Association of Perceived Weight Status and Health-Related Quality of Life in Children and Adolescents: the Weight Disorder Survey of the CASPIAN- IV Study

Silva Hovsepian[1], *Mostafa Qorbani[2,3], Mohammad Esmaeil Motlagh[4], Mojgan Asadi[5], Armita Mahdavi Gorabi[6], Sahar Alirezayi[7], Hamid Asayesh[8], Neda Hani-Tabaei Zavareh[9], *Roya Kelishadi[1]

[1]Pediatrics Department, Child Growth and Development Research Center, Research Institute for Primordial Prevention of Non Communicable Disease, Isfahan University of Medical Sciences, Isfahan, Iran. [2]Non-Communicable Diseases Research Center, Alborz University of Medical Sciences, Karaj, Iran. [3]Endocrinology and Metabolism Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. [4]Department of Pediatrics, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. [5]Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. [6]Department of Basic and Clinical Research, Tehran Heart Center, Tehran University of Medical Sciences, Tehran, Iran. [7]Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. [8]Department of Medical Emergencies, Qom University of Medical Sciences, Qom, Iran. [9]Department of Public Health, Massachusetts College of Pharmacy and Health Sciences, Boston, Massachusetts, USA.

Abstract

Background: This study investigates the association of perceived weight status and health-related quality of life (HRQOL) in a representative sample of Iranian children and adolescents. *Materials and Methods:* In this study, 6-18-year-old students were selected from 30 provinces of Iran. Weight status and perceived weight status of students were determined by physical examination and using the validated questionnaire of the World Health Organization-Global school-based student health survey, respectively. The students' HRQL was evaluated by the Persian version of the Pediatric Quality of Life inventory (PedsQL™ 4.0TM 4.0) Generic Core Scales. *Results:* The participants consisted of 23,043 students with mean (standard deviation [SD]) age of 12.55(3.31) years. Underweight was significantly less prevalent than perceived underweight (30.8%vs 10.0%, respectively, P<0.001), whereas normal weight was significantly more prevalent than perceived normal weight (70.8% vs. 52.5%, respectively P<0.001). The mean total PedsQL™ score and its subscales in different categories of perceived weight did not have significant difference (P>0.05). After adjustment for age, gender, region, socio-economic status, physical activity, screen time, and body mass index (BMI), significant negative association was documented between perceived overweight and total score of HRQOL. School functioning was negatively associated with perceived overweight. Positive significant association existed between perceived overweight and psychosocial functioning. *Conclusion:* Our findings indicated that weight underestimation is the most common form of weight misperception in Iranian children and adolescents, which could be a cause of concern especially for obesity treatment and prevention programs. Furthermore, considering the negative association between weight overestimation and total HRQOL and school functioning, it is suggested that social standards and norms impacts on weight perception and consequently HRQOL in children and adolescents.

Key Words: Health related quality of life, Children, Iran, Weight.

Corresponding Author:

Mostafa Qorbani, Non- Communicable Diseases Research Center, Alborz University of Medical Sciences, Karaj, Iran AND Roya Kelishadi, Child Growth And Development Research Center, Research Institute for Primordial Prevention of Non-communicable Disease, Isfahan University of Medical Sciences, Isfahan, Iran.

E-mail: mqorbani1379@yahoo.com AND roya.kelishadi@gmail.com

1- INTRODUCTION

Heath-Related Quality of Life (HRQOL) is an important health issue that is used as a comprehensive and multidimensional concept for assessment of the impact of disease and health conditions on individuals' physical and mental health and social functioning (1, 2). The association between different diseases and HRQOL has been investigated in several studies in adult populations (3, 4). The U.S Center for Disease and Control and Prevention recommend assessing the interacting relationship for different age groups including children and adolescents (5). The importance of this issue has also been emphasized by some pediatricians (6-8). However, HRQOL could impact on different aspects of diseases management including, patients' wellbeing, as well as treatment outcomes. Weight disorders are of the most common disorders with increasing trend in different populations (9). The association between body mass index (BMI), and HRQOL among children and adolescents has been studied and different results have been reported (10-12). Some studies demonstrated significant associations of overweight or underweight status with HRQOL (13, 14), whereas some others did not show such an association (10-12), and there are still controversies in this regard. Recently, the concept of weight perception and misperception and its association with HRQOL among pediatric population has also been developed (15, 16).

