ORIGINAL ARTICLE

CHILD-REPORT AND PARENT-REPORT OF HEALTH-RELATED QUALITY OF LIFE AMONG 9-11 YEARS OLD OBESE SCHOOL CHILDREN IN TERENGGANU, MALAYSIA

Nur Nadzirah Aziz[1], *Sharifah Wajihah Wafa Syed Saadun Tarek Wafa[1], Hasmiza Halib[1], Marhasiyah Rahim[2], and Mohd Razif Shahril[1]

[1]School of Nutrition and Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin (UniSZA), Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia.
[2]School of Rehabilitation Science, Faculty of Health Sciences, Universiti Sultan Zainal Abidin (UniSZA), Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia.

*Corresponding author: sharifahwajihah@unisza.edu.my

ABSTRACT

Obese children had impaired psychosocial status as they generally tend to be socially isolated, have poor self-esteem, anxiety, mood disorder (depression and bipolar disorder) and eating disorder. The aim of this study was to investigate the child-report and parent-report of HRQoL among 9-11 years old obese school children in Malaysia and to determine the associated factors of HRQoL among obese children in Malaysia. This study was a cross-sectional study involving 101 obese Malay primary school children aged 9-11 years old from eleven primary schools in Kuala Terengganu which were selected via convenience sampling. Height and weight of the respondents were measured and their BMI was calculated. Health-related quality of life (HRQoL) was measured using PedsQL version 4.0. The mean age of the respondents was 10.02 ± 0.82 years old with mean BMI z-score was 3.01 ± 0.60. There were significance differences between boys and girls in; 1) emotional domain score for child-report QoL (p=0.019) using paired t-test and 2) psychosocial domain score for parent-report QoL (p=0.025). Regression analysis found that age and gender were the associated factors for Psychological Health for obese children (p<0.005). Being obese had negative effects on children's quality of life. Various strategies interventions should be done to improve the HRQoL of these obese children. A multidisciplinary approach in schools must be organized to encourage a healthy lifestyle as part of routine among the school children.

Keywords: *Health-related quality of life, obese, children, pedsQL*

INTRODUCTION

In Malaysia, the prevalence of childhood obesity has been increasing at alarming rates over the last few decades; that will cause a huge healthcare burden to the country in the future. The latest National Health and Morbidity Survey (NHMS 2015) reported that the prevalence of childhood obesity in Malaysia was 11.8% with the children aged 5-9 years old had the highest prevalence followed with children aged 10-14 years old [1]. Rapid increases in the prevalence of childhood obesity has alarmed public health agencies, health care clinics, health care researchers and the general public as it negatively affect both health [2] and psychological well-being of the children[3].

Being obese was one of the reasons why children were teased or bullied at school[4]. Obese children were more frequently teased for physical appearance, being called by nasty names, high levels of physical victimization, exclusion from sports or group activities, and being threatened compared to normal weight group [4]. The association between weight status and bullying might be the causal for psychological problems that occurred among obese children, and in turn causing poor health-related quality of life (HRQoL) among them. Several studies has shown that obesity have negative impact on HRQoL in children [5,6]. A study on HRQoL amongst primary school children aged 9-11 years old in Kuala Terengganu found that obese children had lower psychosocial health domain and total HRQoL than normal weight children[7], giving evidence that weight status especially being obese indeed negatively affect the quality of life of the children. In other words, the greater the severity of obesity, the poorer the quality of life of the children. Besides weight status, a study among adults in the United Stated found an association of age, gender, income, health status, current smoking, diet, exercise, and obesity with HRQoL [8]. In a study targeting overweight and obese children in Korea, Kim et al. (2013) reported that self-esteem, depression, physical stress and monthly household income were predictors of HRQoL[9].

