

Pervasiveness of Malnutrition among Selected School-going Adolescents in Hyderabad District, Sindh, Pakistan.

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Abstract

This research study aims to find out the pervasiveness of malnutrition & its associated factors in school-going adolescents in six selected schools of district Hyderabad with age range 10-16 years. Previous data did not describe nutritional research on adolescence phase. A cross-sectional study was designed by selecting 1009 children including 478 boys and 531 girls during 2018–2019 by lottery method. Children below or above 10-16 year were excluded. Socio demographic & dietary data was collected using Questionnaire. Weight, height and middle upper arm circumference (MUAC) were measured by growth chart, MUAC tape, and bathroom scale. Statistical analysis was done by using World Health Organization (WHO) growth measuring software ‘Anthroplus 2007’ that calculates the Z-Score and Percentile. Z-Score < 2 is considered as stunted or underweight child while the children below 3rd percentile are considered as stunted and underweight. SPSS version 2007 was used to calculate Chi-Square and p-value. Chi-Square gives the difference of malnutrition rate in children whereas p-value <0.05 significant difference. This research shows that overall pervasiveness of underweight in the adolescents was high 16.8% than that of stunting 14.3%. However, Stunting was higher in male adolescents 15.1% than the female adolescence 13.8% similarly male adolescents had high underweight 19.3% than female adolescence 14.7%. However, the pervasiveness of stunting was higher in late adolescence 15.5% then early adolescent 9.7% while early adolescent had high underweight 27% then late adolescent 14.4%. This study concluded that pervasiveness of stunting & underweight was higher in male as compared to female adolescents.

Keywords: Malnutrition, stunting, underweight, male adolescent, female adolescent, Hyderabad, Pakistan.

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Introduction

Malnutrition is a significant growing health issue of this era, globally. It has profound effects on the people residing throughout the world at alarming rate. Malnutrition is defined as inadequate ingestion of certain essential nutrients that cannot fulfill the body's energy demand leading to impaired physical growth in term of weight & height that can be corrected by better feeding [1-3]. It is common cause of mortalities and morbidities in the developing countries including Pakistan. Malnutrition is an intergenerational cycle [4, 5] affecting all age group; however, it is highly pervasive in adolescents. Adolescence is unique interventional, transitional phase between childhood and adulthood that was highly ignored in previous nutritional studies. According to World Health Organization this formative phase ranges between 10-19 year [6] and further categorized into three distinct phase early range between 10 and 14 years, middle range between 15 and 17 years, & late phase range between 18 and 20 years [7]. Lack of healthy and balanced



diet during adolescence fails to fulfill their increased nutritional demand and make them most vulnerable malnourished group of society [8]. This nutritional inadequacy results in different forms of malnutrition. Since last decades, various reports are witness that the pervasiveness of malnutrition varies in different periods in Asian adolescents.

It is estimated that 1 million population of developing countries is malnourished among them 70% population is dweller of Asia. The most recent United Nations Children's Fund (UNICEF) report 2025 evaluated that 77 million children and adolescent in Middle East suffered from any form of malnutrition among them 10.6 million are facing thinness and 1 in 10 adolescents are underweight. According to world hunger report 2024 about 2.3 billion people were malnourished. UNICEF, WHO & World Bank Report on malnutrition estimated that 733 million people faced hunger in 2023. However, 2023 world hunger report itself stated that 2.33 billion people suffered from food inadequacy which is higher in compression with hunger report of 2019 that was estimated as 383 million due to poly-crisis indicating the high pervasiveness of malnutrition. In 2022, 690 million children and adolescents were malnourished globally. Global Nutritional Report 2018 estimated one in nine people faced malnourishments; among the total malnourished children 149 million children were stunted. State of Food Security in the world report estimated that 520 and 515 million people were malnourished in 2016 & 2017 respectively. Further, According to World Health Organization (WHO) Global Health observatory data pervasiveness of malnutrition in adolescents was estimated 1.2 billion in 2015.

