Int J Endocrinol Metab. 2021 October; 19(4):e113107. doi: 10.5812/ijem.113107.

Published online 2021 September 12. **Research Article**

Maternal Emotional States in Relation to Offspring Weight and Health-Related Quality of Life: Tehran Lipid and Glucose Study

Parnian Parvin [1], Parisa Amiri [1,*], Sara Jalali-Farahani [1,2], Mehrdad Karimi [1], Mina Moein Eslam [1] and Fereidoun Azizi [3]

[1] Research Center for Social Determinants of Health, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2] Student Research Committee, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3] Endocrine Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

[*] *Corresponding author*: Research Center for Social Determinants of Health, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: amiri@endocrine.ac.ir

Received 2021 January 25; **Revised** 2021 June 09; **Accepted** 2021 July 04.

Abstract

Background: Maternal characteristics have been known to be associated with parenting practices, which could eventually influence their child's weight and health-related quality of life (HRQoL).

Objectives: This study aimed to assess the direct and indirect associations of maternal emotional states (depression, anxiety, and stress) with body mass index (BMI) and HRQoL in their children.

Methods: This study was conducted within the framework of the Tehran lipid and glucose study (TLGS). Participants were the children (n = 231) enrolled in TLGS during 2014 - 2016, who had complete data on maternal emotional states. The body weight and height of children were measured using the standard protocol, and BMI Z-score was determined using Anthroplus. Also, HRQoL in children and emotional states in mothers were assessed using the Iranian version of the pediatric quality of life inventory (PedsQLTM4.0) and the depression, anxiety, and stress scale (DASS-21), respectively. Structural equations modeling (SEM) was used to assess the direct and indirect relations of maternal emotional states with children's BMI Z-score and HRQoL.

Results: Mean age, BMI Z-score, and HRQoL total score in children were 13.8 $\pm$ 3.1 years, 0.74 $\pm$ 1.5, and 84.7 $\pm$ 11.3, respectively. In the mothers, median DASS-21 scores (interquartile ranges) in the three scales of depression, anxiety, and stress were 4 (0 - 10), 6 (2 - 12), and 14 (8 - 20), respectively. Maternal level of education was significantly associated with the DASS-21 score (β = -0.23, 95% CI: -0.37,-0.07). Maternal DASS-21 score was significantly associated with BMI Z-score only in girls (β = 0.25, 95% CI: 0.06, 0.53). Significant determinants of HRQoL in boys were the child's age (β = -0.21, 95% CI: -0.40, -0.01) and maternal education (β = -0.24, 95%CI: -0.44, -0.02) and emotional state (β = -0.24, 95% CI: -0.44, -0.03). The child's age (β = -0.33, 95% CI: -0.53, -0.10) and maternal emotional state (β = -0.31, 95% CI: -0.54, -0.08) were significantly associated with HRQoL in girls.

Conclusions: The maternal emotional state is an important determinant of HRQoL in children, regardless of their weight status. Further research is recommended to examine the current hypothesized model in rural and suburban populations, taking into consideration more influential factors.

Keywords: Quality of Life, Maternal Mental Health, Weight, Children

1. Background

Mental disorders are among the most common health problems worldwide (1). In many societies, women are more prone to mental disorders than men due to various individual and social factors (2-4). The findings of a national survey in 2015 revealed that about one out of four Iranian adults were suspected of suffering mental disorders, ranging between 21 to 34.2% in different regions, with a higher prevalence in women and urban districts than in men and rural areas (5). Accordingly, a recent systematic review showed that the point prevalence of major depressive disorders in Iran was 4.1%, showing a 1.95-time higher rate in women than in men (6). Anxiety prevalence has been reported as 36 and 27% in Iranian women and men, respectively (7). Another study in Iran indicated a higher frequency and intensity of stress in women than in men (8). The considerable prevalence of emotional distress in women makes them vulnerable to several chronic diseases (9). Beyond the mentioned personal effects, emotional distress in women could negatively affect their maternal roles in shaping children's healthy lifestyles, leading to childhood obesity and poor health-related quality of life (HRQoL) (10).

Childhood obesity shows a rising trend in Iran, similar to many developed and developing countries during the last decades (11-13). Being overweight is a multifactorial phenomenon, and several personal and environmental factors can predispose children to this condition (13). The child's weight has a deep correlation with the family environment and parental characteristics (14, 15), particularly the mother's eating style and emotional state (16-20). Our recent research highlighted the vital roles of maternal socio-demographic and cardio-metabolic characteristics in distinguishing parental risk clusters, as one of the main predictors of obesity in children (21). These findings were confirmed by other studies in other communities (22, 23). Despite existing indigenous information on the relationship between maternal socio-demographic and metabolic characteristics, similar data on maternal emotional factors and their children's weight status are limited to the information obtained from other societies, especially Western countries (24, 25). In this regard, previous findings showed that maternal depressive symptoms increased sedentary behaviors in children, which could directly affect their weight status (26, 27). Also, available data suggest that mothers' psychological stress is associated with reduced consumption of fruits and vegetables, lower physical activity, more sedentary behaviors (14, 15, 27), and a higher risk of excessive weight gain (16, 17) in offspring. More evidence revealed that the children of anxious mothers were more likely to suffer from sleeping and eating problems, which could negatively affect their weight status (18, 19).

Existing evidence also showed that maternal emotional distress, including depression, anxiety, and stress, might negatively affect different aspects of offspring's health, including mental health, social functioning, and learning abilities (18, 24, 28). In addition, the children whose mothers suffer from emotional distress are more likely to report poor HRQoL (29, 30). Health-related quality of life, as an essential health outcome, is defined as a comprehensive and multidimensional concept for assessing the patient's perspective about the impact of health or disease on his/her physical, mental, and social well-being (31). The association between the child's weight status and HRQoL has already been revealed, with several studies indicating the negative impact of childhood obesity on HRQoL (25, 32). Studies from Iran have also shown lower HRQol scores in obese children than in their over- or normal-weight counterparts (33, 34), which can be observed in a gender-specific pattern (35). Given the association of the maternal emotional state with offspring's weight status and HRQoL and the relationship observed between children's weight status and their HRQoL, it is reasonable to assume that the negative effect of maternal emotional distress will be intensified in overweight children. There is a lack of evidence regarding the potential link between the maternal emotional state and offspring's weight status in Iran. In addition, to the best of our knowledge, no investigation has studied the mediating role of children's weight in the link between the maternal emotional state and offspring's HRQoL. Therefore, using a structural equation modeling approach, in the current study and for the first time, we aimed to simultaneously investigate the direct and indirect effects of maternal emotional states, including depression, anxiety, and stress, on children's weight status and HRQoL among a population of Tehranian families. Examining the mentioned associations between the maternal emotional state and offspring's HRQoL can provide more insights into the impact of the maternal-child relationship on children's health. Such information would also be helpful for healthcare providers and policymakers.

