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Research article

Relationships between Body Weight Perception and Weight Management: Practices among Adolescents

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ABSTRACT

Background and Objectives: Overweight and obesity are highly prevalent in western countries and growing problems in developing countries. Weight loss behaviors are highly prevalent among adolescents, and body weight perception motivates weight control practices. The aim of this study is to investigate the relationships between actual body weight, body weight perception, and weight control practices among adolescents.

Material and methods: A questionnaire-based survey was used to collect data on anthropometric measurements, demographic information, weight perception and weight control practices from a sample of 200 male and female students (89 boys and 111 girls) aged between13 and19 year old. The association between weight loss attempts and socio demographic factors, weight status and the weight perception were analyzed. Multivariable logistic regression analyses were performed to examine the predictors of misperception and its association with weight-related behaviors. Cohen's kappa was calculated to analyze the accuracy of body weight perceptions.

Results: This study revealed that prevalence of underweight was higher in girls than boys. In this study, 8% were underweight including 3.5% severely underweight, 23.5% were overweight, 6% were obese and the rest of the participants (59%) were of normal weight. Only 61.5% respondents perceived their weight correctly. Perception of 21.5% adolescents was underestimated and 16.5% were overestimated than their actual weight status. Almost one third of the respondents were in weight control interventions. Almost 11% boys and 33% girls attempted weight loss activities. The gender biasness was seen in weight control (statistically significant ,p value =0.003). Body weight perception was found significant (p value, 0.001) in relation to weight control behavior.

Conclusion: Body weight perceptions are not in agreement with actual weight in adolescents. This discrepancy is more marked in females who use a variety of weight control behaviors. These behaviors are motivated more apparently by perceived weight rather than actual body mass index.

Key words: Body weight, Perception, Overweight, Obesity, body mass index

INTRODUCTION

Adolescents represent around twenty percent of the world's population; it is a period of immense change. It involves a transition from childhood dependency to adult self-sufficiency [1]. Adolescence is an important period known as second windows of

opportunity to break vicious cycle of malnutrition. Growth during adolescence is faster than at any other time in an individual's life except the first year [1].

Adolescents make significant developments in physical growth, cognition, identity, family, peers, and sexuality in order to achieve emancipation, identity formation, and assumption of functional roles [2]. Body image is a psychosocial dimension of body size that encompasses both perceptual and attitudinal factors and has been associated with eating disorders. In recent years, its association with overweight and obesity has been described [3-7]. It is recognized that individuals make decisions on lifestyle behaviors based on body weight perceptions (a dimension of body image). In Nepal, there is a large burden of under nutrition alongside increasing overweight and obesity. Overweight and obesity are highly prevalent in western countries and growing problems in developing countries like Nepal [1, 8-11]. For public health and clinical programs to be more effective, body image of undernourished and overweight people should be understood in the context of the influence of culture on body weight perceptions and on weight management behaviors [9-11].

Weight control behaviors are precipitated by body weight perception. Body weight perception refers to the personal evaluation of one's weight as "underweight" or "normal weight" or "overweight" irrespective of actual body mass index [3, 12]. A large number of studies have indicated that children and adolescents misperceive their body weight status [3, 5, 10-11]. There is sparse literature on weight perception and weight loss practices of adolescents in Nepal. Appropriate body weight perception and good weight loss practices are estimated to be an important point of focus for the design and implementation of clinical and public health initiatives [6-9]. There is no literature found on weight perception and weight loss practices in Nepalese population. So this study is carried out to analyze the associations between the actual weight statuses, body weight perceptions with weight-management intentions of the adolescents of Nepal.

