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RESEARCH ARTICLE

RELATION BETWEEN BODY MASS INDEX AND SELF ESTEEM IN ADOLESCENTS

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ABSTRACT

Background: World Health Organization (WHO) has to designate obesity as one of the most important public health menace. Studies suggested that overweight in adolescents has been associated with negative body image.
Method: A cross-sectional study was used that includes students from secondary and high schools located in Taif city, Saudi Arabia. It was conducted between March 2014 and June 2015. Height and weight were measured and BMI was calculated from this data. Related risk factors including the dietary and physical habits, school type, parent's education, living situation, sleeping pattern, and smoking were recorded. The primary aim of the study is to assess the relationship between BMI and self-esteem using Rosenberg self-esteem scale.
Result: A total of 488 students with a mean age of 15.2 year (SD 1.75), 79.7% were male, 58% were secondary school students, and 85.5% were attended public schools. The mean Rosenberg self-esteem scale (RSES) score is 20.35 (SD 4.1) with 10.8% categorized as high self-esteem, 82.6% as normal self-esteem and 6.6% as low self-esteem. 6.6% of the students scored < 14 in the RSES and were considered to have low self-esteem, those with normal/high self-esteem tends to be non-significantly younger, have higher BMI, larger waist circumference, more likely to be overweight/obese, and were more likely to reports healthy lifestyle related habits. Non-significant positive partial correlation between RSES and both BMI (r 0.53, p 0.173) and waist circumference (r 0.074, p 0.094).
Conclusion: There was no significant correlation between BMI and self-esteem. Although, students who are underweight were more likely to be in the low self-esteem group.Positive partial correlation between RSES and smoking were noted.

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INTRODUCTION

Body image is a broad structure that includes multiple components, it encompasses self-perceptions, feelings, attitudes and behaviors by one's body (Cash, 2004). Garner et.al considered that body image disorder can become manifest in two different ways: as a body image distortion and as a body dissatisfaction, body image distortion which refers to the perceptive disturbance due to which that person is not able to properly assess the appearance (size) of his or her body (Zoletić and Duraković-Belko, 2009). Body dissatisfaction refers to the attitude or feelings and thoughts about one's own body (Zoletić and Duraković-Belko, 2009). A 1994 study by Grilo *et al* demonstrated that, the greater the frequency of being teased about weight and shape while growing up, the more negative one's appearance is regarded, and the greater the degree of body dissatisfaction in adulthood (Omar, 2009). The prevalence of pediatric obesity and overweight is growing in both developed and developing countries, but at different rates and patterns (Lobstein *et al*., 2004). World Health Organization (WHO) has to designate obesity as one of the most important public health menace (Lee, 2005). A recent study estimates the prevalence of obesity indicated that overweight and obesity rates among Saudi adolescents aged 14-19 years were overweight and obesity ranged from 39.9-45.6% in males and from 30.4-38.7% in females. Higher prevalence of obesity was observed among adolescents in private schools, and the prevalence of obesity among Saudi children and adolescents is still increasing (Al-Hazzaa *et al*., 2014). Weight stigmatization has been associated with negative Psychosocial reactions that impacts on the individual self or may it is extended to the surrounding environment such as family, friends and socially (Rowland *et al*., 1991; Cooper

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et al., 1990 and Maffeis, 1994). Psychological reactions such as body image distortion and dissatisfaction increased depressive symptoms (i.e. depression, sadness, feelings of isolation, and sense of rejection), lower self-esteem, greater anxiety, and binge eating (Omar *et al*., 2009; Rowland, 1991; Eisenberg, 2006; Sutin and Terracciano, 2015; Needham and Belinda, 2005 and Van den Berg *et al*., 2010). All of these factors that can in turn help maintain a weight surplus. For example, body dissatisfaction does not motivate individuals to make a change for the better (Gouveia, Camilo *et al*., 2012). Many overweight adolescents are socially marginalized due to weight-based teasing that may increase loneliness, sadness, and unhappiness about weight (Rowland, 1991). This self-induced isolation leads to ineffective bonding, which leads to separation from peers (Maffeis *et al*., 1994). This isolation may exacerbate the social and emotional consequences of overweight in this age of adolescence life (Strauss *et al*., 2003). The overweight in adolescents has been associated with negative body image (Omar, 2009). A consistently replicated finding is that overweight children and adolescents have a more negative body image than their peers (Omar, 2009). On the contrarysome obese children, especially those from families in which obesity is a familial problem affecting family members, show little psychological problems. But when the obesity is considered as a characteristic of their family, they appear active and without negative adverse psychological effects from their obesity (Doherty and Harkaway, 1990). Combined, weightbased teasing and a depressive state can lead to suicidal thoughts or attempts (Rowland *et al*., 1991; Cooper *et al*., 1990). Obese children with decreasing levels of self-esteem were also more likely than their normalweight peers to smoke and drink alcohol (Dalton and Sharron, 2004).