Furthermore, in order to get full understanding of the impact of obesity on HRQoL, a parent proxy report is merely important to measure the HRQoL of obese children because of the inability of this

group young age children to interpret the HRQL item in the questionnaire. The perception of the parents constitutes a very useful alternative for assessing the HRQoL of obese children[10]. A review of HRQoL found that there is disagreement between the child-report and parent proxy report of HRQoL. Parents tend to rate a child's HRQoL lower than the child usually does[11]. Although a previous study conducted by Wafa et al. (2016) mentioned examine differences between child-report and parent-proxy report on Physical Health domain and Psychosocial Health domain but the study did not report the details in differences for each questions in Physical functioning, Emotional functioning, Social functioning and School functioning between child-report and parents-report[7]. There are no previous studies that report in details of the HRQoL both child and parent HRQoL scores in obese children. In order to promote health and welfare of obese children, it may be particularly important to gather such information for the development of interventions and policy, while reducing obesity.

Thus, the aim of this study are to investigate the child-report and parent-report of HRQoL among 9-11 years old obese school children in Malaysia and to determine the associated factors of HRQoL among obese children in Malaysia.

METHODOLOGY

Study design and subject recruitment

This study was a cross-sectional study involving 101 obese Malay primary school children aged 9-11 years old from eleven primary schools in Kuala Terengganu which were selected via convenience sampling. This age group of children were selected as children under age 9 years had showed deficient understanding of the purpose of the study, its potential harms and benefits, and their right to withdraw [12]. Sample size for the present study was based on National Health Morbidity Survey 2011 report that reported 5.5% of obese children (<18 years) in Terengganu. A level of confidence at 95% with a 5% level of significance and an additional of 20% of dropout that give a total of 100 obese children were recruited in the present study. Obesity was defined as BMI z-score > +2SD (relative to WHO, 2007 Growth chart reference) based on age and gender specific.

Anthropometric Measurements

Height was measured using a portable stadiometer to the nearest 0.1 cm and weight was measured using a digital weighing scale (Seca Robusta 813) to the nearest 0.1 kg. Before height and weight measurements, respondents need to take off their shoes, hat, or any head wear so that it does not interfere with the measurement. For the purpose of this study, only obese children whom BMI z-score were more than +2SD were invited to the study centre located at Universiti Sultan Zainal Abidin (UniSZA), Kuala Terengganu.

Health-Related Quality of Life Measurements

The Paediatric Quality of Life Inventory™ (PedsQL) version 4.0 questionnaires for children aged 8-12 years old, translated into Malay were used to measure the health-related quality of life (HRQoL) of obese children. It has acceptable reliability and predictive validity in Malay, Mandarin and Tamil language for both child self-report and parent proxy-report for children aged 5-7 and 8-12 years as well as adolescent aged 13-18 years old[13] . For this study, we used both PedsQL questionnaires of children self-report and parent proxy-report for children aged 8-12 years old. The questionnaires were self-administered by both parents and children in the presence of the researcher. The items on both parents and children forms were similar, but differing in language used either as a first or third person tense [14]. Both children and parents used different questionnaires as children self-report was used to assess the perception of their internal opinions while parents report was used to assess their children's observable behaviours [15].

The PedsQL questionnaire contains 23 items with four dimensions; physical functioning (eight items), emotional functioning (five items), social functioning (five items) and school functioning (five items). A five point response-scale was used in these questionnaires; 0 = never a problem, 1 = almost never, 2 = sometimes, 3 = often and 4 = almost always. The items were reversed scored with a scale from 0-100, which the higher scores represent the better health-related quality of life (HRQoL).

If there were more than 50% missing scale, then the scores were not computed in the present study. However, if there were 50% or more items completed, then the mean of the completed items were imputed in the scales. Mean score was calculated when the sum of the items were divided with the number of items answered. Psychosocial Health summary score was calculated when the sum of items in Emotional, Social and School Functioning scales were divided with the numbers of items answered; while Physical Health Summary score was calculated as Physical Functioning scale was divided with the number of items answered. Lastly, the total score was calculated when the sum of all items were divided with the total number of items (means of 23 items). These scores were calculated for both child and parents.