MATERIAL AND METHODS

This is a community based descriptive cross-sectional study. The study was conducted among adolescents aged 13 years to 19 years in 2 higher schools of Kathmandu, Nepal by using convenience sampling technique. Of these schools, 1 was government and 1 was private schools and 50% of sample was collected from each school by using simple random sampling. The sample size was estimated by using following formulae:

Sample Size (n) = $[z^2.pq]/d^2$

Where,

z = critical value which is equal to 1.96 in two-tailed test

pq = 1 (No recorded prevalence)

d = absolute sampling error that can be tolerated and it is fixed at 10%

The total sample size for the study will be 384

Non-response rate was taken as 5%

Final sample size was: 400*0.5=200

Data were collected after verbal consent of the participants and written consent taken from the parents and/or Principal of the school using a structured questionnaire.

Measurement of height, weight and was recorded using standard procedure [13, 14]. A written consent and assent from the respondents were taken before interview and assessment.

Excel and SPSS were used for data entry, coding, decoding and analysis of data. Anthropometric data was transformed to BMI scores using WHO Anthro+ (version 3.2.2, January 2011) software application that provides global references for adolescents' growth and development. Data were reported as number and percentages for all the categorical variables.

The prevalence of overweight and obesity were calculated by sex and age according to the WHO BMI classifications. The corresponding unadjusted odds ratios (ORs) and 95% confidence intervals (CI) for the prevalence of overweight, and obesity was determined by a multiple logistic regression model. The regression model includes age and nature of school as independent variables and was stratified by sex. A non-stratified version of the model was also performed to assess the main effect of sex. The percentage distributions of body weight perception (thin, normal, fat and unknown) were calculated by sex and BMI. The percentage of correct and incorrect (under, over, or correct) weight perception were calculated by sex, age, and BMI. The percentage of taking action to lose weight among all participants was calculated by sex, age, BMI, and weight perception. The percentage of specific weight loss practice among all the persons taking action to lose weight was compared between boys and girls. Cohen's kappa was calculated to analyze the perception accuracy. Following gold standard was used to compare the kappa value:

Table 1: Classification of Kappa Value

Kappa value (%)	Accuracy
Less than 20	Poor agreement
20 to 40	Fair agreement
40 to 60	Moderate agreement
60 to 80	Good agreement
80 to 100	Very good agreement

RESULT

Among total 200 samples 89 were male and 111 were female. 100 adolescents from government higher secondary school and 100 from private higher secondary school were involved in the study. The demographic details of the adolescent respondents of the study are presented in Table 2.

Table 2: Demographic distribution of the respondent by age

Age (Years)	Male	Female	Government school	Private school	Total
13	**10**	**12**	**12**	**10**	**22**
14	**12**	**15**	**13**	**14**	**27**
15	**18**	**16**	**15**	**19**	**34**
16	**14**	**20**	**16**	**18**	**34**
17	**14**	**17**	**13**	**18**	**31**
18	**12**	**17**	**18**	**11**	**29**
19	**9**	**14**	**13**	**10**	**23**
Total	**89**	**111**	**100**	**100**	**200**

Table 3: Distribution of total subjects based on- body weight perception accuracy

Weight perception	Underweight		Normal		Overweight		Total	
	N	%	N	%	N	%	N	%
Correct	**20**	**87**	**56**	**47.4**	**47**	**81**	**123**	**61.5**
Underestimated	**0**	**0**	**32**	**27.1**	**11**	**19**	**43**	**21.5**
Overestimated	**3**	**13**	**30**	**25.4**	**0**	**0**	**33**	**16.5**
Total	**23**	**11.5**	**118**	**59**	**58**	**29**	**200**	**100**
Kappa Value	**(k 0.82)**		**(k 0.19)**		**(k 0.8)**			

Table 4: Gender wise distribution of subjects based on weight perception accuracy