2. Methods

2.1. Study Participants

The Tehran Lipid and Glucose Study (TLGS) is a longitudinal survey designed to determine cardiovascular risk factors in the urban district 13 of Tehran, located in the middle of the city, and assess lifestyle modifications to decrease the prevalence of non-communicable diseases. The participants' age distribution represented Tehran's total population. The related measurements for all participants were conducted at the baseline (1999-2001) and repeated every three years. Further details regarding the rationale and design of the TLGS have been reported elsewhere (36, 37).

The data related to all school-aged children (aged 8 to 18 years) who participated in TLGS during 2014 - 2016 were considered for the current study (n = 309). After excluding those with incomplete maternal information (n = 78), 231 children (51% boys) and their mothers were recruited for the final analysis. The participants provided informed written consent. Ethical approval was obtained from the Ethics Committee of the Research Institute for Endocrine Sciences (RIES) (IR.SBMU.ENDOCRINE.REC.1397.130).

2.2. Measurements

Data on the age and anthropometric indices, including the weight and height, of children were collected by trained interviewers and staff. The participant's weight was measured using a digital scale while wearing minimum clothing and no shoes, and the height was measured in a standing position without shoes and shoulders in a normal alignment. To determine BMI-for-age (BMI Z-score),

WHO AnthroPlus (version 3.2.2) and macros software were used.

Health-related quality of life (HRQoL) in children was measured using the Pediatric Quality of Life Inventory™ version 4.0 (PedsQL™ 4.0) Generic Core Scales which consists of items and four subscales (physical, emotional, social, and school functioning) (38). For each item, children choose their answers from a five-point Likert scale ranging from 0 to 4 (0 = never a problem and 4 = almost always a problem). To score the scale, each item is reversely scored, with higher scores indicating a better HRQoL. Previous studies have assessed and reported the reliability and validity of the Persian version of PedsQL™ 4.0 in Iranian children (8 - 12 years old) and adolescents (12 - 18 years old) (39, 40).

In the current study, maternal data, including age, education, working status, and emotional state, were gathered. Maternal emotional states were assessed using the Depression, Anxiety, and Stress Scale- 21 Items (DASS-21). As a short and user-friendly self-report questionnaire, DASS-21 is applied to measure three related states of depression, anxiety, and stress symptoms (41) in both clinical and community settings (42, 43). Each scale of DASS-21 contains seven items, and each item is scored on a four-point Likert scale from 0 to 3 (0 = it is not applied to me at all, and 3 = it is applied to me very well, or most of the time). The score of each scale is calculated by summing the scores of relevant items, and a higher score in each of the scales of depression, anxiety, and stress indicates a more severe condition. This tool can differentiate stress from depression and anxiety (44), making it a suitable tool to assess these emotional states in a population-based study, such as the TLGS. The sensitivity and specificity of the questionnaire were 75 and 89%, respectively (45, 46). The validity and reliability of the Persian version of DASS-21 used in the current study have been confirmed and reported previously (47). Moreover, Cronbach's alpha coefficients for the depression, anxiety, and stress subscales were 0.77, 0.79, and 0.78, respectively. In addition, the correlation coefficients of this inventory with Beck's Inventory, Zung Anxiety Test, and Perceived Stress Inventory were reported as 0.7, 0.67, and 0.49, respectively (48).

2.3. Statistical Analysis

Data were represented as mean ± SD for normally distributed variables and as median (quartile 1, quartile 3) for variables with non-normal distribution. Normality assumption was examined by the Shapiro-Wilk test. The chi-square test was conducted to compare categorical variables between boys and girls. Independent samples *t*-test or its alternative non-parametric method, the Mann-Whitney U test, was used for comparing means between the two groups. Structural equation modeling (SEM) was used for examining direct and indirect associations among the measured variables. The hypothesized conceptual model, used to examine interrelationships between the variables, has been illustrated in Figure 1. Maternal education, age, and employment status, which described the maternal socio-demographic status, were regarded as exogenous independent variables. The maternal emotional state and the child's BMI were entered in the model as mediators, and the child's HRQoL was considered as the final dependent variable. The maternal emotional state and children's BMIs were considered as latent constructs and measured by their special indicators. Multiple group SEM analysis was conducted for sex-specific evaluations. The maximum likelihood method and Bayesian analysis were used for parameter estimation. Uniform distribution was set as a prior distribution of the parameters, and stability and admissibility were examined on prior data. Finally, the mean (95% confidence interval) of a marginal posterior distribution was reported as the parameter's estimate (49). Fit indices, including the ratio of the chi-square value to DF (χ^2/df), goodness of fit (GFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were calculated to measure the model's adequacy and appropriateness of SEM analysis. Hooper et al. have reported the acceptable thresholds of fit indices (50). For data description and SEM analysis, IBM SPSS statistics 23 and AMOS 23 software were utilized, respectively.

3. Results

The mean age, BMI Z-score, and HRQoL total score of the participants were 13.8 ± 3.1 years, 0.74 ± 1.5, and 84.7 ± 11.3, respectively. Further descriptive statistics of the study participants by sex groups have been presented in Table 1. There were no significant differences between boys and girls in the mean age, BMI Z-score, and the HRQoL scores of the social functioning and school functioning subscales; however, HRQoL scores were significantly higher in boys compared to girls in the physical and emotional functioning subscales. The mean age of the mothers was 42.2 ± 5.8 years; the majority of whom were housewives (80.5%) and had secondary levels of education (57.1%). There were no significant differences between the mothers of boys and girls comparing the DASS-21 score and the distribution of maternal employment status and education level.

Based on multiple group analysis, the measurement model, in which the maternal emotional state was considered the same in the mothers of boys and girls, fitted significantly better on the data ($\Delta\chi^2 = 27.65$, DF = 14, P = 0.01)