Ethical Approval

Prior to the study, ethical approval to conduct this study was obtained from UniSZA Human Research Ethic Committee (UHREC)(UniSZA.N/1/628-1 (28)). A letter of approval to conduct the study was also obtained from the Ministry of Education as well as from Terengganu State of Education Department. Permission from respective school principals were obtained before the commencement of the study. Informed consent form was obtained from both parents and children prior to data collection.

Statistical Analysis

All statistical analysis was done using SPSS version 20.0. Independent *t*-test was applied to compare the difference of two means between boys and girls and dependent t-test for between parents and children. The magnitude of the difference between the two variables between parents and children were measured using Cohen's *d* effect size. Cohen's *d* was calculated as the mean difference between child-report and parents-report (child-report PedsQL score – parent-report PedsQL score) were divided by its standard deviation (SD). A d-value > +0.2 indicated that the parents rated their children QoL lower than their children did, while d-value < -0.2 indicated that the parents rated their children QoL higher than their children did [16]. The analysis was considered significant at a p-value less than 0.05. In addition regression analysis was carried out to determine the socio-demographic risk factor (sex, age, weight, parental education and household income) of HRQoL for obese children. Variables chosen for multiple linear regression analysis using stepwise method were decided not only based on statistical significance in univariable analysis ($p < 0.25$) but also on principles of parsimony and biological plausibility. Final results were presented with crude and adjusted regression coefficients with 95 % confidence interval (CI) and corresponding p-values. A p-value of less than 0.05 was regarded as statistically significant.

RESULTS

Out of 101 obese children, 61.4% of them were boys with the total mean age of 10.02 ± 0.82 years old (Table 1). Majority of the parents received secondary school level with mean household income RM4500.70±4284.33. Their mean BMI z-score was 3.01 ± 0.60 (Table 2). There were no significant differences found in all anthropometric measurements between boys and girls ($p>0.05$). Comparison between parents and children report showed that children had higher score in all domains (Table 2). However, no significant differences were observed in all domains between parents and children report ($p>0.05$).

Table 1: Demographic characteristics of the respondents (n=101)

Characteristics	Frequency	Percentage (%)	Mean (SD)
Gender			
Boy	62	61.4	
Girl	39	38.6	
Age			10.02 (0.82)
Boys			10.13 (0.76)
Girls			9.84 (0.88)
Parents education			
Father (n=85)			
No education	0	0.0	
Primary school	8	9.4	
Secondary school	50	60.0	
College/university	26	30.6	
Mother (n=92)			
No education	0	0.0	
Primary school	1	1.0	
Secondary school	56	62.0	
College/university	34	37.0	
Household income/month (n=97)			4500.70 (4284.33)
Less than RM 1500	24	24.7	
RM 1500 – RM 3500	29	29.9	
RM 3501 – RM 5500	17	17.5	
RM 5501 – RM 7500	8	8.3	
More than RM 7500	19	19.6	

There were no significant differences for parent-proxy report for all domains between boys and girls except for psychosocial domain (Table 2). Parent-proxy report for boys reported significantly higher in psychosocial domain compared to parent-proxy report for girls. In child self-report, boys reported significantly higher in emotional domain compared to girls (70.18 ± 16.32 vs. 61.18 ± 18.99; p<0.05). However, there were no significant differences for other domains.

Comparison for each question between child-report and parent-report showed that there were significant differences in 2 items (25%) in the physical subscale (P1 and P4). While based on Cohen's *d*, parent-reported ratings was lower than the children-reported ratings for 3 items on physical subscale (P1, P2, and P3), and 1 item on school subscale (Sc1) (Table 3).

The univariate analysis showed that children with older age and higher BMI had lower Psychosocial Score and Total Score. Being a girl associated with lower Psychosocial Score (p<0.25). Parent with girls as a children had lower Psychosocial Score and Total Score. Parents with older children had lower Psychosocial Score and higher mother education had lower Physical Score (Table 4). However, using multivariate regression analysis, older children and girls were associated with lower Psychosocial Scores for child-report and parent-report, respectively (p<0.05) (Table 4). There were no associated factors for Physical Scores and Total Scores for both child and parent-report.