Weight perception	Underweight		Normal		Overweight		Total	
	N	%	N	%	N	%	N	%
Boys (k , 0.62)								
	(k, 0.54)		**(k, 0.23)**		**(k, 0.64)**		**(k , 0.62)**	
Correct	4	66.6	34	61.8	20	71.4	58	65.2
Underestimated	0	0	10	18.2	8	28.6	18	20.2
Overestimated	2	33.3	11	20	0	0	13	14.6
Total	**6**	**6.7**	**55**	**61.7**	**28**	**31.4**	**89**	**100**
Girls (k , 0.48)								
	(k, 0.91)		**(k, 0.16)**		**(k, 0.86)**		**(k, 0.48)**	
Correct	16	94.1	22	34.9	27	87	65	58.5
Underestimated	0	0	22	34.9	4	13	26	23.4
Overestimated	1	5.9	19	30.2	0	0	20	18.1
Total	**17**	**15.3**	**63**	**56.7**	**31**	**28**	**111**	**100**

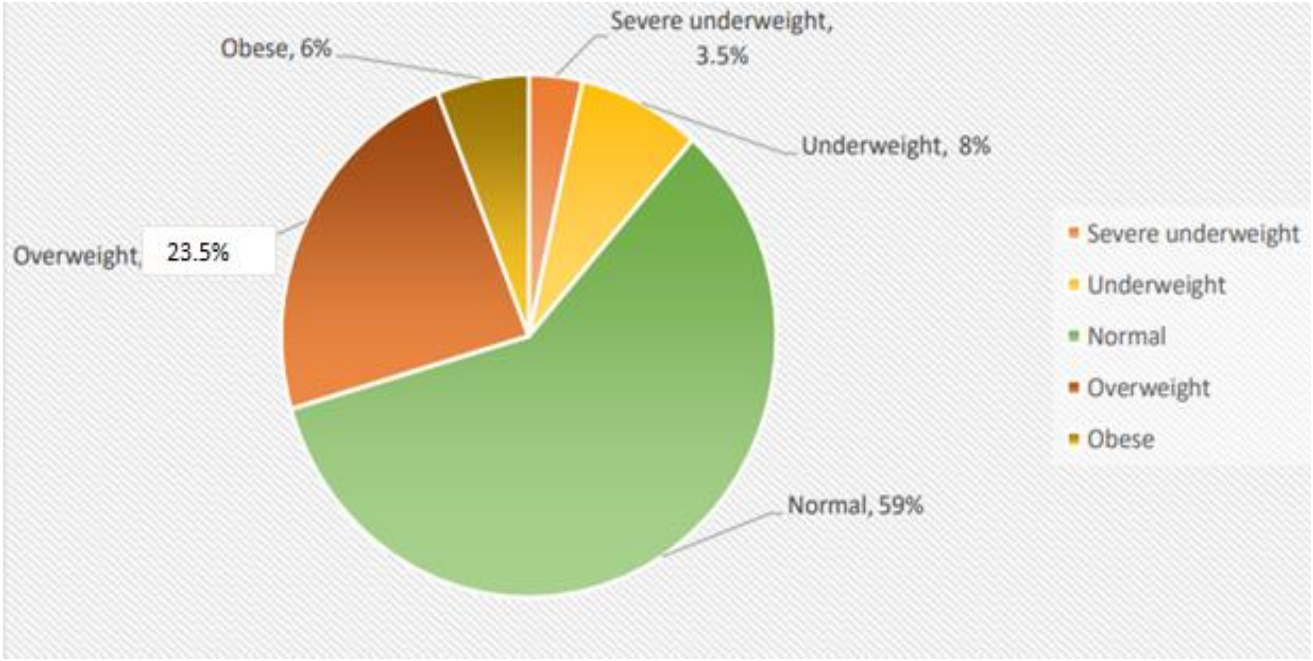

Figure 1: Weight status based on BMIz [Body mass index (BMI) for age z-score recommended by WHO]

The mean BMI was found 21.2±13.4. Figure one shows the Weight status based on Body mass index (BMI) for age z-score recommended by WHO [BMIz]. Eight percent (8%) were underweight including 3.5% severely underweight, 23.5% were overweight, 6% were obese and the rest of the participants (59%) were of normal weight (Figure 1). Table 3 shows the gender wise distribution of total subject based on body weight perception accuracy and Table 4 shows the overall distribution with Kappa value. Weight perception accuracy of boys was moderate (Kappa value: k, 0.62) and was more than the perception accuracy of female (Kappa value: k, 0.48). Only 61.5% respondents perceived their weight correctly. Perception of 21.5% adolescents was underestimated and 16.5% were overestimated than their actual weight. Eighty seven (87%) underweight respondent correctly perceived their weight and 13%