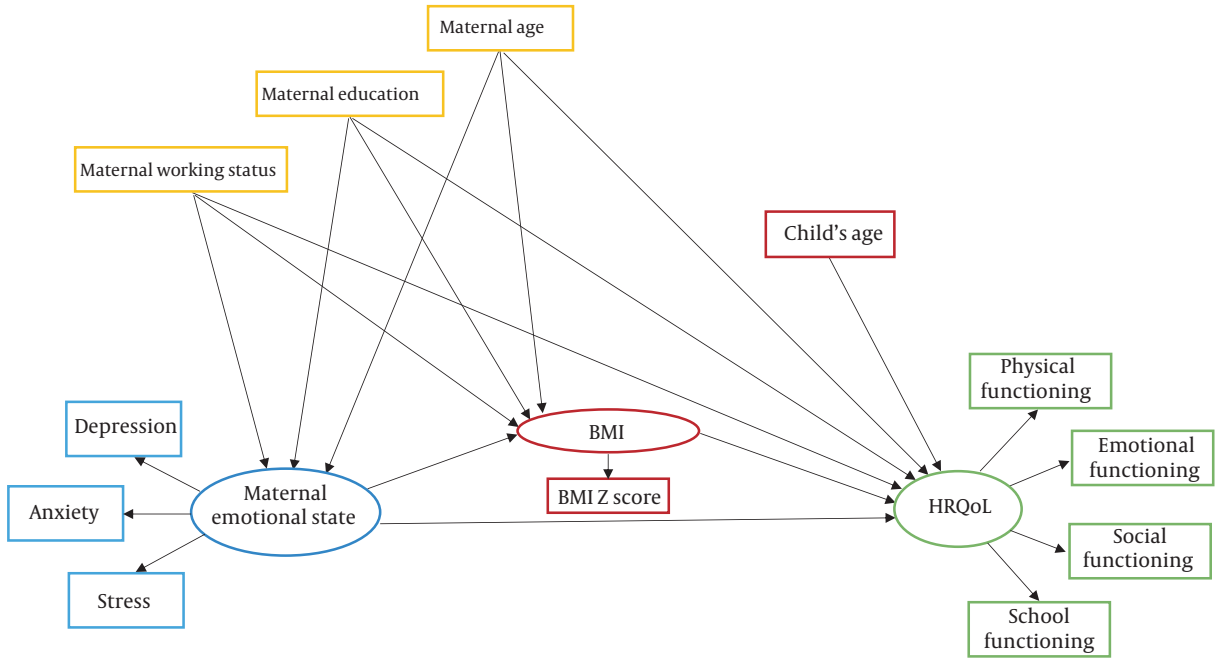

Figure 1. A conceptual model for the relationships of maternal characteristics and emotional states with children's body mass index (BMI) Z- scores and health-related quality of life (HRQoL).

compared to the unconstrained model (in which all the parameters were considered different in boys and girls). Therefore, a sex-specific analysis was conducted considering a number of the mentioned constraints.

Figure 2 displays the final structural models in boys and girls, showing significant associations between the variables, and related standardized estimations have been noted above each path. The fit indices of SEM models (as noted below Figure 2), indicate acceptable thresholds for both boys and girls.

Table 2 displays the results of the examined structural model in terms of the sex-specific associations of maternal characteristics with children's HRQoL. In the hypothesized SEM model, maternal age, education, and working status, as well as the child's age, were the exogenous variables observed. The latent construct of the maternal emotional state and children's BMI Z-score were mediators, and children's HRQoL was the endogenous latent construct. The negative effect of maternal education on the maternal emotional state was significant in both boys and girls (β = -0.23, P < 0.05). Considering maternal variables, only the maternal emotional state had a significant positive effect on girls' BMI Z-score (β = 0.25, P < 0.05). In terms of the determinants of the child's HRQoL, in boys, the child's age (β = -0.21), maternal education (β = -0.24), and maternal emotional state (β = -0.24), and in girls, the child's age (β = -0.33) and maternal emotional state (β = -0.31) had significant negative impacts on HRQoL (P < 0.05 for all). Regarding indirect effects, maternal variables had no significant effects on the child's BMI Z-score and HRQoL (P > 0.05).

4. Discussion

The current study examined a conceptual model for recognizing the direct and indirect relations of mothers' emotional states on their childrens' BMI and HRQoL. Our results indicated that while the maternal emotional state could directly affect HRQoL in both girls and boys, it was associated with weight only in girls. Interestingly, in neither of the genders, the weight status was associated with HRQoL, so its mediating role in the association between the maternal emotional state and offspring's HRQoL was not confirmed. In addition, among the maternal characteristics considered as influential factors in the initial hypothesized model, the level of education directly affected the maternal emotional state in the mothers of both boys and girls, but its effects on HRQoL was only significant in boys.

The current findings regarding the inverse relationship between the maternal emotional state and the child's HRQol are consistent with the data reported by previous studies (30, 51, 52). Maternal depression and stress are accompanied by inappropriate parenting practices and re-

Table 1. Descriptive Statistics of Study Participants

Variables	Total (n = 231)	Boys (n = 118)	Girls (n = 113)	P Value
Children's characteristics				
Age (y)	13.8 ± 3.1	13.9 ± 3.0	13.8 ± 3.2	0.85
BMI Z-score	0.74 ± 1.5	0.63 ± 1.5	0.86 ± 1.4	0.23
HRQoL (PedsQoL)				
Physical functioning	89.6 ± 11.3	91.5 ± 9.9	87.6 ± 12.3	0.008
Emotional functioning	73.5 ± 18.7	77.1 ± 15.7	69.7 ± 20.8	0.003
Social functioning	89.1 ± 13.0	90.2 ± 11.3	88.0 ± 14.5	0.19
School functioning	83.7 ± 14.5	83.2 ± 13.8	84.2 ± 15.3	0.59
Total HRQoL	84.7 ± 11.3	86.3 ± 9.9	83.0 ± 12.4	0.03
Maternal characteristics				
Maternal age (y)	42.2 ± 5.8	42.4 ± 6.2	41.9 ± 5.3	0.54
Maternal level of education, No. (%)				
Primary	36 (15.6)	21 (17.8)	15 (13.3)	0.38
Secondary	132 (57.1)	69 (58.5)	63 (55.8)	
Higher	63 (27.3)	28 (23.7)	35 (31.0)	
Maternal job status, No. (%)				
Housewife	186 (80.5)	94 (79.7)	92 (81.4)	0.86
Employed/student	45 (19.5)	24 (20.3)	21 (18.6)	
Maternal emotional state (DASS-21)				
Depression	4 (0 - 10)	4 (0 - 10)	4 (0 - 10)	0.89
Anxiety	6 (2 - 12)	6 (2 - 14)	6 (2 - 12)	0.97
Stress	14 (8 - 20)	16 (8 - 20)	14 (6 - 22)	0.38

Abbreviations: BMI, body mass index; HRQoL, health-related quality of life; DASS-21, depression, anxiety, and stress scale-21.

duced warmth and sensitivity in mothers' interactions with their children, delaying the achievement of developmental milestones and leading to poor self-regulation and executive performance by children, as well as poor overall functioning (52, 53). In addition, anxious mothers, via transmitting negative emotional and thinking patterns to their children and the lack of providing a motivational environment in the family, reduce their children's self-efficacy and success in future experiences (54).