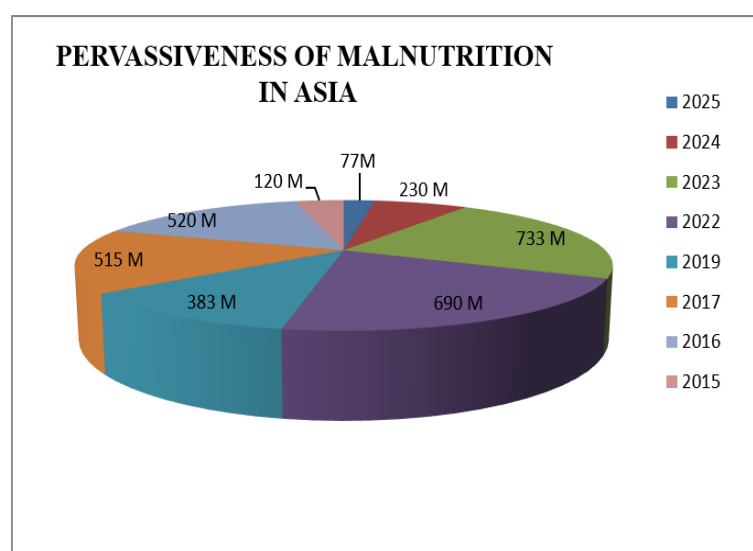


Figure 1. Pervasiveness of malnutrition in Asia

Source: Data compiled from joint reports published by the United Nations Children's Fund (UNICEF), World Health Organization (WHO), Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), World Food Program (WFP), and *The State of Food Security and Nutrition in the World* reports.

Global Food Security Index (GFSI 2019) showed particularly Pakistan is facing high food insecurity or malnutrition as compare to other Asian countries [9, 10]. According to United Nations Development Programme (UNDP) report 2019, Pakistan is 5th malnourished country, where four out of ten inhabitants suffered from multi-dimensional poverty which is leading cause of malnutrition. However, malnutrition is influenced by various factors including political and financial instability of nations, pandemics, climatic conditions, disasters and the social inequalities prevailing in Pakistan. Nutritional and pathological factors also contribute to malnutrition [11-22]. Malnutrition not only effects cognitive, psychomotor skills and educational performance [23-26], but also badly restricts the physical growth. Height is heritable trait [27-28] and indicator of chronic malnutrition [4, 29] restricted physical growth in term of height called Stunting which is define as low height for age (HAZ) or height < 2 SD of the reference standards



set by WHO with respect to the age [4]. However, Underweight 2nd indicator of under nutrition is defined as Low weight for age (WAZ) or Weight < 2 SD of the WHO standardized set points is an acute malnutrition and talks about recent nutritional picture of an individual [4] with BMI less than 18.5% at a particular age group [30]. The aim of this study is to assess the nutritional status of adolescent to fulfil gap of past research in Sindh province of Pakistan particularly in district Hyderabad. As to ensure healthy and successful future of Pakistani adolescents firstly, it is indispensable to evaluate the pervasiveness of malnutrition. Secondly, various nutritional interventional programs can be introduced so that millennium development goal (MDG), sustainable development goal (SDG) 2030 and WHO and UNICEF 2030 nutritional target can be achieved.

Methods

This cross-sectional study was conducted from August 2018 to May 2019 among 41337 school of Distract Hyderabad, Sindh, Pakistan. Only six schools were selected from different educational sectors including government, semi government and private system. Total 1009 adolescent were selected belong to age group 10-16 years through the lottery method in which adolescent boys were 478 and adolescent girls were 531 to find out the pervasiveness of different indicators of malnutrition particularly stunting and underweight. According to United Nations (UN) criteria, adolescents below 14 years of age were considered as early adolescents and adolescents above the 14 years were characterized as late adolescents [10]. 3rd National & Nutritional Examination survey (NHANES) was used to formulate the required questionnaire to collect the data related to socio-demographic information and anthropometric measurement. Weight was measured with barefoot and light cloth in kilogram by using portable weighing machine in kg. To measure middle upper arm circumference, find midpoint between olecranon and acromion after binding the left upper. MUAC tape was used to measure the middle upper arm circumference. Height was measured by using growth chart. Anthropometric data was scrutinized by using WHO anthroplus 2007. To attain the statistical analytical approach, SPSS version 1.0 was used. For making compression in different related variables chi-square test was done. Chi-square and p value were expressing the results where the significant level was set at $p < 0.05$.