Studies on self-esteem in overweight children and adolescents also report conflicting results. Some studies have shown moderately lower self-esteem in overweight children and adolescents than their non-overweight peers (Omar *et al*., 2009; Van den Berg *et al*., 2010), while others have shown no correlation between population-based groups of overweight children and their non-overweight peers (French *et al*., 1996; Rumpel *et al*., 1994). Problems with self-image, body satisfaction, self-esteem also occur during adolescence with males who are both too thin, too short, or who do not look like the "thin ideal" of the perfect body. Their variety compromises direct comparison between studies (Omar, 2009). Whereas Girls who perceived themselves as "much too fat" were least weight satisfied among girls (Page and Allen, 1995). This attributed to pervasive media images of thin women and muscular men have contributed to poor body image and unhealthy control practices (Page and Allen, 1995). Furthermore, the relationship between BMI and self-esteem is unlikely to be linear since both over and underweight children express body shape dissatisfaction (Omar, 2009). Health professionals try to get the diagnosis right, because labeling a child "overweight" can risk not only his or her physical development but the child's social and emotional development as well. Obese children, especially girls' self-confidence and attractiveness, evidence significantly lower levels of self-esteemby early adolescence compared to non-obese children, according to several studies (Dalton and Sharron, 2004; Buddeberg-Fischer *et al*., 1999; Ter Bogt, 2006). Our study aims toevaluatetheassociation between the self-esteem using Rosenbergscale and the BMI among the secondary and high school students. We also will assess the association of this with the other related risk factors that may affects psychological and social outcomes of obese life.

MATERIALS AND METHODS

A cross-sectional study for the students from the secondary and high school levels in Taif city, Saudi Arabia that was conducted between March 2014 and June 2015. Permission was taken from the local authority in Taif that represent the Ministry of Education locally to obtain data about weight, height, waist circumference and self-esteem related score. The primary outcome of the study is to assess the relationship between body mass index (BMI) and self-esteem. We also evaluated the impacts of other related risk factors including the age, gender, dietary habits, physical activity, parent education, parents living status, sleeping pattern and smoking/passive smoker. We included secondary and high school students who age 12-18 years who are willing to participate in the study. We excluded any students with any chronic medical illness, existing psychiatric disorders, and students with learning disabilities. A total of 13 schools which was randomly selected were included. 5 of them were high schools with 1 of those were for girl's student.

The other 8 were secondary schools with 2 of them for girls' students. 10 schools out of 13 were public schools and the rest of them were private schools. In each school that was visited, one or two classrooms were randomly selected. Each student's height and weight were measured by the researchers and BMI was calculated according to the formula (Weight (kg)/height (m) ^{2}). BMI was categorized into; underweight (BMI <18.5), normal (BMI 18.5-24.9), overweight (BMI 25-29.9), and obesity (BMI $\geq$30). Researchers evaluated self-esteem by using Rosenberg self-esteem scale RSE to each participant. RSE translated to Arabic to fit our research purpose, the scale ranges from 0-30, student who scores between 15 and 25 considered within normal range while student who scores below 15 suggested having low self-esteem (Table1) (ter Bogt, 1965). The study included a total of 488 male and female students whom were willing to participate. The personal information was collected through an interview and self-reported questionnaire. This questionnaire was tested in one school prior to the data collection phase to check for errors, ambiguities and redundancies. The researchers sat with the respondents, explained the rationale of the study and the process and took consent from them verbally. They handed over the questionnaire to be filled immediately. The respondents were given adequate time to fill the questionnaire and the researchers were available to answer any related questions.

