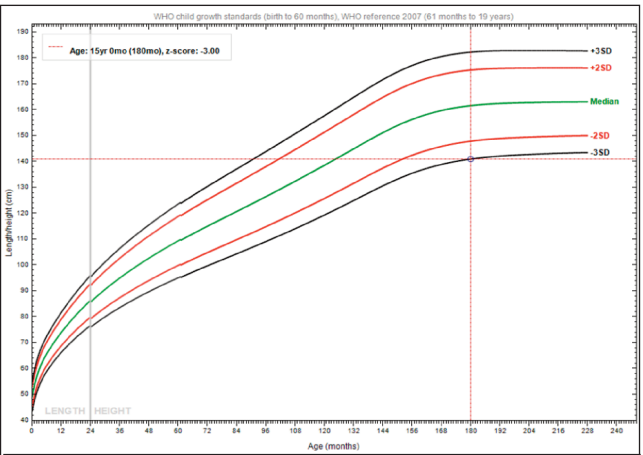


Figure-2 C: Comparison between a representative sample of severely stunted participants.

8(2.03%) severely thin (Figure 3.)

Among the socio-demographic factors, stunting was more frequent in participants with father's income ≤ 15000 Pak rupees (PKR) ($p < 0.05$) (Table 4). In context of thinness, groups based on number of siblings and family size showed a clear trend though not significant ($p > 0.05$).

Table-3: Overall prevalence of stunting in adolescent females based on Z score.

Factor	Stunting n (%)	Thinness n (%)
Normal Z score ≥ -1.99	266 (67.7)	351 (89.3)
Moderate stunting Z score ≤ -2	93 (23.7)	34 (8.6)
Severe Stunting Z score ≤ -3	34 (8.6)	8 (2)

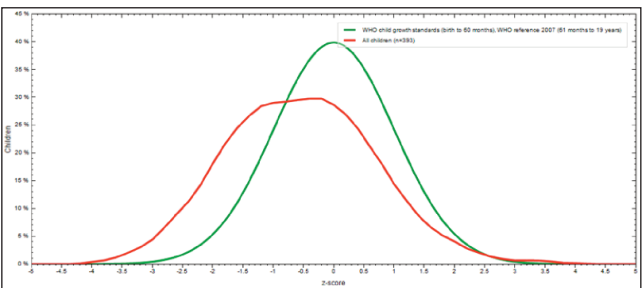


Figure-3 A: Comparison of body mass index (BMI) for age.

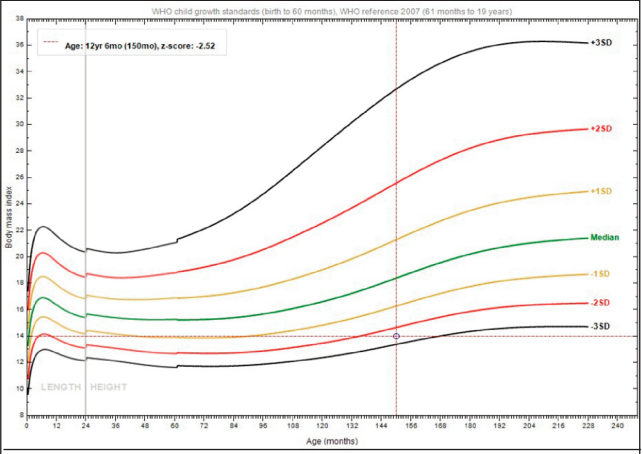


Figure-3 B: Comparison between age and body mass index (BMI) in a representative sample of moderately thin participants.

Multivariable analysis showed that higher age and less income significantly contributed to stunting (Table 5). However, thinness showed no significant association with socio-demographic factors (Table 6).