Results

The study performed in selected 1009 subject or population of schools of district, Hyderabad, Sindh, Pakistan, among them 47% (n=478) were males adolescents and 52% (n=531) were females. Table 1 shows socio-demographic information. This study shows that overall pervasiveness of underweight in the adolescents was high 16.8% than that of stunting 14.3% (Figure 2). Similarly, overall pervasiveness of underweight was found to be higher 24.1 % than that of stunting 17.4% in percentile (Figure 3). Stunting in late adolescents was higher 15.5% & 18.7% (n=126) while in adolescents of early age showed less pervasiveness 9.7% & 12.2% by using WHO set standards in z-score and 3rd percentile (n=18, chi-square=4.37, $p=0.037$) (Figure 4). Similarly, underweight in late adolescents was lower 14.4% & 21.5% (n=811) than that of early adolescents which was found to be 27% & 35.2% (n=196) in z-score and 5th percentile (chi-square=17.9, $p=0.000$) (Figure 5). In comparison of gender studies male adolescents were found to be more stunted 15.1% & 18.7 % (n=72) then female adolescents 13.8 % & 12.2 % (n=73) in z-score and percentile (Figure 6). Similarly, male adolescents were found to be more underweight 19.3 % & 35.2% (n=72) then female adolescents 14.7% & 21.25% (n=78) in z-score and percentile (chi-square=3.73, $p=0.05$) (Figure 7). Subjects having more siblings or belong to increase family size none significantly associated with stunting. Low-income group was more stunted (n=24, 16.4%) then the well economic group (n=120, 14%, chi-square=0.628, $p=, 428$) (Table 2). Subjects with more siblings (n=119) had high pervasiveness of underweight 17.5% then the group having low sibling (n=52, 15.6%), (chi-square=0.614, $p=0.43$). Subjects belong to



increase family size were more underweight (18.2%, n=125) then low family size (14%, n=45) (chi square 2.78, p=0.095). Subjects belong to low economic class was more underweight (30.8%, n=45) then the well economic group (14.5%, n=125), (chi-square=23.5, p=0.000) (Table 3).

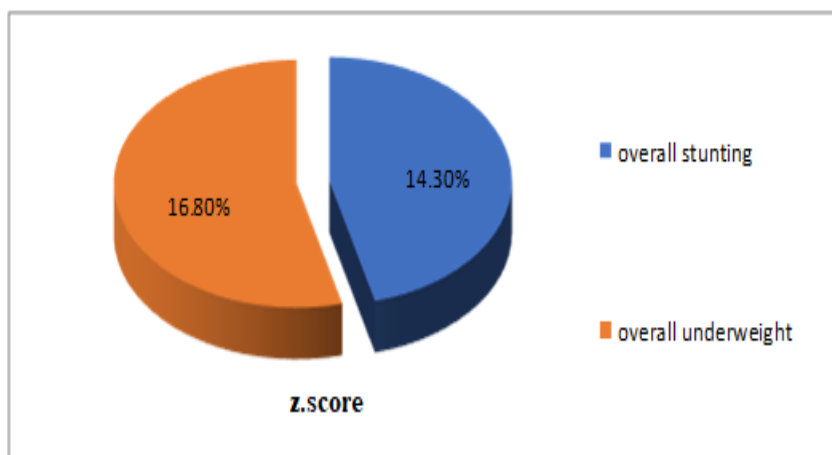


Figure 2. Overall comparison of pervasiveness of stunting and underweight in z-score.

Table 1. Socio-demographic data of participants.