The person's subjective appraisal about their weight status is defined as weight perception whichcould be affected by social and ethnic factors (17). Weight status misperception is defined as the difference between individuals' perception and their actual weight status based on their height and weight measurement, which could be presented as both weight underestimation and overestimation (18). The reported prevalence rate ofweight perception has a wide range of 20-50% in different communities. This rate varied in different societies according to their sociodemographic, ethnicity, and cultural characteristics (19-21). The rate of weight misperception was 50.8% among Iranian children and adolescents (22). It is documented that weight misperception is related to psychosocial health problems and weight control practice in children and adolescents with weight disorders (23, 24). More recent studies suggested that compared with measured weight status, weight perception is a stronger factor associated with children's wellbeing (25,26). Moreover, evidences indicated that weight misperception is associated with health risk behaviors in children and adolescents and targeting weight misperception in pediatric population could improve the achievement of healthy behaviors (27, 28).

The most important interventional field in this regard is weight disorders in children because it is a preventable disorder and effective interventional policies are fundamental in providing healthier lifestyle which consequently result in better prevention of weight disorders specially obesity (29, 30); while many studies have evaluated the relationship of weight status with HRQOL (10, 12, 31), but few studies are available worldwide about the association between perceived weight status and HRQOL in children and adolescents (26, 32). Thus, this nationwide study aimed to investigate the association of perceived weight status and health related quality of life in Iranian children and adolescents. Our results would be helpful for providing more effective preventative strategies for pediatric weight disorders.

2- MATERIALS AND METHODS

2-1. Study design and population

This nationwide school-based study was designed as a cross sectional study

and conducted as a part of the Weight Disorder Survey of a surveillance program entitled the Childhood Adolescence Surveillance and Prevention of Adult Non-communicable disease (CASPIAN- IV) study; details are published previously (33, 34).

2-2. Methods

Herein, the methods of current study are explained briefly. School students, aged 6-18 years, were selected randomly from rural and urban areas of 30 provinces of Iran. First, the list of schools was provided by the information bank of the Ministry of Education, and then by random sampling method, schools were selected from this list. The protocol of the study was designed based on the declaration of Helsinki (Seoul, 2008), and confirmed by relevant national and provincial regulatory organizations and regional ethics committees. Sampling in each province was performed based on student's place of residence (urban or rural) and level of education (primary and secondary) using the proportional to size methodand with equal sex ratio. This means that the number of boys and girls was the same in each province, and their ratio in urban and rural areas was proportional to the number of students in urban and rural areas. Similarly, the number of samples between different grades in urban and rural areas was divided according to the number of students in each grade. Achieving the desired number of samples was obtained using cluster sampling in each province with equal cluster sizes (34).

The objectives of the study and methods were described for all participants. They assured that participation in this study was voluntary and they had the right to withdraw from the survey. They also assured that all of their information and responses would remain confidential. After that, oral assent and written informed consent were obtained from selected students and their parents who accepted to participate in the study. Demographic and family- based characteristics of the students were recorded by trained researchers using the validated questionnaires of the CASPIAN IV study. Two sets of questionnaires were completed by students and their parents. The students' questionnaire was obtained from the translated and validated questionnaire of the World Health Organization- Global school-based student health survey (WHO-GSHS) (35). The validity and reliability of the translated version of the WHO_GSHS questionnaire was approved by an expert panel. They approved the face validity and in the phase of content validity assessment, the questions getting a score of more than 0.75 were affirmed to have appropriate content validity. Cronbach's alpha coefficient of the whole questionnaires was 0.97 and Pearson's correlation coefficient of the test–retest phase was 0.94, which confirmed the reliability of questionnaires (36).