Table 2: Anthropometric status and PedsQL score of the respondents (n=101)

	Total (n=101)	Boys (n=62)	Girls (n=39)	p-value[1]	p-value[2]
Height (cm)	140.96 (7.35)	141.00 (7.27)	140.90 (7.59)	0.949	
Weight (kg)	54.07 (10.83)	53.10 (10.29)	55.66 (11.63)	0.274	
BMI (kg/m^2)	26.93 (3.33)	26.50 (3.38)	27.63 (3.19)	0.120	
BMI z-score	3.01 (0.60)	3.06 (0.66)	2.94 (0.50)	0.360	
Waist circumference (cm)	85.65 (8.95)	85.21 (8.67)	86.37 (9.49)	0.571	
Parent-proxy report					
Total score	72.15 (16.06)	73.93 (16.05)	69.21 (15.89)	0.178	0.167
Psychosocial score	72.20 (14.77)	74.91 (14.28)	67.75 (14.68)	**0.025***	0.366
Emotional	66.33 (19.35)	69.29 (18.33)	61.47 (20.28)	0.063	0.796
Social	78.00 (18.23)	80.89 (16.04)	73.24 (20.74)	0.070	0.863
School	72.28 (18.83)	74.55 (19.69)	68.53 (16.95)	0.142	0.222
Physical score	72.05 (23.04))	72.10 (23.28)	71.97 (23.00)	0.979	0.116
Child self-report					
Total score	73.85 (13.92)	74.92 (13.79)	72.09 (14.15)	0.352	
Psychosocial score	73.15 (13.69)	75.00 (13.28)	70.10 (14.00)	0.100	
Emotional	66.78 (17.82)	70.18 (16.32)	61.18 (18.99)	**0.019***	
Social	78.28 (17.83)	80.71 (16.16)	74.26 (19.89)	0.096	
School	74.39 (16.13)	74.11 (17.03)	74.85 (14.74)	0.833	
Physical score	75.17 (17.96)	74.78 (18.12)	75.83 (17.95)	0.790	

Values were presented as mean (SD)
[1] Comparison between boys and girls; Independent t-test by group
[2] Comparison between parents and children; dependents t-test by group
**p<0.05*

DISCUSSION

Obese children were commonly blamed for their excessive weight and often being victimised at school [17], such as being avoided, ignored, excluded from social activities, verbal threats, being teased in the cafeteria, physical harassment and having negative rumours spread about them [17]. Those children had the highest risk of becoming the target for stigmatisation [18] which might be the reason of lower quality of life in obese children when compared to their healthy weight peers as observed in previous studies [3,5].

Table 3: Comparison for child-report and parent-report PedsQL (n=101)

Items#	Difference[a]	SD	p-value	d[b]
Physical Function				
P1: Hard to walk more than a block	9.44	31.30	**0.043***	**0.30¥**
P2: Hard to run	6.67	29.82	0.134	**0.22¥**
P3: Hard to do sports or exercise	0.28	30.72	0.952	0.01
P4: Hard to lift something heavy	2.50	25.58	0.514	0.10
P5: Hard to take bath or shower	10.83	34.57	**0.035***	**0.31¥**
P6: Hard to do chores around house	-1.11	29.14	0.799	-0.04
P7: Hurt or ache	-2.22	24.59	0.546	-0.09
P8: Low energy	-1.39	25.58	0.717	-0.05
Emotional Function				
E1: Feel afraid of scared	2.22	28.13	0.598	0.08
E2: Feel sad or blue	-0.83	25.31	0.826	-0.03
E3: Feel angry	-1.11	25.83	0.774	-0.04
E4: Trouble sleeping	0.00	26.95	1.000	0.00
E5: Worry about what will happen	1.94	29.95	0.664	0.06
Social Function				
So1: Trouble getting along with peers	-0.56	22.79	0.871	-0.02
So2: Other kids do not want to be friend	0.28	23.35	0.937	0.01
So3: Teased	0.00	27.16	1.000	0.00
So4: Not doing things other peers do	-1.39	23.31	0.691	-0.06
So5: Hard to keep up when play with others	3.06	27.64	0.460	0.11
School Function				
Sc1: Hard to concentrate	6.94	30.84	0.131	**0.23¥**
Sc2: Forget things	-0.28	25.77	0.943	-0.01
Sc3: Trouble keeping up with school work	4.17	31.69	0.379	0.13
Sc4: Miss school, not well	-0.56	23.28	0.873	-0.02
Sc5: Miss school, doctor appointment	0.28	22.50	0.934	0.01