Information about related factors such as the eating and drinking habits that includes frequency of eating fast food per week, soft drink consuming per week and the frequency of drinking milk per week were self-reported. Sedentary lifestyle was identified as those whom perform exercises for a duration that is $\leq$ 150 min per week. Sleeping hours per night was obtained and categorized into <6 hours, 6-8 hours, and >8

hours and the optimal were considered for those who sleep 6-8 hours per night. Social related data such as smoking habits (active/passive), parent's education, living with both parents were also recorded. Data were collected and analyzed using the SPSS software. The Chi squared test was used to study the relationship between variables and the T-test was used to compare between means. Partial correlation analysis was used to determine the degree of association between BMI and self-esteem.

Table 1. Baseline characteristics of the whole cohort

Baseline characteristics	
Mean age (yrs)	15.2 (SD 1.75)
Male (%)	79.7
Female (%)	20.3
High school students (%)	42
Secondary school students (%)	58
Study at governmental school (%)	85.5
Mean weight (Kg)	55.96 (SD 17.52)
Mean height (m)	1.6 (SD 0.11)
Mean BMI (Kg/m^2)	21.52 (SD 5.4)
Mean waist circumference (cm)	78.7 (SD 12.95)
Self-esteem	
Mean Rosenberg Self-esteem scale score	20.35 (SD 4.1)
High self-esteem (%)	10.8
Normal self-esteem (%)	82.6
Low self-esteem (%)	6.6
BMI categories	
Underweight (%)	35.5
Normal weight (%)	39.8
Overweight (%)	16.2
Obese (%)	8.4
Socioeconomic	
Live with both parents (%)	88.1
Own their houses (%)	58.4
Level of education, high school or less (both or either parents) (%)	56.6
Lifestyle habits	
Optimal sleep hours (%)	41.8
Eat fruits or vegetables at least once daily (%)	22.3
Drinking soft drinks $\geq$ daily	35.4
Rarely eat fast food (%)	47.2
Sedentary life style (%)	42.1
Active smoker (%)	10.4
Passive smoker (%)	47.8

RESULTS

A total of 488 students were enrolled in the study with a mean age of 15.2 year (SD 1.75), 79.7% of students were male, 42% were high school students, 58% were secondary school students and 85.5% were attended public schools (Table 1).
The mean weight is 55.6 kg (SD 17.52), mean height of 1.6 m (SD 0.11), mean BMI of 21.52 kg/m^2 (SD 5.4), and the mean waist circumference (WC) of 78.7cm (SD 12.95).39.8% of the students were considered to have normal weight, 35.5% were underweight, 16.2% were overweight, and 8.4% were obese (Table 1). Regarding the self-esteem, the Mean Rosenberg Self-esteem scale score is 20.35 (SD 4.1) with 10.8% of the students categorized as high self-esteem, 82.6% categorized as normal self-esteem and 6.6% low self-esteem. Majorities of them live with both of parent with58.4% own their houses. 56.6% of the students have either both or one parent with high school degree or less. Only 41.8% report optimal sleep hours per night, 22.3% ate fruits or vegetables at least once daily and 47.2% rarely eat fast food. 35.4% drinking soft drinks $\geq$once daily, 42.1% report sedentary lifestyle. 10.4% of the students were active smokers while 47.8% were Passive smoker.