Discussion

Pakistani population is facing problems of poverty and inflation. Marginalised areas lack industries and people do

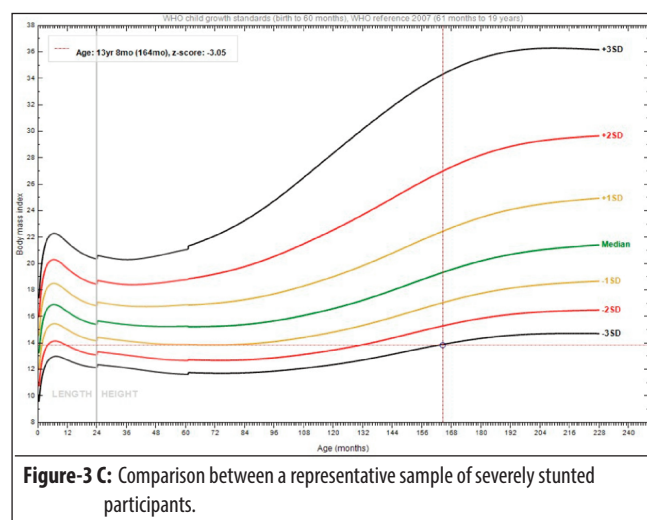


Table-4: Socio-demographic factors associated with stunting and thinness in adolescent females.

Factor	Sample	HAZ score ≥ -1.99	HAZ Score ≤ -2.00	Chi square p -value	BAZ score ≥ -1.99	BAZ Score ≤ -2.00	Chi square
Age (years)							
11-13	104 (100%)	77 (74.03%)	27 (25.96%)	$\chi^2=2.23$	93 (89.42%)	11 (10.57%)	$\chi^2=0.002$
13-16	158(100%)	104 (65.85%)	54 (34.17%)	$p=0.26$	141(89.24%)	17 (10.75%)	$p=0.99$
17-19	131(100%)	85 (64.88%)	46 (35.11%)		117 (89.31%)	14 (10.68%)	
Father Income							
≤ 15000 PKR	137	81 (59.12%)	56 (40.87%)	$\chi^2=7.04$	120 (87.59%)	17 (12.40%)	$\chi^2=0.65$
>15000 PKR	256	185 (72.26%)	71 (27.73%)	$p=0.008$	231(90.23%)	25 (9.76%)	$p=0.41$
Siblings							
$\leq$ Four	194	137 (70.61%)	57 (29.38%)	$\chi^2=1.58$	177 (91.23%)	17 (8.76%)	$\chi^2=1.48$
$>$ Four	199	129 (64.82%)	70 (35.17%)	$p=0.21$	174 (87.43%)	25 (12.56%)	$p=0.23$
Family Type							
Nuclear	259	175 (67.56%)	84 (32.43%)	$\chi^2=0.05$	233 (89.96%)	26 (10.03%)	$\chi^2=0.33$
Joint	134	91 (67.91%)	43 (32.08)	$p=0.94$	118 (88.05%)	16 (11.94%)	$p=0.56$
Family Size							
≤ 10	131	89 (67.93%)	42 (32.06%)	$\chi^2=0.006$	121 (92.36%)	10 (7.63%)	$\chi^2=1.91$
>10	262	177 (67.55%)	85 (32.44)	$p=0.93$	230 (87.78%)	32 (12.21%)	$p=0.16$
Father Education							
Illiterate	75	50 (67.66%)	25 (33.33%)	$\chi^2=0.44$	65 (86.66%)	10 (13.33%)	$\chi^2=0.68$
Literate	318	216 (67.92%)	102 (32.07%)	$p=0.83$	286 (89.92%)	32 (10.06%)	$p=0.41$
Mother Education							
Illiterate	181	122 (67.40)	59 (32.49%)	$\chi^2=0.12$	160 (88.39%)	21 (11.60%)	$\chi^2=0.29$
Literate	212	144 (67.92%)	68 (32.07%)	$p=0.91$	191(42.92%)	21 (9.90%)	$p=0.58$

HAZ: Height for Age Z score, BAZ: Body mass index for Age Z score.

Table-5: Multivariable analysis of stunting in adolescent females.

Variables in the Equation	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Age (year)	0.113	0.051	4.843	0.028	1.12	1.012	1.239
Siblings	-0.055	0.079	0.499	0.48	0.946	0.811	1.103
Siblings	-0.491	0.353	1.936	0.164	0.612	0.307	1.222
Family type	0.039	0.291	0.018	0.893	1.04	0.588	1.839
Family size	-0.003	0.026	0.012	0.913	0.997	0.947	1.05
Father education	-0.128	0.298	0.185	0.667	0.879	0.49	1.578
Income	-0.703	0.239	8.636	0.003	0.495	0.31	0.791
Mother Education	-0.085	0.232	0.134	0.714	0.919	0.583	1.446
Stunting	-1.381	1.013	1.858	0.173	0.251		