***p<0.05; ¥d>0.2**

[a]Difference = (Child-report PedsQL score) - (parent-report PedsQL score)

[b]Cohen's d = mean difference / SD

The most recent study on quality of life amongst 156 primary school children aged 9-11 years old in Kuala Terengganu found that obese children had lower psychosocial health domain and total QoL than normal weight children [7], giving evidence that there was negative relationship between QoL and BMI. However, obese children in the present study had a higher total score and psychosocial health score than obese children in previous study [7]. In contrast, mean total score of obese children in this study was lower than mean total score of obese children in urban Sarawak [3].

Overall, parent-proxy report and child-report of QoL among obese children in this study were similar in all domains. Similarly, mean total score of obese Malaysian children were similar between parent-report and child-report [19]. However, using Cohen's d calculations, parent tend to underestimate their children's' physical function as they thought that their children had difficulties in walking and taking a bath. Similarly, a study on the parent-report of severely obese children had a significantly lower total score, psychosocial health, emotional functioning and social functioning than child-report [20]. Because parents normally showed more concern regarding their children's body weight [3]. They often perceived that their children's BMI negatively affected their children's QoL, particularly in school performance.

Parents tend to report lower total score, physical score and psychosocial score than their children as they were more concerned if their children's body mass index will have an effect on children's quality of life [3]. Parent perceived in QoL might be more important than the child as the decision to seek treatment for obesity usually lies with the parents rather than the child [21]. The fact that child self-report was not consistent with parent-proxy report does not indicated lack of validity but more likely refer to the differences in perceptions regarding quality of life [20]. In contrast, one study found that parents of obese children tended to overestimate the quality of life of their children [22], because the parents were unaware of their children's obesity induced problems.

Table 4: The associated factors of health-related quality of life

Variables	Psychosocial		Physical		Total	
	b (95% CI)	p-value	*b* (95% CI)	p-value	*b* (95% CI)	p-value
Child-Report						
Sex (Girl)						
[a]Unadjusted	-4.90 (-10.76, 0.95)	0.100*	1.05 (-6.75, 8.85)	0.790	-2.83 (-8.85, 3.19)	0.352
[b]Adjusted	-3.87 (-9.80, 2.07)	0.198	1.12 (-6.89, 9.13)	0.782	-2.13 (-8.27, 4.00)	0.492
Age						
[a]Unadjusted	4.30 (0.79, 7.81)	0.017**	0.72 (-3.97, 5.41)	0.761	3.05 (-0.55, 6.66)	0.096*
[b]Adjusted	4.57 (0.81, 8.32)	0.018**	0.60 (-5.08, 6.28)	0.834	2.83 (-0.85, 6.50)	0.130
Weight (kg)						
[a]Unadjusted	0.24 (-0.02, 0.51)	0.072*	0.06 (-0.29, 0.42)	0.725	0.18 (-0.09, 0.45)	0.191*
[b]Adjusted	0.18 (-0.13, 0.49)	0.256	0.03 (-0.39, 0.46)	0.875	0.13 (-0.20, 0.45)	0.432
Parent-Report						
Sex (Girl)						
[a]Unadjusted	-7.17 (-13.40, -0.93)	0.025**	-0.13 (-10.14, 9.88)	0.979	-4.72 (-11.63, 2.19)	0.178*
[b]Adjusted	-7.27 (-13.74, -0.79)	0.028**	0.59 (-10.87, 9.67)	0.910	-4.80 (-11.81, 2.22)	0.264
Age						
[a]Unadjusted	4.26 (0.45, 8.07)	0.029**	-1.14 (-7.21, 4.92)	0.708	2.38 (-1.83, 6.59)	0.264
[b]Adjusted	3.60 (-0.21, 7.42)	0.064	-0.44 (-6.51, 5.63)	0.886	2.36 (-1.93, 6.64)	0.278
Mother Education						
Secondary						
[a]Unadjusted	-1.26 (-7.68, 5.15)	0.696	-7.12 (-17.01, 2.79)	0.157*	-3.30 (-10.24, 3.65)	0.348
[b]Adjusted	1.18 (-6.43, 8.78)	0.759	3.17 (-47.11, 53.46)	0.900	4.36 (-28.24, 36.96)	0.791
Tertiary						
[a]Unadjusted	1.78 (-4.66, 8.23)	0.584	7.35 (-2.60, 17.30)	0.146*	3.72 (-3.26, 10.70)	0.292
[b]Adjusted	3.24 (-3.09, 9.57)	0.312	8.30 (-1.68, 18.27)	0.102	4.42 (-2.58, 11.41)	0.213