Table 5: distribution of respondents by weight control behavior

Variables	Attempted Weight loss		Unadjusted Odd Ratio (95%CI)	P-value
	Yes	No		
Gender				
Male	11 (12%)	78 (88%)	0.8	0.003
Female	33 (30%)	78 (70%)	1	
Age category				
13-15 Years	7 (8%)	76 (92%)	1.3	**0.002**
16-19 Years	37 (32%)	80 (68%)	0.5	
School				
Private	28 (28%)	72 (72%)	1.1	0.06
Government	16 (16%)	84 (84%)	0.9	
Actual weight status				
Underweight	2 (9%)	21 (91%)	0.4	**0.003**
Normal	12 (10%)	106 (90%)	0.7	
Overweight	21 (46%)	25 (54%)	1.6	
Obesity	9 (75%)	3 (25%)	1.9	
Own perception on weight				
Very thin	0 (0%)	21 (100%)	NA	**0.001**
Thin	0 (0%)	33 (100%)	NA	
Normal	2 (3%)	66 (97%)	0.6	
Fat	25 (44%)	32 (56%)	1.3	
Very fat	19 (90%)	2 (10%)	1.4	
Parents' perception on weight				
Very thin	0 (0%)	22 (100%)	1.4	**0.004**
Thin	1 (2%)	42 (100%)	1.4	
Normal	6 (6%)	93 (94%)	0.6	
Fat	14 (44%)	18 (56%)	1.3	
Very fat	2 (50%)	2 (50%)	1.4	

overestimated their weight. The perception was found as almost perfect accuracy (k, 0.82) [Table 3]. Similarly, only 47.4% respondents having normal weight status correctly perceived their weight. 27.1% adolescents having normal weight status underestimated their weight and25.4% overestimated their weight. The perception accuracy was found slightly align with actual BMI (k 0.19) among normal adolescents [Table 3]. Similarly, 81% overweight adolescents perceived their weight correctly whereas 19% of them felt as normal or underweight (underestimated). The perception accuracy of overweight subjects was found almost perfect (k 0.8) [Table 3].

When perception accuracy was observed gender wise slightly more than sixty-five percent (65.2%) boys accurately perceived their weight followed by 20.2% underestimation and 14.6% overestimation. The overall perception accuracy of boys was found to be moderate (k 0.62). About sixty-seven percent (66.6%) underweight boys perceived their weight correctly and 33.3% overestimated their weight. The perception accuracy of underweight boys was found moderate (k 0.54). About sixty-two percent (61.8%) normal boys perceived them correctly whereas 18.2% underestimated and 20% overestimated. Normal weight boys fairly accurately perceived their weight themselves (k 0.23). Almost seventy-two (71.4%) percent overweight boys perceived them correctly and 28.6% felt them as normal/underweight (underestimated). The perception accuracy of overweight boys was moderate (k 0.64). Almost fifty-nine percent (58.5%) girls accurately perceived their weight followed by 23.4% underestimation and 18.1% overestimation. The overall perception accuracy was found to be moderate (k 0.48). Among underweight girls, 94.1% perceived them correctly and the perception accuracy was almost perfect (k 91). But only 34.9% girls having normal weight status perceived them as normal. 30.2% felt them as overweight and 34.9% underestimated their weight. Perception of own weight of girls having normal weight status was poorly accurate (k 0.16). Eighty seven percent overweight girls perceived them correctly and the perception accuracy was almost perfect (k 0.86). The perception accuracy was found slightly higher in boys then in girls [Table 3 & 4].