Variables	Numbers	Percentage %
Male	478	47.36
Female	531	52.64
Early adolescents	197	19.5
Late adolescents	812	80.4
Sibling ≤ 3	335	33.2
Sibling ≥ 3	674	66.7
Family size ≤ 5	323	32.01
Family size ≥ 5	686	67.9
Income ≤ 15000	148	14.6
Income ≥ 15000	861	85.3

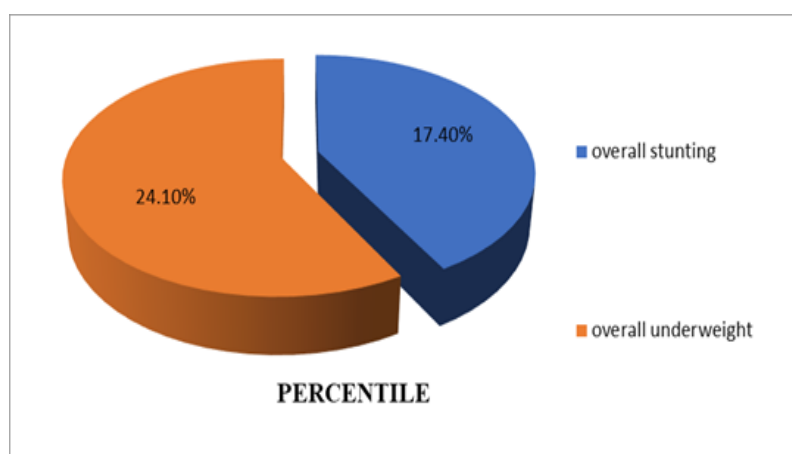


Figure 3. Overall comparison of pervasiveness of stunting and underweight in percentile.

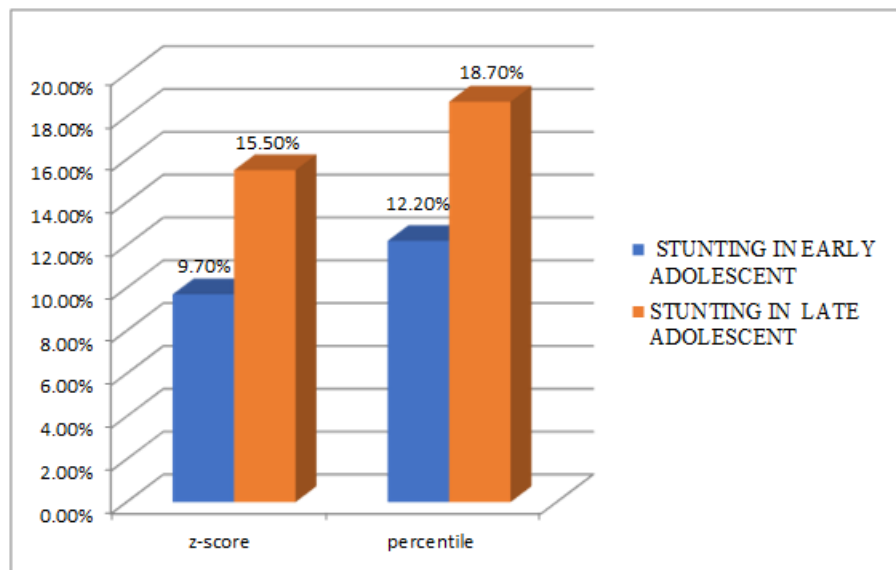


Figure 4. Pervasiveness of stunting in early and late adolescents in z-score and percentile

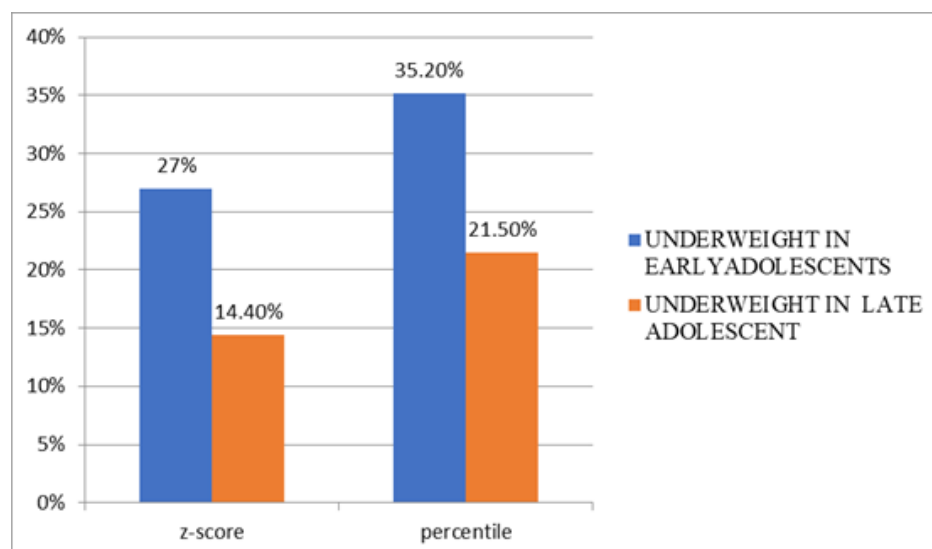


Figure 5. Pervasiveness of underweight in early and late adolescents in z-score and percentile.