Anthropometric measurements including weight and height of the students were conducted by trained healthcare professionals with light clothes and without shoes by using calibrated instruments. Weight was measured to the nearest 0.1 kg on a scale placed on a flat ground and subjects wearing light clothing and standing motionless and height were measured without shoes to the nearest 0.1 cm. BMI of each participant was calculated as weight (Kg) divided by height squared (m^2)(34). Weight status and perceived weight status of the students were determined by BMI categories and using the abovementioned validated questionnaire, respectively (34). Physical activity level was evaluated using the physical activity questionnaire for adolescents (PAQ-A), which is the validated, modified version of the physical activity questionnaire for children (PAQ-C).It is a self-administered questionnaire that records the subjects' exercise or

activities during leisure time, physical education period, after school, in evening and on weekends during a 7- day period. It is classified as low and high physical activity level by considering PAQ-A score of 1-1.9 and 2-5, respectively. The validity and reliability of the Persian version of the questionnaire were approved through a comprehensive national study among Iranian population (34, 37). Screen time (ST) was determined by asking the average time (hours per day) in weekdays and weekends that students spent watching TV, electronic games or leisure time computer use. Level of ST was classified as low (< 2hours per day) and high (>2 hours per day) (38). Socio-economic status of the families was estimated using the method of the Progress in the International Reading Literacy Study (PIRLS) (39,40). Socioeconomic status (SES) variables including parents' education and occupation, type of home (private/rental), school type (private/public), possessing private car, and having personal computer in home were used in the principal component analysis. Health-related QoL (HRQL) of the students was evaluated by using the Persian version of the Pediatric Quality of Life inventory (PedsQL™ 4.0™ 4.0) Generic Core Scales (41). Mean of HRQL in different categories of weight status and perceived weight status, as well as the association between students' perceived weight status and HRQL and its subscales

2-3. Ethical consideration

This study was approved by ethical committee of Tehran and Isfahan university of Medical Sciences. All of the subjects received an explanation of the study and signed the informed consent. There were no obligation for participation in this study and all of the subjects were volunteers (ID number: 188092).

2-4. Measuring tools

2-4-1. Assessment of weight status and perceived weight status

Weight and height of the participants were measured according to the standard protocol of the study to the nearest 0.1 kg and 0.1 cm, respectively. Body Mass Index (BMI) was calculated as the ratio of weight (kg) to height squared (m2). All mentioned anthropometric measurement conducted by trained health care professionals.

Weight status was categorized as underweight, normal weight, overweight and obese according to the World Health Organization (WHO) standard growth curves. According to the curves BMI less than 5th percentile for age and gender defined as underweight and BMI between 85th and 95th percentiles and greater than the 95th percentile defined as overweight and obesity, respectively (34). Perceived weight status of the students was categorized as underweight, appropriate weight (about right) and overweight based on their perception of their weight status using a reliable and validated questionnaire which could be used for weight disorders in a nationally representative sample of schoolchildren in MENA (34, 42).

2-4-2. Assessment of HRQL

The PedsQL™ 4.0 scale is a well-established tool with multidimensional construct which contains 23 items in 4 subscales including physical, emotional, social, and school functions. Physical function contains 8 items and the other three items were defined as psychosocial score have 5 items. The scale is scored from 0-100; higher scores reflected better HRQL (41). The Persian version of the Pediatric Quality of Life inventory (PedsQL™ 4.0™ 4.0) Generic Core Scales which validity and reliability have been confirmed previously (41) was used for assessment of the students' HRQL. The internal consistency reliability of the

Persian version of the questionnaire was 0.95 and 0.91 for parent-proxy and child-self reports, respectively. The Cronbach's alpha for the total scale score was 0.73 and 0.9 for child-self and parent-proxy reports, respectively (41).

2-5. Inclusion and exclusion criteria

School students, aged 6-18 years, were selected randomly from rural and urban areas of 30 provinces of Iran. Schoolchildren with a medical history of any chronic disorder or prolonged use of any medication were not included in this study.

2-6. Data Analyses

The data were analyzed by the STATA software version 10.0 (STATA Corp, College Station, Tex.). The categorical variables are presented as number (%) and continuous variables as mean (standard deviation [SD]). The Pearson Chi-square test was used to analyze categorical variables. Comparison of means of total PedsQL™ and its subscales across perceived weight status were investigated by analysis of variance (ANOVA). Linear regression was performed to examine the association of perceived weight status with total PedsQL™ and its subscales in different models applied for adjusting potential confounders. Model I was a crude model; Model II was adjusted for age, gender and living area, and in Model III, additional adjustment was done for SES, PA, ST, and BMI. Sampling method (cluster sampling) was considered in all statistical analyses. P-value<0.05 was considered as statistically significant.