We divided the cohort into 2 groups based on the Rosenberg self-esteem scale (RSE), students who scored>14 considered to be in normal or high self-esteem (>25 point) representing 93.4% with mean RSE scale score 12.53 point while those who scored14 point or less considered to be in the low self-esteem group representing 6.6% with mean RSE scale score 20.9 point (Table 2). Students whom have low self-esteem tend to live with poorly educated parent, more likely to be smokers and more likely to be exposed to passive smoking. While the other factor like BMI, waist circumference, living status with parents, own their houses, sleeping and dietary habits, sedentary life style were non-statically significant for both of tow categorical group (Table 2). Partial correlation adjusting for age, gender, grade, school type, parents' educational level, sleeping and dietary habits, exercise, active and passive smoking, and living situation; showed non-significant positive

Table 2. Baseline characteristics based on Rosenberg Self-esteem Scale Score

	Low self-esteem	Normal/high self-esteem	P value
Baseline characteristic			
Overall students (%)	6.6	93.4	0.001
Mean Rosenberg Self-esteem scale score	12.53	20.9	0.000
Age (years)	15.5	15.2	0.389
Male (%)	84.4	79.8	0.53
Female (%)	15.6	20.2	
Students attend private school (%)	9.4	14.9	0.39
High school students (%)	6.9	93.1	0.87
Secondary school students (%)	6.5	93.5	
BMI (kg/m^2)	20.5	21.6	0.253
Waist circumference (cm)	75.98	78.97	0.216
Socioeconomic			
Live with both parents (%)	88	87.5	0.89
Own their houses (%)	58.3	58.1	0.961
Low level of education (both or either parents) (%)	75.2	55.65	0.023
BMI categories			
Underweight (%)	50	34.1	
Normal weight (%)	34.4	40.5	0.168
Overweight (%)	6.3	17.1	
Obese (%)	9.3	8.3	
Lifestyle habits			
Optimal sleep hours (%)	36.7	42	0.51
Eat fruits or vegetables at least once daily (%)	13.8	26	0.056
Drinking soft drinks $\geq$ daily	50	34.5	0.791
Rarely eat fast food (%)	21.4	20.5	0.251
Sedentary life style (%)	62.1	40.6	0.078
Active smoker (%)	23.3	9.7	0.061
Passive smoker (%)	60	46.6	0.001

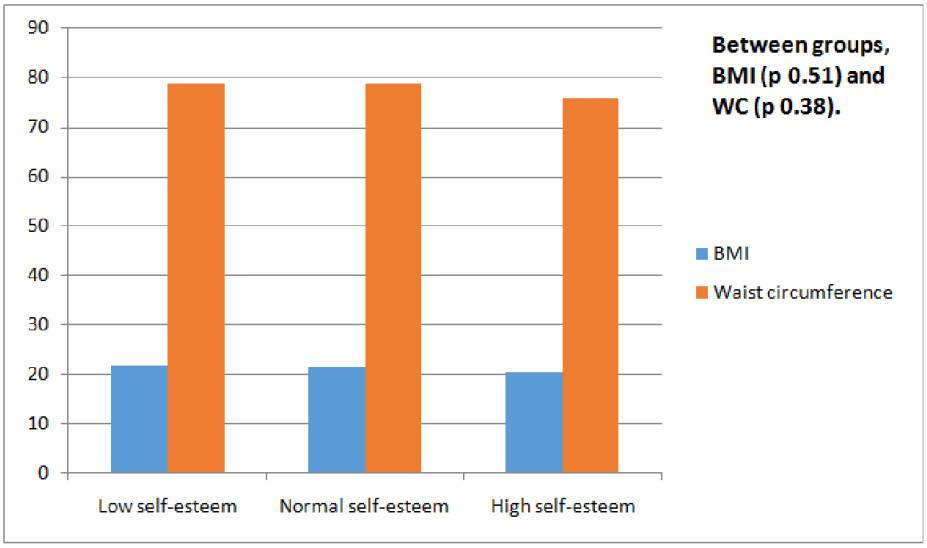

Fig 1. BMI and waist circumference according to the different self-esteem categories

correlation between Rosenberg score and BMI (r 0.53, p 0.173) and non-significant positive correlation between Rosenberg score and waist circumference (r 0.074, p 0.094). Partial correlation adjusting for age, gender, grade, school type, BMI, waist circumference, parents' educational level, sleeping and dietary habits, exercise, and living situation; showed significant positive correlation between Rosenberg score and active smoking (r 0.096, p 0.045).