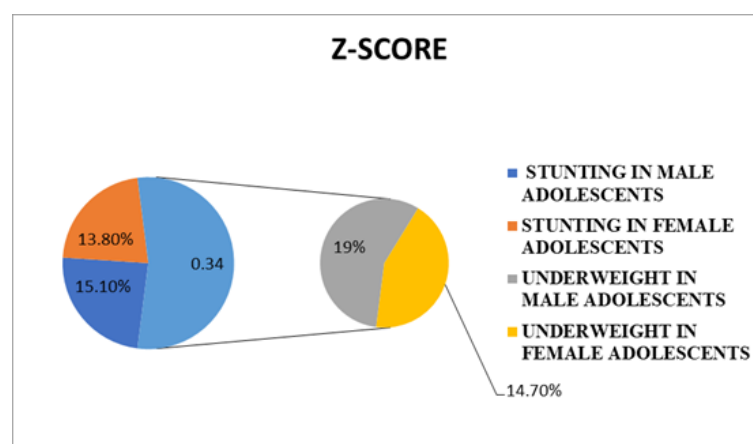


Figure 6. Gender wise pervasiveness of stunting underweight in z-score.

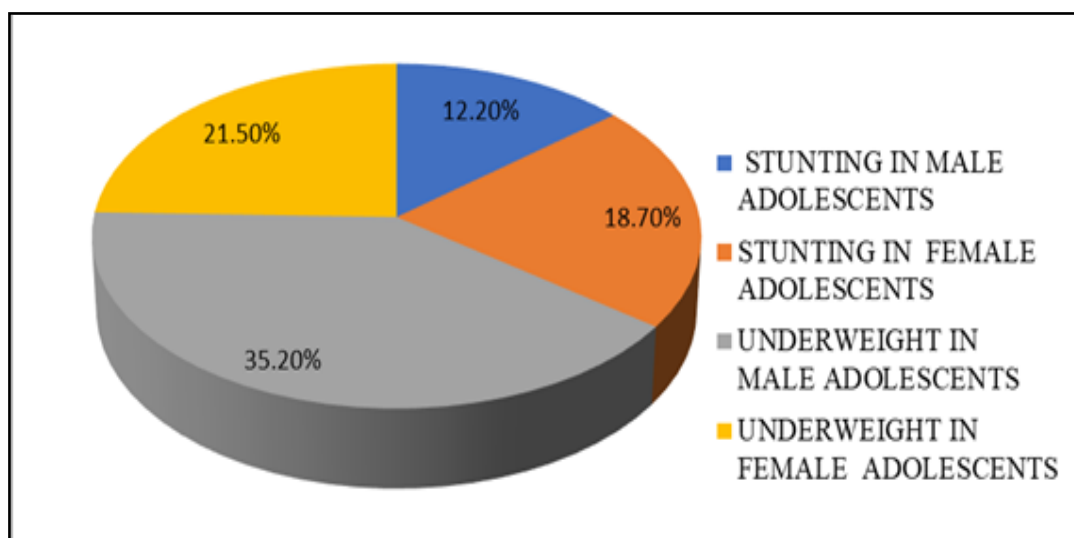


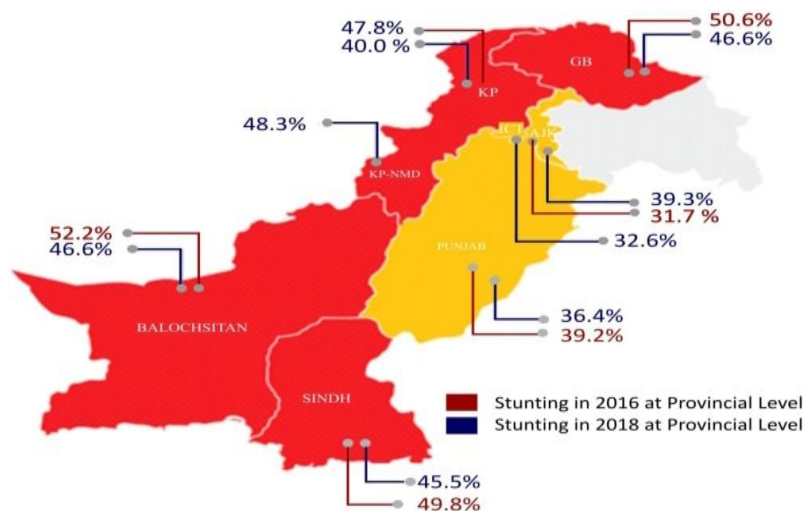
Figure 7. Gender wise pervasiveness of stunting underweight in percentile.

Table 2. Association of Socio demographic factor with stunting using < -2 Z-score

Variables	Normal		Stunted		χ^2	P-value
	N	%	N	%		
Gender						
Male	406	84.9	72	(15.1)	0.35	0.5
Female	458	86.2	73	(13.8)		
Age group						
Early adolescent	178	90.3	19	9.7	4.37	0.037
Late adolescent	686	84.5	126	15.5		
Siblings						
≤ 3	286	85.3	49	14.7	0.030	0.863
≥ 4	578	85.7	96	14.3		
Family member						
≤ 5	274	85.0	48	15.0	0.157	0.692
≥ 6	590	86.08	96	14.0		
Monthly income						
≤ 15000	123	83.6	24	16.4	0.628	0.428
≥ 15000	741	86.0	120	14.0		

Table 3. Association of Socio demographic factor with Underweight using Z score

Variable	Normal		Underweight		χ^2	P-value
	N	%	N	%		
Gender						
Male	385	80.7	92	19.3	3.73	0.05
Female	452	85.3	78	14.7		
Age group						
Early adolescent	143	73.0	53	27	17.9	0.000
Late adolescent	694	25.6	117	14.4		
Siblings						
≤ 3	282	84.4	52	15.6	0.614	0.43
≥ 3	555	82.5	118	17.5		
Family member						
≤ 5	276	86.0	45	14.0	2.78	0.095
≥ 5	560	81.8	125	18.2		
Income						
≤ 15000	103	69.2	45	30.8	23.5	0.000
≥ 15000	736	85.5	125	14.5		



Prevalence of Stunting in 2016 & in 2018 by Suleman Choudary time News November 2020 and NNS 2018 Respectively at Provincial level.