3- RESULTS

In this study 23,043 students were evaluated. The participation rate was 92.2%. Their mean (SD) age was 12.55 (3.31) years; 73.4% were from urban areas and 49.2% were girls. General characteristics, total PedsQL™ and its subscales, as well as perceived weight status of participants according to gender are presented in **Table.1**. The total prevalence rate of underweight was significantly lower than the prevalence of perceived underweight (10.0% vs. 30.8%, P<0.001). The total prevalence rate of normal weight was significantly higher than the prevalence of perceived normal weight (70.0% vs. 52.5%, P<0.001). Mean (SD) of total PedsQL™ in total population was 81.7(13.6). Mean (SD) of total PedsQL™ of girls was significantly lower than boys [83.59(12.37) vs. 79.87(14.51), P<0.001]. Mean (SD) of total PedsQL™ and its subscales according to perceived weight status are presented in **Table.2**.

Mean of total PedsQL™ score and in subscales in different categories of perceived weight did not have significant difference in boys (P>0.05). Mean of total PedsQL™ score and psychosocial score were significantly higher in girls who had perceived normal weight (P=0.029 for total PedsQL™ score and P=0.023 for psychosocial score). Mean of school functioning score was significantly lower in girls with perceived overweight and obesity (P=0.014).

Association of body weight status and perceived weight status with total PedsQL™ and its subscales are presented in **Table.3**. After adjustment for age, gender, living area, SES, physical activity, ST and BMI, significant inverse association was documented between perceived overweight and total score of HRQOL. School functioning was negatively associated with perceived overweight (B= -0.82, P<0.01). Positive significant association existed between perceived overweight and psychosocial functioning (B= -0.6, P=0.03).

Table-1: General characteristics, perceived weight status, total PedsQL™ and its subscales according to gender: the Weight disorders survey of the CASPIAN –IV Study.

Variables	Total	Boy	Girls	P-value
Age (year)*	12.5(3.4)	12.36 (3.36)	12.67 (3.29)	<0.001
BMI (kg/m^2)*	18.786 (4.42)	18.64 (4.36)	18.92 (4.48)	<0.001
Living area**				
Urban	14218(73.0)	6952(71.0)	7266(74.9)	<0.001
Rural	5267(27.0)	2431(25.1)	2836(29.0)	
SES				
Quintile 1	3392(20.5)	1746(21.0)	1646(20.0)	
Quintile 2	3328(20.1)	1690(20.3)	1638(19.9)	
Quintile 3	3263(19.7)	1615(19.4)	1648(20.0)	0.36
Quintile 4	3245(19.6)	1600(19.2)	1645(20.0)	
Quintile 5	3312(20.0)	1666(20.0)	1646(20.0)	
Physical activity^2				
Active	14994(76.4)	8508(86.2)	6486(66.5)	<0.001
Inactive	4632(23.6)	1361(13.8)	3271(33.5)	
Screen time(hr/day)				
High	7836(41.3)	3811(39.8)	4025(42.8)	<0.001
Low	11147(58.7)	5769(60.2)	5378(57.2)	
Body weight status**				
Underweight	1958(10.0)	1037(10.5)	921(9.4)	
Normal weight	13890(70.8)	6786(68.8)	7104(7208)	<0.001
Overweight/ obese	1732(17.8)	2046(20.7)	1732(17.8)	
Perceived weight status**				
Under weight	6016(30.8)	3081(31.3)	2935(30.2)	
Normal weight	10271(52.5)	5133(52.2)	5138(52.8)	0.20
Overweight/ obese	3276(16.7)	1623(16.5)	1653(17.0)	
QoL components*				
Physical	84.25 (14.7)	84.5(14.4)	83.9(14.9)	0.002
School	78.65 (14.59)	82.2(13.1)	75.0(15.1)	<0.001
Emotional	78.25 (19.40)	81.0(18.2)	75.4(20.2)	<0.001
Social	90.04 (14.25)	89.9 (14.4)	90.1(14.1)	0.64
Psychosocial	81.24 (14.15)	83.6(12.9)	78.8(14.8)	<0.001
Total	81.7(13.6)	83.59(12.37)	79.87(14.51)	<0.001

PedsQL™: Pediatric Quality of Life Inventory™ generic core scales; BMI; Body mass index, SES; Socioeconomic status, QOL; Quality of life. *are presented as mean (SD); ** are presented as number (%).

Table-2: Mean (SD) of total PedsQL™ and its subscales according to perceived weight status: the Weight disorders survey of the CASPIAN –IV Study.