[a]Crude regression coefficient by simple linear regression, [b]Adjusted regression coefficient by multiple linear regression The models reasonably fitted well. Model assumptions were met. There were no interaction and multicollinearity problems

**Significant p-values (<0.25), **Significant p-values (<0.05),*

The present study found that there were significance differences between boys and girls in; 1) psychosocial domain score for parent-report QoL: and 2) emotional domain score for child-report QoL. This study reported that girls had lower emotional scores than boys in child-report QoL. Moreover, being gender difference obese girl was found in the present study as the associated factor for lower psychosocial health. This was probably due to the fact that girls were more concerned regarding their weight status than boys, thus making them more exposed to psychosocial problems [23]. Girls' BMI was significantly associated with depressive symptoms while boys' BMI not significantly associated with depressive symptom [24]. Girls need friends to share or talk about their emotions as well as to play in a group, however, due to stigmatization and were generally not welcomed by their peers caused by their weight or appearances, might in turn cause emotional difficulties in these obese girl [25,26]. Besides, being overweight/ obesity was directly linked to physical appearance or body image and overweight girls had more negative attitudes toward physical appearance than boys [25], which might be another reason why obese girl in this study had lower emotional score than boys. The present study found that girls had significantly lower psychosocial domain score than boys in parent-report QoL. Similarly, a study in an extremely obese adolescents also reported that girls had lower emotional domain scores than boys in child-report QoL, but no significant differences were found between gender in parent-report QoL [27].

Contradictory to the present study, Riazi et al. (2010) found that boys and girls had similar QoL score in all domains for child-report; suggesting that the impact of obesity was not necessarily gender specific.[29] Meanwhile, a study on impact of psychosocial factors on QoL in overweight youth reported that boys had higher physical functioning score than girls in both child-report and parent-report QoL [30]. Moreover, consistent with the present study, several studies had showed that obese children had achieved the poorest score in the emotional domain [7,29], suggesting that obese children had high levels of anxiety and depression, but low level of self-esteem.

Besides gender, age also associated with HRQoL of obese children as older children tend to have

lower psychosocial health than younger children. This is because growth development had plays an important role in emotional, physical, and psychological changes in children and adolescents especially in girls thus has a negative effect on HRQoL [31].

This study has several limitations. First, we recruited only children aged 9-11 years old which was not large enough to represent the community sample. Second, only obese children participated in this study, limiting the weight status range.

CONCLUSION

Being obese had negative influences on children's quality of life. Various strategies on childhood obesity interventions should be directed toward improving the HRQoL of these obese children. A multidisciplinary approach in schools must be organized to encourage a healthy lifestyle as part of routine among the school children. Participating in the program in terms of subjective health, emotional and social well-being, as well as disease-specific HRQoL can give a possible benefit to this group of children. These findings should be tested using larger sample of obese children from various areas to determine the HRQoL of obese children in Malaysia.