Our results showed that the maternal emotional state was associated with a higher BMI level in girls but not boys. Several studies have reported a relationship between maternal emotional problems and the child's overweight (29, 32, 55); however, only one study has explicitly investigated this relationship in a sex-specific pattern, focusing on maternal depression (56). The findings of the recent study were consistent with ours, indicating a significant association between maternal depression and a higher BMI only in girls, mediated by the low levels of physical activity in girls (56). Another study demonstrated that mothers with emotional problems were more likely to have unhealthy weight-related behaviors (25), and regarding same-gender role modeling, the impacts of the maternal lifestyle are greater on daughters than on sons, justifying the observed higher BMIs in girls (57-59).

In the present study, no relationship was observed between the weight status and HRQoL in both sexes, contradicting our initial assumption regarding the role of BMI in modulating the association between the maternal emotional state and their children's HRQoL. The data available on the relationship between the weight status and HRQoL in children is controversial. Several studies have reported a negative association between the child's weight status and his/her HRQoL (60, 61). Tsiros et al., in a systematic review conducted on 22 studies, reported an inverse linear relationship between BMI and HRQoL in children, using both pediatric self-reports and parent proxy-reports (62). Further evidence indicates that Iranian children with higher BMIs are more likely to report poorer HRQoL (33). However, consistent with our results, two studies from Kuwait and

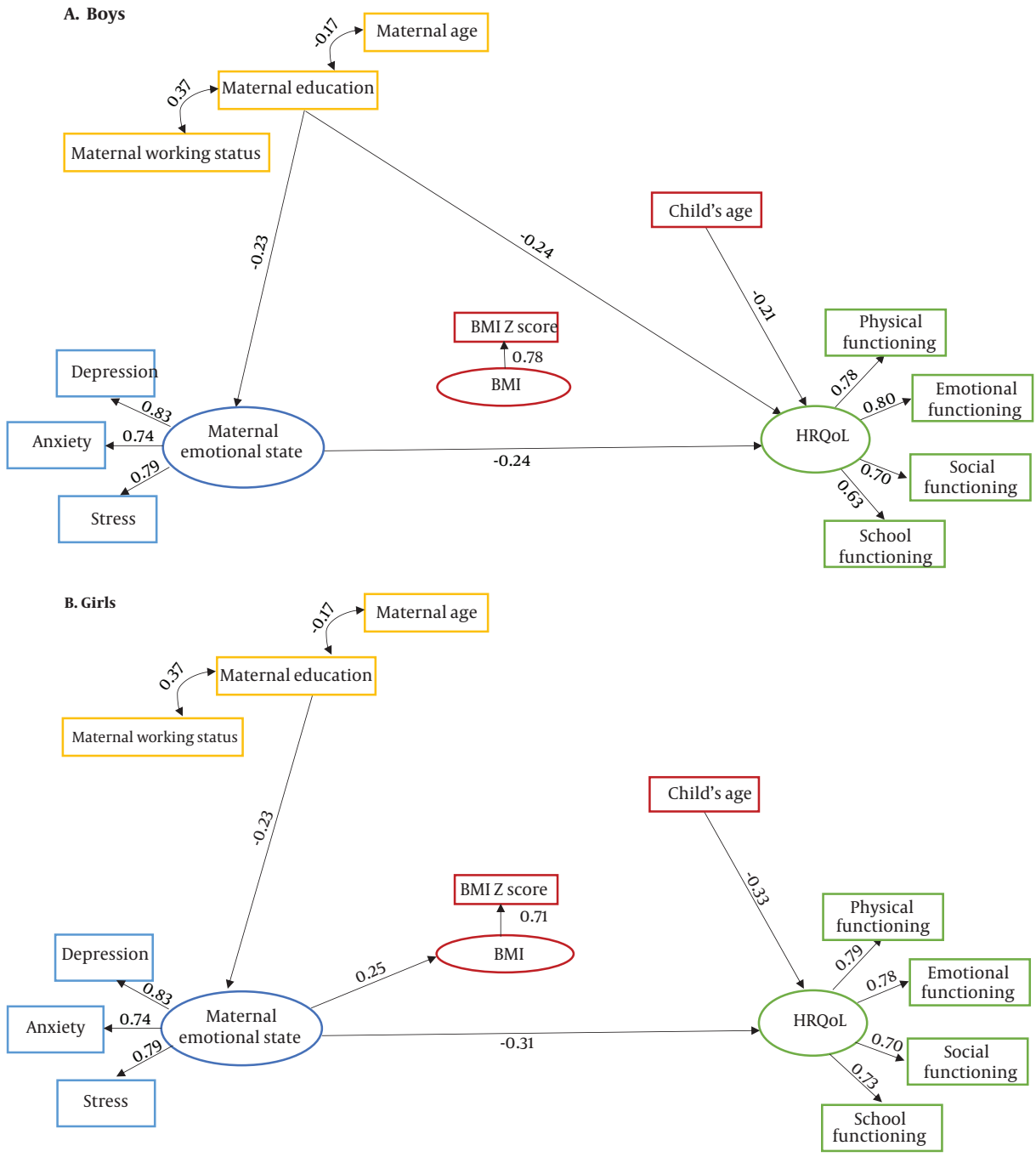

Figure 2. Final structural models after testing the relationships of maternal characteristics and emotional states with children's body mass index (BMI) Z- scores and health-related quality of life (A, boys; and B, girls). Fit indices were acceptable for both structural equations modeling (SEM) in boys (χ^2 = 69.8, DF = 42, χ^2/DF = 1.66, RMSEA = 0.75, GFI = 0.91, CFI = 0.93, IFI = 0.93, NFI = 0.90) and girls (χ^2 = 74.3, DF = 42, χ^2/DF = 1.77, RSMEA = 0.80, GFI = 0.90, CFI = 0.91, IFI = 0.92, NFI = 0.91).

Fiji found no strong association between the weight and HRQoL in children (63, 64); both of which reported that HRQoL scores in children with overweight/obesity did not significantly differ from the corresponding values in their normal-weight counterparts.