CI: Confidence interval

not have many employment opportunities. The storm of inflation has affected the lives of common people.^{26,27} According to the World Bank assessment in 2016 taking US\$1.90 per day as the cut-off, 52% of the population of Pakistan live below the line of poverty.¹⁷

Malnutrition has been reported higher in all age groups, but it is more common in adolescent females.^{3,28-30} Several studies have previously reported a number of factors associated with an increased prevalence of malnutrition in adolescent age group, like under-nutrition, menstrual disorders and other socio-demographic factors.^{31,32} Socio-demographic factors include income, siblings, family size and parental education.^{13,28,29,33} Adolescence is an important age group as it comprises formative years.

Finally the current study, to the best of our knowledge, is the first on adolescent female nutritional assessment in the entire country. UNICEF has reported that prevalence of stunting in South Asia is 11%, but this study found stunting to be nearly three times higher at 32.31% in adolescent females.¹⁰ A similar trend was reported by studies done in India,²⁸ Bangladesh³⁴ and Nepal.³⁰

The current study noticed a considerable, though not significant, trend in terms of age group and the number of siblings. The age group-wise data showed that compared to early adolescence, the prevalence

Table-6: Multivariable analysis of thinness in adolescent females.

Variables in the Equation	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Age	-0.048	0.076	0.402	0.526	0.953	0.821	1.106
Siblings	-0.16	0.127	1.591	0.207	0.852	0.665	1.092
Siblings	-1.127	0.532	4.488	0.034	0.324	0.114	0.919
Family type	0.709	0.414	2.936	0.087	2.033	0.903	4.576
Family size	-0.089	0.048	3.418	0.064	0.915	0.833	1.005
Father education	-0.641	1.106	0.336	0.562	0.527	0.06	4.603
Income	0.11	0.421	0.069	0.793	1.117	0.49	2.546
Mother Education	-0.277	0.353	0.618	0.432	0.758	0.379	1.513
Age	0.059	0.348	0.029	0.864	1.061	0.536	2.101
Thinness	0.657	1.498	0.192	0.661	1.928		

CI: Confidence interval

of stunting was higher in middle and late adolescence. Such a trend was also reported from Bangladesh where the prevalence of stunting was found to be increasing with age.²⁹ Comparatively, higher prevalence of stunting in middle and late adolescent females indicate an increased demand for the nutrition to achieve proper physical development. In addition, the other possible explanation is the onset of menstrual cycle, which might cause an increase in blood-loss.^{35,36} The current study found that stunting was significantly associated with factors, such as low income status, and previous studies have also reported similar findings.^{12,13} If income inequalities are reduced in vulnerable populations, stunting can be eradicated in risk groups, including female adolescents. It was also noted that there was a trend of increased prevalence of stunting in adolescent females having more than four siblings. Increased number of siblings have also been associated with increased prevalence of stunting in several other studies.^{11-13,30}

The prevalence of thinness was 10.63% in the current study. The trend, though statistically non-significant, showed that the prevalence rate of thinness was higher in adolescent females with family size >10 and siblings >4. The finding is also in agreement with previous reports.^{11-13,30,37}

In the light of the findings, it is recommended that federal and provincial governments in Pakistan should immediately start in government primary and secondary schools the proposed subsidy programme of 'A Glass of Milk'.³⁸

Also, the government should put more efforts into creating more jobs to reduce income inequalities. Where feasible, kitchen gardening should be made mandatory for the general population and the district agriculture extension department administration be given the role of monitoring and sharing progress reports on a monthly basis with government. Finally, there should be government and academia linkages to monitor and evaluate the

effectiveness of projects aimed at reducing stunting and thinness.

Conclusion

The prevalence of stunting in adolescent females was high and was associated with low income. The prevalence of thinness was relatively lower. The increased prevalence of stunting and thinness in adolescent females needs to be addressed by the policy-makers to enable Pakistan to meet nutrition and health-related sustainable development goals (SDGs) set by the United Nations.

Abbreviations: WHO: World Health Organization, UNICEF: United Nation's Children Emergency Fund, BDHS: Bangladesh Demographic and Health Survey, BAZ: BMI for age Z score, HAZ: Height for age Z score.

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