Body weight perception and weight control behavior is shown in Table 5. Almost one third of the respondents were in weight control interventions. 11% boys and 33% girls were attempted weight loss activities in last 3 months. The gender biasness in weight control was found statistically significant (p value, 0.003). Actual weight status of weight perception directly leads to weight loss (p value, 0.003) . Body weight perception was found significant in relation to weight control behavior. Parents' weight perception also played significant role in weight control measures [Table 5].

DISCUSSION

In this study, 8% were underweight including 3.5% severely underweight, 23.5% were overweight, 6% were obese and the rest of the participants (59%) were of normal weight based on body mass index (BMI) for age z-score recommended by WHO (figure 1). Underweight was found statistically different in boys and girls. According to the adolescent nutrition survey conducted by NHRC [15], 42.2% adolescent aged 15-19 years were under weight and 1.8% was obese in Nepal. This study revealed that prevalence of underweight were higher in girls than boys but the findings of the study done in Lalitpur,

indicated that prevalence of underweight was slightly more in male (2.4%) than in female (1.9**%)**[16].

Among the subjects, 47.5% (56/118) perceived themselves as having a normal weight whereas 59% of total respondents were normal. The Malaysia School Based Nutrition Survey 2012, which included a body weight perception questionnaire and anthropometric measurements, compared actual and perceived body weight status, the findings show that 13.8% of adolescents underestimated their weight, 35.0% overestimated, and 51.2% correctly judged their own weight [13].

In this study, only 61.5% respondents perceived their weight correctly. Perceptions of 21.5% adolescents were underestimated and 16.5% were overestimated than their actual weight status. 87% underweight respondent correctly perceived their weight and 13% overestimated their weight. The perception of underweight adolescents was found as almost perfect accuracy (k 0.82). Similarly, only 47.4% respondents having normal weight status correctly perceived their weight. 27.1% adolescents having normal weight status underestimated their weight and 25.4% overestimated their weight. The perception accuracy of normal weight was found slightly align with actual BMI (k 0.19). 81% overweight and obese was perceived their weight currently whereas 19% of them felt as normal or underweight (underestimated). The perception accuracy of overweight subjects was found almost perfect (k 0.8) [Table 3].

Bhurtun et. al. [4] found gender differences in body weight perception among their study subjects, they also observed that the weight-loss behaviours was more among girls than their male counterpart which is similar to the finding of this study [Table 5]. They also reported that the body weight perception was poorly associated with actual weight status which is in contrast to what is seen in our study.

When observed gender wise, slightly more than sixty-five percent (65.2%) boys of our study accurately perceived their weight followed by 20.2% underestimation and 14.6% overestimation. The overall perception accuracy of boys was found to be moderate (k 0.62) [Table 4]. About sixty-seven percent (66.6%) underweight boys perceived their weight correctly and 33.3% overestimated their weight. The perception accuracy of underweight boys was found moderate (k 0.54). About sixty-two percent (61.8%) normal boys perceived them correctly whereas 18.2% underestimated and 20% overestimated. Normal weight boys fairly accurately perceived their weight themselves (k 0.23). Almost seventy-two (71.4%) percent overweight boys perceived them correctly and 28.6% felt them as normal/underweight (underestimated). The perception accuracy of overweight boys was moderate (k 0.64). Almost fifty-nine percent (58.5%) girls accurately perceived their weight followed by 23.4% underestimation and 18.1% overestimation. The overall perception accuracy of girls was found to be moderate (k 0.48). Among underweight girls, 94.1% perceived them correctly and the perception accuracy was almost perfect (k, 0. 91). But only 34.9% girls having normal weight status perceived them as normal. 30.2% felt them as overweight and 34.9% underestimated their weight. Perception of own weight of girls having normal weight status was poorly accurate (k 0.16). Eighty seven percent overweight girls perceived them correctly and the perception accuracy was almost

perfect (k 0.86). The perception accuracy was found slightly higher in boys then in girls [Table 3 & 4].