Variables	Physical	School	Emotional	Social	Psychosocial	Total
Boys						
Perceived weight status						
Normal weight	84.5(14.6)	82.7(12.8)	81.2(18.3)	90.2(14.2)	83.5(13.2)	83.9(12.1)
Underweight	84.5(14.4)	82.3(12.8)	81.0(17.9)	89.9(14.2)	83.5(12.7)	83.5(12.2)
Overweight/ obese	84.8(14.0)	81.6(13.6)	80.4(18.7)	89.8(15.0)	83.8(12.9)	83.5(12.7)
p-value	0.719	0.084	0.371	0.603	0.778	0.424
Girls						
Perceived weight status						
Normal weight	84.0(14.9)	79.9(15.2)	75.4(20.2)	89.8(14.4)	79.7(14.0)	80.6(13.5)
Underweight	83.9(14.8)	76.0(14.4)	75.5(20.3)	90.2(13.8)	78.5(15.2)	79.9(14.4)
Overweight/ obese	83.5(15.1)	74.7(15.2)	75.2(20.2)	90.0(14.1)	78.8(14.7)	79.5(14.8)
P-value	0.481	0.014	0.865	0.487	0.023	0.029

SD: Standard deviation; PedsQL™: Pediatric Quality of Life Inventory™ generic core scales.

Table-3: Association of body weight status and perceived weight status with total PedsQL™ and its subscales: the Weight disorders survey of the CASPIAN- IV Study.

Models	Sub-group	Physical	School	Emotional	Social function	Psychosocial	Total
Perceived weight status							
Model 1	Normal weight	Reference	Reference	Reference	Reference	Reference	Reference
	Underweight	0.02(0.25)	-0.07(0.26)	0.09(0.33)	-0.03(0.25)	0.19(0.25)	0.23(0.24)
	Overweight/obese	-0.08(0.31)	-0.80(0.31)*	-0.05(0.42)	-0.10(0.31)	0.68(0.30)*	-0.74(0.29)*
Model 2	Normal weight	Reference	Reference	Reference	Reference	Reference	Reference
	Underweight	0.00(0.25)	-0.13(0.25)	0.01(0.33)	-0.05(0.25)	0.14(0.25)	0.19(0.24)
	Overweight/obese	-0.07(0.31)	-0.81(0.29)*	-0.49(0.41)	-0.09(0.31)	0.68(0.29)*	-0.75(0.28)*
Model 3	Normal weight	Reference	Reference	Reference	Reference	Reference	Reference
	Underweight	0.06(0.27)	-0.16(0.26)	0.04(0.36)	-0.02(0.27)	0.08(0.25)	0.14(0.24)
	Overweight/obese	-0.05(0.34)	-0.82(0.31)*	-0.45(0.44)	-0.09(0.33)	0.60(0.30)*	-0.64(0.29)*
*Statistically significant; PedsQL™: Pediatric Quality of Life Inventory™ generic core scales. Data are presented as β coefficient (standard error). Model 1: crude model, Model 2: adjusted for age, gender, region, Model 3: Additionally adjusted for socioeconomic status, physical activity and screen time, body mass index.							

4- DISCUSSION

This nationwide study investigated the association between perceived weight status and quality of life in Iranian children and adolescents. Our findings indicated that total score of HRQOL was not different in various categories of perceived weight status among boys, whereas girls with perceived normal weight had higher total score of HRQOL than their other counterparts. Mean of school and physical functioning was lower in boys and girls with perceived overweight status, whereas girls with perceived normal weight status had better psychosocial function. Those with perceived underweight status had better emotional function but lower social function. Recently the concept of weight misperception has gained great popularity in association with different health aspects of children (27, 28). Some recent studies showed that the impact of weight perception on HRQOL is more significant than actual weight measurement categories (24, 25). A study on a national sample of American girls evaluated the associations between HRQOL and weight indices, including weight status and perceived weight status, indicated that HRQOL is more influenced by perceived weight status than by the actual weight status (24). Thus, in current study we investigated the association between perceived weight status and HRQOL in children and adolescents. The association between weight status and HRQOL has been reported recently in this population (43). Weight misperception could be underestimated and overestimated and the reported rate for weight misperception and its features have great variability in previous researches. A growing body of evidence suggested that the rate could influenced by gender, growth status, social norms and standards of each community as well as norms of ideal body size and physical attractiveness of the dominant population (19-21). Results of a cohort study among 8th grade adolescents in the USA showed that weight misperception is