Our findings regarding the negative relationship between maternal education and HRQoL in boys, but not in girls, are difficult to compare with those of other stud-

Table 2. Sex-specific Associations Between Maternal Characteristics and the Child's Health-Related Quality of Life

Predictors	Response	Boys		Girls	
		Estimate [a]	95% CI	Estimate [a]	95% CI
Maternal age (y)	Maternal emotional state	-0.12	(-0.26, 0.02)	-0.12	(-0.26, 0.02)
Maternal education		-0.23	(-0.37, -0.07)	-0.23	(-0.37, -0.07)
Maternal working status		0.01	(-0.14, 0.15)	0.01	(-0.14, 0.15)
Maternal age (y)	Child's BMI Z score	-0.10	(-0.31, 0.13)	-0.06	(-0.33, 0.22)
Maternal education		0.10	(-0.16, 0.36)	0.11	(-0.17, 0.39)
Maternal working status		-0.13	(-0.37, 0.12)	-0.21	(-0.46, 0.07)
Maternal emotional state		0.12	(-0.13, 0.37)	0.25	(0.06, 0.53)
Child's age (y)	Child's HRQoL	-0.21	(-0.40, -0.01)	-0.33	(-0.53, -0.10)
Child's BMI Z-score		0.02	(-0.25, 0.28)	0.21	(-0.10, 0.51)
Maternal age (y)		-0.12	(-0.03, 0.06)	0.19	(-0.05, 0.41)
Maternal education		-0.24	(-0.44, -0.02)	-0.14	(-0.35, 0.08)
Maternal working status		0.05	(-0.15, 0.24)	0.12	(-0.10, 0.34)
Maternal emotional state		-0.24	(-0.44, -0.04)	-0.31	(-0.54, -0.08)

[a] Standardized path coefficients and their 95% confidence intervals (CI).

ies because there is no gender-specific study investigating this relationship. Nevertheless, contrary to our results, several studies have documented the positive relationship between maternal education and children's HRQoL in other countries (65, 66) and Iran (67). It seems that highly educated mothers who cannot work because of their child care duties have more parenting stress and experience less satisfaction with their maternal roles (68). Considering the emergence of sexuality in early adolescence and increasing complexities in opposite-sex relationships in the family, maternal stress seems to have stronger effects on sons' functioning (69). However, regarding the inconsistency of our findings with those of previous studies, more research is needed to clarify the relationship between the education of mothers and HRQoL in children. On the other hand, in our study, maternal education had a positive association with HRQoL in both girls and boys, which was mediated via the maternal emotional state and consistent with the findings of previous studies (70-72). Mothers with lower levels of education are more likely to suffer from depression and use negative and harsh parental practices, which adversely affect children's mental well-being and their ability to learn (70, 72). Also, given that education is one of the indicators of socioeconomic status, mothers who are less educated have limited access to social support and childcare services, leading them to experience excessive parenting stress, which can impede their ability to adequately meet their children's needs (73). Also, in this study, the HRQoL of children declined with age, which was also consistent with the observations of other studies (74, 75). As the age increases, puberty-related physical and hormonal changes can reduce the psychological balance (76). Also, because of the formation of new values and norms in adolescence, while seeking their new identity, teenagers may encounter social insecurity, moral contradictions, and an ambiguous future, which can ultimately impair their subjective well-being (75).

This study is one of the first efforts to explore the direct and indirect effects of the maternal emotional state on the child's weight status and HRQoL using a structural equation modeling approach. Our findings also add important information to the literature regarding gender differences in the above-mentioned parameters and interactions. However, certain limitations also need to be considered. First, the cross-sectional design of this study did not allow us to assess causal relationships between the studied variables. This study was conducted on an urban population in Tehran city, which might limit the generalizability of our findings to rural and suburban populations. Finally, by investigating other influential factors, such as parents' relationship quality and children's coping strategies, it is possible to provide a more accurate picture of the association between the maternal emotional state and the child's weight status and HRQoL.

In conclusion, our results highlighted the impacts of the maternal emotional state on the subjective health status of children (both girls and boys) irrespective of their BMIs. Further research is required to either confirm or de-

bate the gender-specific findings of this study.

Footnotes

Authors' Contribution: PP, PA, and SJF designed the study. PP, SJF, and MM drafted the manuscript. PP, PA, and SJF contributed to data interpretation. FA revised the manuscript critically for important intellectual content. PA supervised the study and revised the manuscript. MK conducted statistical analysis. All authors read and approved the final manuscript.

Conflict of Interests: The authors declare that they have no competing interests.

Ethical Approval: This study was approved by the Research Ethics Committee of the Research Institute for Endocrine Sciences (RIES), Shahid Beheshti University of Medical Sciences.

Funding/Support: The authors declare that they received no funding/support.

Informed Consent: All participants signed informed consent forms prior to data collection.