Figure 8. Pervasiveness of stunting in pakistan at provincial level



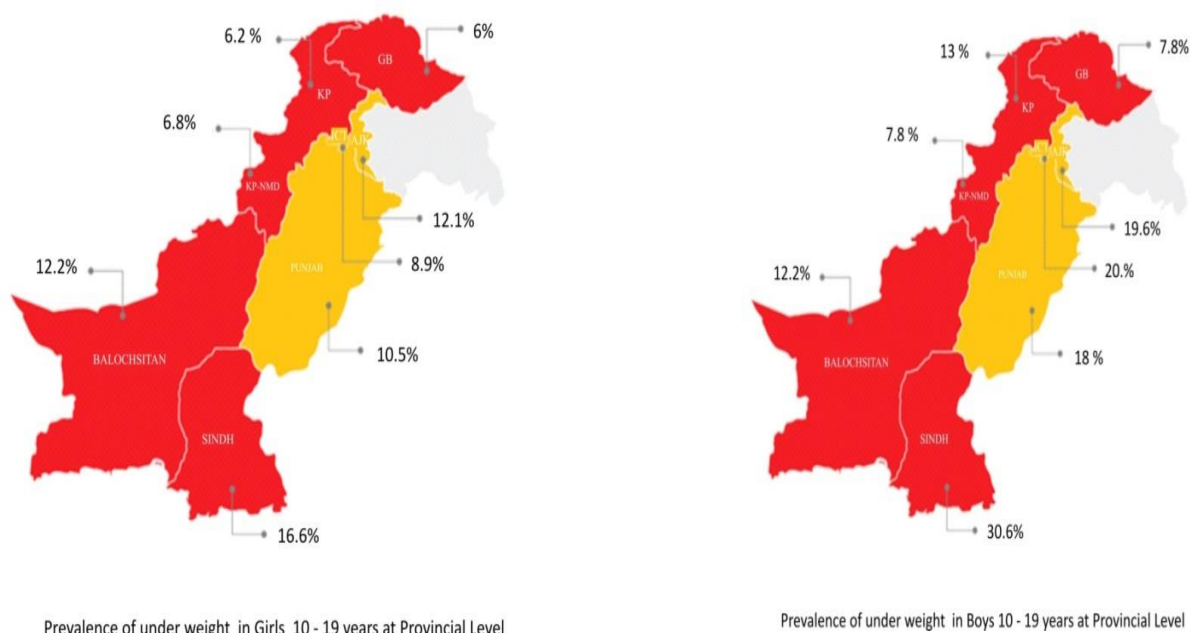


Figure 9. Pervasiveness of underweight in girls (a) and boys (b) in Pakistan at provincial level.

Discussion

Malnutrition is serious growing health concern in the developing countries especially in Asia including Pakistan. Globally, it affects all age group specially children under 5 and adolescents. World hunger report estimated, 690 million people were malnourished worldwide in 2020 while its rate declined 15% to 8.9% from 2004-2019 [6]. FAO also reported declined trend of malnutrition in Asia, 17.3 in 2001, 11.4 in 2017, 8.4% in 2019 (36 1. 3 million) however during COVID-19, it again increased to 9.9 (418 million) in 2020 (Food inflation and food and nutrition security situation in Asia). Similarly Global Hunger Index (GHI) 2021 reported highest pervasiveness of malnutrition 59.5% in Somalia, an Asian country [31]. United nation of food and agriculture organization estimated that 37.5 million, 24% of total population suffering malnourishment in Pakistan [32]. Map showing malnutrition prevalence in different area of Pakistan.

This research shows male gender is highly susceptible to malnutrition having high stunting & underweight pervasiveness as compare to female gender. Socio-demographic health survey 2012-13, global alliances of improved nutrition 2018 also found that male were more stunted and underweight. No one knows the exact facts behind this but it is be hypothesized that usually male are more sensitive as with the growing age they had the various responsibilities on their shoulders and use to exposed to different environmental stress. Late adolescent was more stunted in compression to early adolescents as with the growing age they divert towards junk food. Thus, they became more malnourished than the early adolescents. Further, the late adolescent phase is the growth ketchup phase and in case of inadequate nutrition in the past the adolescents show stunting in this age. The research also recruit that early adolescent was more underweight as early adolescence is transitional growth phase & influenced by hormonal changes that may cause mood swings & change in dietary habits.

This research shows stunting and underweight is directly proportional to socio-demographic factors particularly sibling family size while indirectly proportional to income. In other words, the current research manifested that food competition in the sample population with more siblings or increased family size among the low economic class cause high pervasiveness of different



indicators of malnutrition as they have to face competition for the healthy food. Previous studies or the literature review manifested that pervasiveness of the malnutrition particularly stunting is influenced by various factor especially economic status of the sample population [11-26].

Conclusion

This study concluded that overall pervasiveness of underweight is higher than the prevalence of stunting. However, pervasiveness of stunting & underweight was high in male adolescents than female adolescents. Among the selected age group late adolescents had higher stunting than early adolescents while early adolescents had significant pervasiveness of underweight than late adolescents. Furthermore, data from the various source manifested the decline trend in the pervasiveness of malnutrition since last decades however political instability, economic conditions and pandemic condition like COVID-19 hindered this progressive shift. Thus, there is a need to introduce more nutrition interventional programs to cope with this emerging situation of malnutrition in order to achieve “Sustainable Development Goal (SDGs) 2030.

Ethics Approval and Consent to Participate

Not applicable.

Human and Animal Rights

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and analysed during the current study are available from the corresponding author upon reasonable request.

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Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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