DISCUSSION

Few studies suggested that under-weight, overweight or obese students were more likely to be associated with low self-esteem. Our study showed non-significant association between BMI or waist circumference and self-esteem level among adolescent age group for both gender. Studies have shown being normal weight did not necessarily guarantee positive self-esteem among their peers therefore children who diagnosed with obesity, obesity-related co-morbidities or underweight child have the same normal weight self-esteem scores (Wong, William *et al*., 2014). In contrast Studies demonstrate that self-esteem affected by higher BMI through negative correlation and being a girl is moreliable to be influenced by self-esteem and higher BMI (Becerra *et al*., 2015; Hesketh *et al*., 2004). Another study showed the thinner body shape also is low self-worth and low physical self-concept have more significant effect body dissatisfaction than overweight does (Canpolat *et al*., 2005).

Our findings showed that students who live with low level educated parents (both or either parents) whom have high school degree or below were morelikely to develop lower self-esteem than other. Studies on self-esteem and parent's education showed that students whom have mothers or father graduated only from primary school or below was significantly lower self-esteemscore than those of adolescents whom their mother or father who had bachelor's degree or higher (Sahin *et al*., 2013). In contrast, other study had shown nocorrelation between parents' education and adolescence self-esteem level (Blackmon, 1997).

Our study identified that student who report active or passive smoking was more likely toscore lower in RSES of self-esteem than others who didn't.Studies have shownthere is gender gap in smoking behavior appears to occur primarily among individuals with lower self-esteem especially in male while other study shows self-esteem in female is a factor to initiate and maintaining smoking habit more than male (Hale *et al*., 2015; Abernathy *et al*., 1995). Obese females with lower body image satisfaction are more likely to develop lower levels of self-esteem by early adolescence than male (Strauss, 2000; Croghan *et al*., 2006). In addition, obese children with decreasing levels of self-esteem tends to have higher rates of sadness, loneliness, and nervousness and are more likely to engage in high-risk behaviors like smoking or consuming alcohol (Strauss, 2000; Croghan *et al*., 2006 and McGee, 2000). An increased risk of been smokersobserved in adulthood for those who had low self-esteem during the adolescence. However, other study showed that low self-esteem during the adolescence isn't significantly associated with smoking in adulthood (Saari, 2015).

Our study does stress on the importance of the good lifestyle habits such as healthy diet and physical activities.Our findings showed that students who have higher self-esteem tend to have good dietary habits such as regular eating of fruit and vegetable (p 0.056) while students who have lower self-esteem were more likely to have sedentary lifestyle (p0.078). Studies on eating habits identified that strong association between a low level of self-esteem and dislike of body shape, and an abnormal pattern of eating (Hoare *et al*., 1998). Recent study that reinforce the role of thepositive family and parent level interpersonal dynamics such as warmth, group enjoyment, parental positive reinforcement at family meals as a factor to reduce risk of childhood overweight and obesity (Tremblay *et al*., 2000). Studies on self-esteem and physical activity among children showedthat physical active negatively associated with BMI and positively with self-esteem and indirectly positive relationship with academic achievement of both boys and girl (Tremblay *et al*., 2000 and Hoda, Edona, 2013). Studies on self-esteem and healthy behavior shows that self-esteem was

positively influenced both through physical activity and the consumption of fruits and vegetableswhile poor dietary habits negatively influenced self-esteem and academic achievement, and self-esteem was negatively influenced by increasing levels of BMI (Kristjánsson *et al*., 2010). Our study strengths includes evaluation of factors that may affect self-esteem, BMI,and waist circumference which includes socioeconomic status, diet habits, sleeping habits, physical activity andsmoking. Our weakness includes small sample size for both gender especially girls and that only one city included.

Conclusion

There was no significant correlation between BMI and self-esteem. Although, students who are underweight were more likely to be in the low self-esteem group.Students who have normal/high self-esteem tend to be non-significantly younger, have higher BMI, larger waist circumference, more likely to be overweight/obese, and were more likely to reports healthy lifestyle related habits. Non-significant positive partial correlation between RSES and both BMI (r 0.53, p 0.173) and waist circumference (r 0.074, p 0.094).Significant positive partial correlation between RSES and smoking were noted.

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