References

1. Mohammadi MR, Davidian H, Noorbala AA, Malekafzali H, Naghavi HR, Pouretemad HR, et al. An epidemiological survey of psychiatric disorders in Iran. *Clin Pract Epidemiol Ment Health*. 2005;**1**:16. doi: 10.1186/1745-0179-1-16. [PubMed: 16185355]. [PubMed Central: PMC1253522].
2. Boyd A, Van de Velde S, Vilagut G, de Graaf R, O'Neill S, Florescu S, et al. Gender differences in mental disorders and suicidality in Europe: Results from a large cross-sectional population-based study. *J Affect Disord*. 2015;**173**:245–54. doi: 10.1016/j.jad.2014.11.002. [PubMed: 25462424].
3. Wittchen HU, Jacobi F, Rehm J, Gustavsson A, Svensson M, Jonsson B, et al. The size and burden of mental disorders and other disorders of the brain in Europe 2010. *Eur Neuropsychopharmacol*. 2011;**21**(9):655–79. doi: 10.1016/j.euroneuro.2011.07.018. [PubMed: 21896369].
4. Abate KH. Gender disparity in prevalence of depression among patient population: A systematic review. *Ethiop J Health Sci*. 2013;**23**(3):283–8. doi: 10.4314/ejhs.v23i3.11. [PubMed: 24307828]. [PubMed Central: PMC3847538].
5. Noorbala AA, Faghihzadeh S, Kamali K, Bagheri Yazdi SA, Hajebi A, Mousavi MT, et al. Mental health survey of the Iranian adult population in 2015. *Arch Iran Med*. 2017;**20**(3):128–34. [PubMed: 28287805].
6. Gharraee B, Zahedi Tajrishi K, Sheybani F, Tahmasbi N, Mirzaei M, Farahani H, et al. Prevalence of major depressive disorder in the general population of Iran: A systematic review and meta-analysis. *Med J Islam Repub Iran*. 2019;**33**:151. doi: 10.34171/mjiri.33.151. [PubMed: 32280657]. [PubMed Central: PMC7137832].
7. Valizadeh R, Sarokhani D, Sarokhani M, Sayehmiri K, Ostovar R, Angh P, et al. A study of prevalence of anxiety in Iran: Systematic review and meta-analysis. *Der Pharma Chemica*. 2016;**8**(21):48–57.
8. Mirzaei M, Yasini Ardekani SM, Mirzaei M, Dehghani A. Prevalence of depression, anxiety and stress among adult population: Results of Yazd health study. *Iran J Psychiatry*. 2019;**14**(2):137–46. [PubMed: 31440295]. [PubMed Central: PMC6702282].
9. Turabian JL. Gender differences in prevalence of chronic disease: Facts and hypothesis; melody and harmony. *J Public Health General Med*. 2018;**1**(1):1–3.
10. Barroso CS, Roncancio A, Hinojosa MB, Reifsnider E. The association between early childhood overweight and maternal factors. *Child Obes*. 2012;**8**(5):449–54. doi: 10.1089/chi.2011.0094. [PubMed: 23181894]. [PubMed Central: PMC3647485].
11. Mansourian M, Marateb HR, Kelishadi R, Motlagh ME, Aminaee T, Taslimi M, et al. First growth curves based on the World Health Organization reference in a nationally-representative sample of pediatric population in the Middle East and North Africa (MENA): The CASPIAN-III study. *BMC Pediatr*. 2012;**12**:149. doi: 10.1186/1471-2431-12-149. [PubMed: 22985219]. [PubMed Central: PMC3471000].
12. Kelishadi R, Haghdoost AA, Sadeghirad B, Khajehkazemi R. Trend in the prevalence of obesity and overweight among Iranian children and adolescents: A systematic review and meta-analysis. *Nutrition*. 2014;**30**(4):393–400. doi: 10.1016/j.nut.2013.08.011. [PubMed: 24332523].
13. Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. Childhood obesity: Causes and consequences. *J Family Med Prim Care*. 2015;**4**(2):187–92. doi: 10.4103/2249-4863.154628. [PubMed: 25949965]. [PubMed Central: PMC4408699].
14. Lampard AM, Jurkowski JM, Lawson HA, Davison KK. Family ecological predictors of physical activity parenting in low-income families. *Behav Med*. 2013;**39**(4):97–103. doi: 10.1080/08964289.2013.802215. [PubMed: 24236806]. [PubMed Central: PMC4000568].
15. Lundahl A, Nelson TD, Van Dyk TR, West T. Psychosocial stressors and health behaviors: Examining sleep, sedentary behaviors, and physical activity in a low-income pediatric sample. *Clin Pediatr (Phila)*. 2013;**52**(8):721–9. doi: 10.1177/0009922813482179. [PubMed: 23524644].
16. Parks EP, Kumanyika S, Moore RH, Stettler N, Wrotniak BH, Kazak A. Influence of stress in parents on child obesity and related behaviors. *Pediatrics*. 2012;**130**(5):e1096–104. doi: 10.1542/peds.2012-0895. [PubMed: 23090343]. [PubMed Central: PMC3483892].
17. Suglia SF, Duarte CS, Chambers EC, Boynton-Jarrett R. Cumulative social risk and obesity in early childhood. *Pediatrics*. 2012;**129**(5):e1173–9. doi: 10.1542/peds.2011-2456. [PubMed: 22508921]. [PubMed Central: PMC3340590].
18. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. The timing of maternal depressive symptoms and mothers' parenting practices with young children: Implications for pediatric practice. *Pediatrics*. 2006;**118**(1):e174–82. doi: 10.1542/peds.2005-1551. [PubMed: 16818531].
19. Petrozzi A, Gagliardi L. Anxious and depressive components of Edinburgh Postnatal Depression Scale in maternal postpartum psychological problems. *J Perinat Med*. 2013;**41**(4):343–8. doi: 10.1515/jpm-2012-0258. [PubMed: 23426862].
20. El-Behadli AF, Sharp C, Hughes SO, Obasi EM, Nicklas TA. Maternal depression, stress and feeding styles: Towards a framework for theory and research in child obesity. *Br J Nutr*. 2015;**113**(Suppl):S55–71. doi: 10.1017/S000711451400333X. [PubMed: 25588385].
21. Jalali-Farahani S, Amiri P, Abbasi B, Karimi M, Cheraghi L, Daneshpour MS, et al. Maternal characteristics and incidence of overweight/obesity in children: A 13-year follow-up study in an Eastern Mediterranean population. *Matern Child Health J*. 2017;**21**(5):1211–20. doi: 10.1007/s10995-016-2222-7. [PubMed: 28102505].
22. Jiang J, Rosenqvist U, Wang H, Greiner T, Ma Y, Toschke AM. Risk factors for overweight in 2- to 6-year-old children in Beijing, China. *Int J Pediatr Obes*. 2006;**1**(2):103–8. doi: 10.1080/17477160600699391. [PubMed: 17907322].
23. Gibson LY, Byrne SM, Davis EA, Blair E, Jacoby P, Zubrick SR. The role of family and maternal factors in childhood obesity. *Med J Aust*. 2007;**186**(11):591–5. doi: 10.5694/j.1326-5377.2007.tb01061.x. [PubMed: 17547550].
24. Ordway MR. Depressed mothers as informants on child behavior: Methodological issues. *Res Nurs Health*. 2011;**34**(6):520–32. doi: 10.1002/nur.20463. [PubMed: 21964958]. [PubMed Central: PMC3207031].