ACKNOWLEDGEMENTS

We would like to thank the Ministry of Education and Terengganu Department of Education for their ethical approval to conduct this research in the school. We also would like to thank the school and students for their support throughout the recruitments and data collection process. This study received the financial support from Universiti Sultan Zainal Abidin, under the Research Acculturation Grant Scheme (RAGS) (RAGS/2012/UniSZA/SKK10/2/RR030).

REFERENCES

1. Institute for Public Health. *National Health and Morbidity Survey 2015 (NHMS 2015). Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems*.; 2015.

2. Reilly JJ, Coyle J, Kelly L, Burke G, Grant S, Paton JY. An objective method for measurement of sedentary behavior in 3- to 4-year olds. *Obes Res*. 2003;11(10):1155-1158. doi:10.1038/oby.2003.158.

3. Lee PY, Cheah W, Chang CT, Siti Raudzah G. Childhood obesity, self-esteem and health-related quality of life among urban primary schools children in Kuching, Sarawak, Malaysia. *Malays J Nutr*. 2012;18(2):207-219.

4. Bacchini D, Licenziati MR, Garrasi A, et al. Bullying and Victimization in Overweight and Obese Outpatient Children and Adolescents: An Italian Multicentric Study. *PLoS One*. 2015;10(11):1-13. doi:10.1371/journal.pone.0142715.

5. Hamzaid H, Talib RA, Azizi NH, Maamor N, Reilly JJ, Wafa SW. Quality of life of obese children in Malaysia. *Int J Pediatr Obes*. 2011;6(5-6):450-454. doi:10.3109/17477166.2011.590206.

6. Williams J, Wake M, Hesketh K, Maher E, Waters E. Health-related quality of life of overweight and obese children. *JAMA*. 2005;293(1):70-76. doi:10.1001/jama.293.1.70.

7. Wafa SWW bte SS, Shahril MR bin, Ahmad A bte, et al. Association between physical activity and health-related quality of life in children: a cross-sectional study. *Health Qual Life Outcomes*. 2016;14(1):71. doi:10.1186/s12955-016-0474-y.

8. Hassan MK, Joshi A, Madhavan S, Amonkar M. Obesity and health-related quality of life: a cross-sectional analysis of the US population. *Int J Obes*. 2003;27:1227-1232. doi:10.1038/sj.ijo.0802396.

9. Kim HS, Park J, Ma Y, Ham OK. Factors influencing health-related quality of life of overweight and obese children in South Korea. *J Sch Nurs*. 2013;29(5):361-369. doi:10.1177/1059840513475363.

10. Theunissen NCM, Vogels TGC, Koopman HM, Verrips GHW, Zwinderman KAH, M. SPV-V. The proxy problem: child report versus parent report in health-related quality of life researc. *Qual Life Res*. 1998;7:387-397.

11. Griffiths LJ, Parsons TJ, Hill AJ. Self-esteem and quality of life in obese children and adolescents: a systematic review. *Int J Pediatr Obes*. 2010;5(4):282-304. doi:10.3109/17477160903473697.

12. Field MJ, Berman RE. *The Necessity and Challenges of Clinical Research Involving Children*.; 2004. doi:10.17226/10958.

13. Varatharajan S, Chen WS. Validation and Reliability of PedsQL in Healthy Malaysian Pediatric Population. *Int J Soc Sci Stud*.

2013;1(1):90-95. doi:10.11114/ijsss.v1i1.61.

14. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med Care*. 2001;39(8):800-812. doi:10.1097/00005650-200108000-00006.

15. Kim J-H, Lee C, Sohn W. Urban Natural Environments, Obesity, and Health-Related Quality of Life among Hispanic Children Living in Inner-City Neighborhoods. *Int J Environ Res Public Health*. 2016;13(1). doi:10.3390/ijerph13010121.