reported in 42.1% of total population from which 35.3% and 6.8% presented as underestimation and overestimation respectively (44). The rate among Iranian children and adolescents has been reported to be 58% (22). In this study, the commonest form of weight misperception was underestimation of actual weight status and the prevalence of misperception was not different between boys and girls. Regarding gender differences, epidemiological data indicate that overestimation of weight is more frequent among girls, whereas its underestimation is more prevalent in boys (45, 46). There are also evidences that underestimation of weight status is more common in families and communities with low socioeconomic conditions (47). However, there are also opposing reports, as a study in England that showed most of the normal weight and mainly overweight adolescents underestimated their weight status (48).

In a study in Bahrain, most of the obese and overweight adolescents underestimated their actual weight status (49). In our study, most of the underestimation was reported by normal-weight students. It is suggested that it may be due to the social and ideal body size norms of our community. Few studies exist on the association between weight misperception and HRQOL. A recent study investigated the relation between weigh misperception and HRQOL in American adolescents. It showed that weight underestimation was associated with higher total HRQOL and its related physical, emotional and social functioning, whereas weigh overestimation was associated with lower social functioning (32). Studies in Denmark (50), and Italy (51) reported that overweight misperception is related with lower level of psychological wellbeing than actual overweight and obesity. In a study in Australia, a complex relationship existed between perceived weight status and HRQOL in adolescents. It indicated that weight underestimation was associated with lower levels of physical, psychosocial and total HRQOL. Moreover, normal weight adolescents who overestimated their weight status had lower psychosocial functioning and total HRQOL, but underweight individuals who overestimated their weight had higher total level of HRQOL (26). In current study, mean of total HRQOL and its subscales were not significantly different among boys. Girls with perceived healthy weight had higher total HRQOL, school and psychosocial functioning than their other counterparts. Significant inverse association existed between perceived overweight and obesity and total HRQOL and school functioning. Psychosocial functioning was positively associated with perceived overweight and obesity. Our findings regarding the lower level of school functioning and total HRQOL in students with perceived overestimation is consistent with some previous studies (32, 49-51).

However, our finding on the positive association between perceived overweight status and psychosocial function might be because of cultural values and rituals of our community and the differences in ethnic composition. Likewise other Eastern nations overweight and obesity not being underweight and thin, is more acceptable for our population (52, 53). Moreover as reported previously in countries with higher prevalence rate of overweight and obesity, weight misperception in the form of overestimation is more prevalent than other communities, and it is associated with poor HRQOL status (54). Considering that weight misperceptions could impact on the process of management of weight disorders especially overweight and obesity, it is useful to develop comprehensive educational programs for both health professionals and

school children to improve their knowledge about healthy attitude towards weight status and the role of weight misperception on physical and psychological health. Furthermore, given the role of cultural standards and social norms of each community on understanding of weight perception which could also effect on individual perception, it would be more favorable to also develop population- based programs in this field in order to establish accurate weight perception. However such a multi-dimensional educational program will provide better changes across the community in this regard.

The main limitation of current study was its cross sectional design, therefore our findings cannot properly determine the causal pathway between perceived weight status and HRQOL, but considering that our studied population was a nationally representative sample of Iranian adolescents, our current finding could be used for investigation of the causal mechanism between weight stigmatization and adolescents well-being and quality of life. The strength of current study was that it was the first study of its kind not only in Iran, but also in the Eastern Mediterranean region.

5- CONCLUSION

The findings of this nationwide study indicated that weight underestimation is the commonest form of weight misperception in Iranian children and adolescents. This could be a cause of concern especially for obesity treatment and prevention programs. Further, the inverse association between weight overestimation and total HRQOL and school functioning is emphasized on proper education of both students and their parents about weigh disorders and healthy attitude towards weight status. However targeting misperception in children and adolescents could facilitate the

development of healthy lifestyle mainly regarding their weight statues. Adoption of healthy lifestyle results in better HRQOL. It is recommended to design prospective studies in order to investigate the related risk factors of both underestimation and overestimation in children and adolescents.

6- CONFLICT OF INTEREST

7- ACKNOWLEDGMENTS

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