25. O'Connor SG, Maher JP, Belcher BR, Leventhal AM, Margolin G, Shonkoff ET, et al. Associations of maternal stress with children's weight-related behaviours: A systematic literature review. *Obes Rev*. 2017;**18**(5):514–25. doi: 10.1111/obr.12522. [PubMed: 28296057]. [PubMed Central: PMC5523809].
26. Fernald LC, Jones-Smith JC, Ozer EJ, Neufeld LM, DiGirolamo AM. Maternal depressive symptoms and physical activity in very low-income children. *J Dev Behav Pediatr*. 2008;**29**(5):385–93. doi: 10.1097/DBP.0b013e318182a98e. [PubMed: 18714208]. [PubMed Central: PMC2770096].
27. Hoyos Cillero I, Jago R. Systematic review of correlates of screen-viewing among young children. *Prev Med*. 2010;**51**(1):3–10. doi: 10.1016/j.ypmed.2010.04.012. [PubMed: 20417227].
28. Ashman SB, Dawson G, Panagiotides H, Yamada E, Wilkinson CW. Stress hormone levels of children of depressed mothers. *Dev Psychopathol*. 2002;**14**(2):333–49. doi: 10.1017/s0954579402002080. [PubMed: 12030695].
29. Lampard AM, Franckle RL, Davison KK. Maternal depression and childhood obesity: A systematic review. *Prev Med*. 2014;**59**:60–7. doi: 10.1016/j.ypmed.2013.11.020. [PubMed: 24291685]. [PubMed Central: PMC4172574].
30. Dittrich K, Fuchs A, Bermpohl F, Meyer J, Fuhrer D, Reichl C, et al. Effects of maternal history of depression and early life maltreatment on children's health-related quality of life. *J Affect Disord*. 2018;**225**:280–8. doi: 10.1016/j.jad.2017.08.053. [PubMed: 28843077].
31. Testa MA, Simonson DC. Assessment of quality-of-life outcomes. *N Engl J Med*. 1996;**334**(13):835–40. doi: 10.1056/NEJM199603283341306. [PubMed: 8596551].
32. Tate EB, Wood W, Liao Y, Dunton GF. Do stressed mothers have heavier children? A meta-analysis on the relationship between maternal stress and child body mass index. *Obes Rev*. 2015;**16**(5):351–61. doi: 10.1111/obr.12262. [PubMed: 25879393]. [PubMed Central: PMC4447110].
33. Farajpour M, PishgahRoodsari M, Salehiniya H, Soheilipour F. The relationship between body mass index (BMI) and quality of life in Iranian primary school students in Tehran, Iran. *Biomedicine*. 2018;**8**(1):3. doi: 10.1051/bmdcn/2018080103. [PubMed: 29480798].
34. Khodaverdi F, Bahram A, Jafarabadi MA. Quality of life, motor ability, and weight status among school-aged children of Tehran. *Iran J Public Health*. 2012;**41**(6):97–102. [PubMed: 23113200]. [PubMed Central: PMC3468998].
35. Jalali-Farahani S, Alamdari S, Karimi M, Amiri P. Is overweight associated with health-related quality of life (HRQoL) among Tehranian school children? *Springerplus*. 2016;**5**:313. doi: 10.1186/s40064-016-1930-1. [PubMed: 27066345]. [PubMed Central: PMC4786555].
36. Azizi F, Rahmani M, Emami H, Mirmiran P, Hajipour R, Madjid M, et al. Cardiovascular risk factors in an Iranian urban population: Tehran lipid and glucose study (phase 1). *Soz Praventivmed*. 2002;**47**(6):408–26. doi: 10.1007/s000380200008. [PubMed: 12643001].
37. Azizi F, Ghanbarian A, Momenan AA, Hadaegh F, Mirmiran P, Hedayati M, et al. Prevention of non-communicable disease in a population in nutrition transition: Tehran lipid and glucose study phase II. *Trials*. 2009;**10**:5. doi: 10.1186/1745-6215-10-5. [PubMed: 19166627]. [PubMed Central: PMC2656492].
38. 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):800–12. doi: 10.1097/00005650-200108000-00006. [PubMed: 11468499].
39. Amiri P, Eslamian G, Mirmiran P, Shiva N, Jafarabadi MA, Azizi F. Validity and reliability of the Iranian version of the Pediatric Quality of Life Inventory 4.0 (PedsQL) Generic Core Scales in children. *Health Qual Life Outcomes*. 2012;**10**:3. doi: 10.1186/1477-7525-10-3. [PubMed: 22221765]. [PubMed Central: PMC3311062].
40. Amiri P, M. Ardekani E, Jalali-Farahani S, Hosseinpanah F, Varni JW, Ghofranipour F, et al. Reliability and validity of the Iranian version of the Pediatric Quality of Life Inventory 4.0 Generic Core Scales in adolescents. *Qual Life Res*. 2010;**19**(10):1501–8. doi: 10.1007/s11136-010-9712-7. [PubMed: 20665118].
41. Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the beck depression and anxiety inventories. *Behav Res Ther*. 1995;**33**(3):335–43. doi: 10.1016/0005-7967(94)00075-u. [PubMed: 7726811].
42. Norton PJ. Depression Anxiety and Stress Scales (DASS-21): Psychometric analysis across four racial groups. *Anxiety Stress Coping*. 2007;**20**(3):253–65. doi: 10.1080/10615800701309279. [PubMed: 17999228].
43. Bener A, Alsulaiman R, Doodson L, El Ayoubi H. Comparison of Reliability and Validity of the Breast Cancer depression anxiety stress scales (DASS- 21) with the Beck Depression Inventory-(BDI-II) and Hospital Anxiety and Depression Scale (HADS). *International Journal of Behavioral Research & Psychology*. 2016:197–203. doi: 10.19070/2332-3000-1600035.
44. Pooravari M, Dehghani M, Salehi S, Habibi M. Confirmatory factor analysis of Persian version of depression, anxiety and stress (DASS-42): Non-clinical sample. *Razavi Int J Med*. 2017;**5**(4).
45. Beaufort IN, De Weert-Van Oene GH, Buwalda VAJ, de Leeuw JRJ, Goudriaan AE. The Depression, Anxiety and Stress Scale (DASS-21) as a screener for depression in substance use disorder inpatients: A pilot study. *Eur Addict Res*. 2017;**23**(5):260–8. doi: 10.1159/000485182. [PubMed: 29224000].
46. Tran TD, Tran T, Fisher J. Validation of the depression Anxiety Stress Scales (DASS) 21 as a screening instrument for depression and anxiety in a rural community-based cohort of northern Vietnamese women. *BMC Psychiatry*. 2013;**13**:24. doi: 10.1186/1471-244X-13-24. [PubMed: 23311374]. [PubMed Central: PMC3566910].
47. Asghari A, Saed F, Dibajnia P. Psychometric properties of the Depression Anxiety Stress Scales-21 (DASS-21) in a non-clinical Iranian sample. *Int J psychol*. 2008;**2**(2):82–102.
48. Sahebi A, Asghari MJ, Salari RS. [Validation of depression anxiety and stress scale (DASS-21) for an Iranian population]. *Dev Psychol*. 2005;**1**(4).
49. Lee SY, Song XY. *Basic and advanced Bayesian structural equation modeling: With applications in the medical and behavioral sciences*. New Jersey, USA: John Wiley & Sons; 2012.
50. Hooper D, Coughlan J, Mullen MR. Structural equation modelling: Guidelines for determining model fit. *Electron J Bus Res Methods*. 2008;**6**(1):53–60.
51. Giannakopoulos G, Dimitrakaki C, Pedeli X, Kolaitis G, Rotsika V, Ravens-Sieberer U, et al. Adolescents' wellbeing and functioning: Relationships with parents' subjective general physical and mental health. *Health Qual Life Outcomes*. 2009;**7**:100. doi: 10.1186/1477-7525-7-100. [PubMed: 20003508]. [PubMed Central: PMC2804705].
52. Wong ST. The relationship between parent emotion, parent behavior, and health status of young African American and Latino children. *J Pediatr Nurs*. 2006;**21**(6):434–42. doi: 10.1016/j.pedn.2006.05.002. [PubMed: 17101401].
53. Baker CE. Maternal depression and the development of executive function and behavior problems in head start: Indirect effects through parenting. *Infant Ment Health J*. 2018;**39**(2):134–44. doi: 10.1002/imhj.21698. [PubMed: 29485682].
54. Mazaheri E, Ghasemzadeh A, Saadat M, Karami S, Pourshahriari M. The relationship between parent's anxiety and their children's self-efficacy in primary schools. *Procedia Soc Behav Sci*. 2011;**29**:257–60. doi: 10.1016/j.sbspro.2011.11.235.
55. Benton PM, Skouteris H, Hayden M. Does maternal psychopathology increase the risk of pre-schooler obesity? A systematic review. *Appetite*. 2015;**87**:259–82. doi: 10.1016/j.appet.2014.12.227. [PubMed: 25572134].
56. Duarte CS, Shen S, Wu P, Must A. Maternal depression and child BMI: Longitudinal findings from a US sample. *Pediatr Obes*. 2012;**7**(2):124–33. doi: 10.1111/j.2047-6310.2011.00012.x. [PubMed: 22434752]. [PubMed