16. Lin C-Y, Su C-T, Wang J-D, Ma H-I. Self-rated and parent-rated quality of life (QoL) for community-based obese and overweight children. *Acta Paediatr*. 2013;102(3):e114-9. doi:10.1111/apa.12108.

17. Puhl RM, Luedicke J, Heuer C. Weight-based victimization toward overweight adolescents: observations and reactions of peers. *J Sch Health*. 2011;81(11):696-703. doi:10.1111/j.1746-1561.2011.00646.x.

18. Sikorski C, Luppa M, Brahler E, Konig H-H, Riedel-Heller SG. Obese children, adults and senior citizens in the eyes of the general public: results of a representative study on stigma and causation of obesity. *PLoS One*. 2012;7(10):e46924. doi:10.1371/journal.pone.0046924.

19. Sharifah WW, Nur HH, Ruzita a T, Roslee R, Reilly JJ. The Malaysian Childhood Obesity Treatment Trial (MASCOT). *Malays J Nutr*. 2011;17(2):229-236. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=22303576.

20. Hughes a R, Farewell K, Harris D, Reilly JJ. Quality of life in a clinical sample of obese children. *Int J Obes (Lond)*. 2007;31(1):39-44. doi:10.1038/sj.ijo.0803410.

21. Hamzaid H, Talib RA, Azizi NH, Maamor N, Reilly JJ, Wafa SW. Quality of life of obese children in Malaysia. *Int J Pediatr Obes*. 2011;6(5-6):450-454. doi:10.3109/17477166.2011.590206.

22. Su C-T, Wang J-D, Lin C-Y. Child-rated versus parent-rated quality of life of community-based obese children across gender and grade. *Health Qual Life Outcomes*. 2013;11:206. doi:10.1186/1477-7525-11-206.

23. Chen Y-P, Wang H-M, Edwards TC, et al. Factors influencing quality of life of obese students in Hangzhou, China. *PLoS One*. 2015;10(3):e0121144. doi:10.1371/journal.pone.0121144.

24. Xie B, Chou C-P, Spruijt-Metz D, et al. Effects of perceived peer isolation and social support availability on the relationship between body mass index and depressive symptoms. *Int J Obes (Lond)*. 2005;29(9):1137-1143. doi:10.1038/sj.ijo.0803006.

25. Danielsen YS, Stormark KM, Nordhus IH, et al. Factors associated with low self-esteem in children with overweight. *Obes Facts*. 2012;5(5):722-733. doi:10.1159/000338333.

26. Wang C, Chen P, Zhuang J. A National Survey of Physical Activity and Sedentary Behavior of Chinese City Children and Youth Using Accelerometers. *Res Q Exerc Sport*. 2013;84(sup2):S12-S28. doi:10.1080/02701367.2013.850993.

27. Modi AC, Loux TJ, Bell SK, Harmon CM, Inge TH, Zeller MH. Weight-specific health-related quality of life in adolescents with extreme obesity. *Obesity (Silver Spring)*. 2008;16(10):2266-2271. doi:10.1038/oby.2008.347.

28. Riazi A, Shakoor S, Dundas I, Eiser C, McKenzie SA. Health-related quality of life in a clinical sample of obese children and adolescents. *Health Qual Life Outcomes*. 2010;8:134. doi:10.1186/1477-7525-8-134.

29. Riazi A, Shakoor S, Dundas I, Eiser C, McKenzie S a. Health-related quality of life in a clinical sample of obese children and adolescents. *Health Qual Life Outcomes*. 2010;8(1):134. doi:10.1186/1477-7525-8-134.

30. Janicke DM, Marciel KK, Ingerski LM, et al. Impact of psychosocial factors on quality of life in overweight youth. *Obesity (Silver Spring)*. 2007;15(7):1799-1807. doi:10.1038/oby.2007.214.

31. Palacio-Vieira JA, Villalonga-Olives E, Valderas JM, Herdman M, Alonso J, Rajmil L. Predictors of the use of healthcare services in children and adolescents in Spain. *Int J Public Health*. 2013;58(2):207-215. doi:10.1007/s00038-012-0360-2.