One of the studies done in Bahrain adolescents shows that there is significant discrepancy between adolescents' perception of body weight and actual BMI. There was a tendency for adolescents to underestimate their weight status, which was especially noteworthy among the overweight and obese. More than half of the girls and about one-third of the boys expressed discontent with their current body weight [17]. Another study done by Wang et. al. in China [6] indicated that 19.8% of these youth perceived themselves as underweight, 57.8% as normal weight, and 22.4% as overweight. In reality, 4.9% were underweight, 64.3% were normal weight, and 30.8% were overweight. Furthermore, approximately 66.4% of these Chinese youth correctly perceived their body image, 28.2% underestimated their true body image, and 5.4% overestimated their weight status [6].

As per Malaysia School Based Nutrition Survey, significantly more normal weight girls felt they were overweight, whereas significantly more overweight boys perceived themselves as underweight [7]. Similarly in a study done by Wang et. al. in China [6] girls were more likely than boys to overestimate their weight. Similar report was seen in southern California. More females perceived themselves as overweight and tried to control their weight, whereas more males tried to gain weight or never tried to control their weight ($p < 0.001$) [18].

Almost one third of the respondents were in weight control interventions. Eleven percent (11%) boys and 33% girls attempted weight loss activities in last 3 months. The gender biasness was seen in weight control behavior of the participants and was found statistically significant (p value, 0.003, Table 5). More students of age group 16-19 years (32%) attempted weight loss behavior than the students of lower age group ie. 13-15 years (8%). Likewise, more females (30%) attempted weight loss behavior than their male counterpart (12%). Actual weight status of weight perception directly leads to weight loss behavior shown by odd ratio upto 1.9 at 95% CI (p value, 0.003) as shown in Table 5.

Own body weight perception of the subjects was found to have significant relation on weight control behavior. Parents' weight perception also played significant role in weight control measures [Table 5]. Among the cohort, more overweight than non-overweight students expressed a desire to lose weight. There was a significant relationship between perceived weight and weight control behaviors, such that females who perceived themselves as overweight were more likely to exercise. As per Malaysia School Based Nutrition Survey (3), significantly more normal weight girls felt they were overweight, whereas significantly more overweight boys perceived themselves as underweight. The overall appropriateness of weight control practices to body weight was 72.6%. Adolescents attempting to lose or gain weight need to have better understanding toward desirable behavioral changes. According to Frank et. al. [11], adolescents of both sexes who perceived their body weight as below the expected weight took more initiatives to gain weight, and those who perceived themselves as overweight made more efforts to lose weight. In adolescents who perceived themselves as overweight, the behavior of not taking medication was associated with the outcome only in boys, whereas in girls, an association

was observed with the variables eating less, cutting calories, or avoiding fatty foods aiming to lose or avoid increasing body weight. Adolescents of both sexes who practiced exercises were more likely to perceive themselves as overweight.

Inappropriate perceptions about body weight leads to increase in the problems related to overweight/obesity. Children are likely to attempt weight loss in India irrespective of their weight status, age and gender. Children who were actually overweight as well as those who were perceived by themselves to be overweight or obese were highly likely to try to lose weight as seen in study in south India [10] which is somewhat similar to the finding of this study.

CONCLUSION

Prevalence of overweight and obesity among adolescents is in increasing trends. Body weight perception was poorly associated with BMI among adolescents. Gender biasness was seen in the weight perceptions, with many more female adolescents overestimating their body size. Adolescents who perceived themselves as overweight engaged in weight reducing activities. Weight misperception is a determinant of healthy and unhealthy weight-related behaviors. It is such that females who perceived themselves as overweight were more likely to exercise. Males who perceived themselves as overweight or who were actually (estimated to be) overweight, were more likely to exercise. This double-edged problem of weight misperception needs to be addressed by appropriate awareness programs from health care providers as well as from the media.

Further study of body weight perception, a weight status and weight management practice with large sample size is recommended. Similarly, role of cofounders in weight perception and control measures could also be studied and analyzed.

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