Central: PMC4353610].
57. Cutting TM, Fisher JO, Grimm-Thomas K, Birch LL. Like mother, like daughter: Familial patterns of overweight are mediated by mothers' dietary disinhibition. *Am J Clin Nutr*. 1999;**69**(4):608–13. doi: 10.1093/ajcn/69.4.608. [PubMed: 10197561].
58. Gustafson SL, Rhodes RE. Parental correlates of physical activity in children and early adolescents. *Sports Med*. 2006;**36**(1):79–97. doi: 10.2165/00007256-200636010-00006. [PubMed: 16445312].
59. Shaban LH, Vaccaro JA, Sukhram SD, Huffman FG. Do mothers affect daughter's behaviors? Diet, physical activity, and sedentary behaviors in Kuwaiti mother-daughter dyads. *Ecol Food Nutr*. 2018;**57**(2):109–23. doi: 10.1080/03670244.2017.1418337. [PubMed: 29278939].
60. Khairy SA, Eid SR, El Hadidy LM, Gebril OH, Megawer AS. The health-related quality of life in normal and obese children. *Egypt Paediatr Assoc Gaz*. 2016;**64**(2):53–60. doi: 10.1016/j.epag.2016.05.001.
61. Jalali-Farahani S, Shojaei FA, Parvin P, Amiri P. Comparison of health-related quality of life (HRQoL) among healthy, obese and chronically ill Iranian children. *BMC Public Health*. 2018;**18**(1):1337. doi: 10.1186/s12889-018-6239-2. [PubMed: 30509220]. [PubMed Central: PMC6278028].
62. Tsiros MD, Olds T, Buckley JD, Grimshaw P, Brennan L, Walkley J, et al. Health-related quality of life in obese children and adolescents. *Int J Obes*. 2009;**33**(4):387–400. doi: 10.1038/ijo.2009.42. [PubMed: 19255583].
63. Petersen S, Moodie M, Mavoa H, Waqa G, Goundar R, Swinburn B. Relationship between overweight and health-related quality of life in secondary school children in Fiji: Results from a cross-sectional population-based study. *Int J Obes (Lond)*. 2014;**38**(4):539–46. doi: 10.1038/ijo.2013.212. [PubMed: 24232500].
64. Boodai SA, Reilly JJ. Health related quality of life of obese adolescents in Kuwait. *BMC Pediatr*. 2013;**13**:105. doi: 10.1186/1471-2431-13-105. [PubMed: 23845118]. [PubMed Central: PMC3710478].
65. von Rueden U, Gosch A, Rajmil L, Bisegger C, Ravens-Sieberer U. Socioeconomic determinants of health related quality of life in childhood and adolescence: Results from a European study. *J Epidemiol Community Health*. 2006;**60**(2):130–5. doi: 10.1136/jech.2005.039792. [PubMed: 16415261]. [PubMed Central: PMC2566139].
66. Spurrier NJ, Sawyer MG, Clark JJ, Baghurst P. Socio-economic differentials in the health-related quality of life of Australian children: Results of a national study. *Aust N Z J Public Health*. 2003;**27**(1):27–33. doi: 10.1111/j.1467-842x.2003.tb00376.x. [PubMed: 14705264].
67. Alipour M, Yaseri M, Maheri A, Garmaroudi G. Health-related quality of life of high school students in Tehran, Iran. *Journal of School of Public Health and Institute of Public Health Research*. 2017;**14**(4):57–72.
68. Nomaguchi KM, Brown SL. Parental strains and rewards among mothers: The role of education. *J Marriage Fam*. 2011;**73**(3):621–36. doi: 10.1111/j.1741-3737.2011.00835.x. [PubMed: 23136449]. [PubMed Central: PMC3489180].
69. Leinonen JA, Solantaus TS, Punamaki RL. Parental mental health and children's adjustment: The quality of marital interaction and parenting as mediating factors. *J Child Psychol Psychiatry*. 2003;**44**(2):227–41. doi: 10.1111/1469-7610.t01-1-00116. [PubMed: 12587859].
70. Waylen A, Stewart-Brown S. Factors influencing parenting in early childhood: A prospective longitudinal study focusing on change. *Child Care Health Dev*. 2010;**36**(2):198–207. doi: 10.1111/j.1365-2214.2009.01037.x. [PubMed: 20015278].
71. Boe T, Sivertsen B, Heiervang E, Goodman R, Lundervold AJ, Hysing M. Socioeconomic status and child mental health: The role of parental emotional well-being and parenting practices. *J Abnorm Child Psychol*. 2014;**42**(5):705–15. doi: 10.1007/s10802-013-9818-9. [PubMed: 24150864].
72. Augustine JM, Crosnoe R. Mothers' depression and educational attainment and their children's academic trajectories. *J Health Soc Behav*. 2010;**51**(3):274–90. doi: 10.1177/0022146510377757. [PubMed: 20943590]. [PubMed Central: PMC5555847].
73. Parkes A, Sweeting H, Wight D. Parenting stress and parent support among mothers with high and low education. *J Fam Psychol*. 2015;**29**(6):907–18. doi: 10.1037/fam0000129. [PubMed: 26192130]. [PubMed Central: PMC4671474].
74. Bolton K, Kremer P, Rossthorn N, Moodie M, Gibbs L, Waters E, et al. The effect of gender and age on the association between weight status and health-related quality of life in Australian adolescents. *BMC Public Health*. 2014;**14**:898. doi: 10.1186/1471-2458-14-898. [PubMed: 25183192]. [PubMed Central: PMC4158070].
75. Bisegger C, Cloetta B, von Rueden U, Abel T, Ravens-Sieberer U; European Kidscreen Group. Health-related quality of life: gender differences in childhood and adolescence. *Soz Praventivmed*. 2005;**50**(5):281–91. doi: 10.1007/s00038-005-4094-2. [PubMed: 16300172].
76. Holder MK, Blaustein JD. Puberty and adolescence as a time of vulnerability to stressors that alter neurobehavioral processes. *Front Neuroendocrinol*. 2014;**35**(1):89–110. doi: 10.1016/j.yfrne.2013.10.004. [PubMed: 24184692]. [PubMed Central: PMC3946873].