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The Moderating Effect of Parental Feeding Style in Relation to Familial Psychosocial Risk Factors and Childhood Obesity

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ABSTRACT

Background: The prevalence of obesity in children is increasing in the world and it has become one of the major health problems. Parents are the first people who have the opportunity to shape child's eating experiences and habits, including food preferences, attitudes, and eating patterns. This study was conducted to determine the moderating role of parental feeding styles in relation to family psychosocial and social risk factors and childhood obesity in primary school children in 2018-2019 academic year in Shiraz, Iran. **Methods**: In this study, 298 children aged 6 to 11 years from primary schools in Shiraz were selected using multistage cluster sampling method. Their parents completed the stress-anxiety-depression scale tool and parenting feeding styles questionnaire. The data were analyzed using simultaneous multiple regression analysis, cluster analysis, and two-way analysis of variance (ANOVA). **Results**: The results showed that there was a statistically significant correlation between the identified risk factors and child's body mass index (BMI), as well as the variable effect of feeding styles on the child's BMI. The interaction of risk factors on feeding styles indicated that the effect of adjusting feeding styles on childhood obesity was significant due to risk factors. **Conclusion**: These findings support the moderating role of parental feeding styles in the development or prevention of childhood obesity.

Keywords: *Parental feeding style; Child obesity*

Introduction

Childhood obesity is a major health issue in many countries worldwide. Childhood is a critical time for the development of obesity and overweight. The feeding pattern that children adopt during childhood will continue into their adulthood, and childhood obesity is strongly associated with adult obesity. Obesity is associated with adverse health consequences, such as heart disease, high blood pressure, stroke, diabetes, all types of cancers, and premature death (World Health Organization, 2014).

The global prevalence of obesity among children is rising rapidly. According to the available data, more than 10% of Iranian children of school age are overweight and 4.8% of them are obese (Vagheri *et al.*, 2009). As a result, the

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children of the present generation are expected to die before their parents (Vagheri *et al.*, 2009). The growing trend of obesity among children has led researchers to explore factors associated with obesity in children. Gene-environment interaction leads to obesity, indicating the significant role of parents in the development or prevention of childhood obesity. Although parents provide genes, they also create a healthy or unhealthy lifestyle which may lead to obesity, and the home environment may have lasting effects on children's weight gain (Birch and Davison, 2001). According to Per Birch's theory (2001), the mother's feeding pattern and her role in meeting the feeding needs and eating of the infant in early childhood are important in formulating the basic pattern of feeding in upcoming years (Birch and Davison, 2001). As the child gets older, the family eating styles and parent-children interactions during meal time, would affect children's eating habits and behavior (Blissett, 2011). Parental dietary habits can determine the amount of vegetables, sugar, and dairy consumed by children, and these factors have shown to directly correlate with the child's weight (Hennessy *et al.*, 2012, Hughes *et al.*, 2005, Patrick *et al.*, 2005) .

In addition, studies have shown that parents' mental health status can negatively and inadvertently affect parents' feeding style associated with childhood obesity (Hughes *et al.*, 2015). Previous studies have shown that stress, anxiety, and depression among parents is associated with restrictive feeding and increasing pressure to eat in children (Birch and Davison, 2001, Blissett *et al.*, 2010, Hurley *et al.*, 2011).

Another important factor in the family environment which has been shown to predict childhood obesity is the socioeconomic factors of the family, including parental income and education. Parental education has been associated with both improved family living conditions and the health of the child. Mothers with higher level of education become more concerned about their children's eating habits (Didarloo *et al.*, 2013). Low family socioeconomic status is associated with increased childhood obesity rates which may be explained by low access to healthy food and less attention to healthy eating habits leading to higher prevalence of obesity in low-income families.

Role of parenting as an important force for training in healthy eating habits has been well recognized; therefore, parenting and feeding style may be used as an intervention tool to prevent childhood obesity. In fact, it has been shown that "caring feeding style" can moderate the relationship between some factors of family socioeconomic risk and body mass index (BMI) in preschool children (Horodynski *et al.*, 2018). Furthermore, clinical observations of obese adult patients under treatment have shown that their parents' tendency, behavior, and attitude toward food are the main reasons for their abnormal eating habits (Brink *et al.*, 1999, Bruch, 1981, Rand and Stunkard, 1977). This study aimed to investigate the moderating effect of parental feeding style in relation to familial psychosocial risk factors and childhood obesity in primary school children.

Materials and Methods

Study design and participants: This was a cross sectional study. Children in the 2018-2019 academic year in primary schools in Shiraz and their mothers were included in this study; children with obesity due to an illness (i.e. hypothyroidism) were excluded. Mothers of 298 primary school children aged 6 to 11 years were invited to participate in the study using multi-stage cluster sampling.

In order to estimate the sample size, the criterion of 15 to 20 test participants was used for each subscale measured. To this end, two schools were selected from each of the four education districts of Shiraz and five classes were randomly selected from each school (one class for each grade) and the questionnaires were provided to the mothers of all children in each class.

Measurements: Lovibond's Depression, Anxiety, Stress Scales Questionnaire was used for determining of depression, anxiety and stress

(Lovibond and Lovibond, 1995). The depression, anxiety and stress scale - 21 items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety, and stress. Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience on the effects of anxiety. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient. Scores for depression, anxiety, and stress are calculated by summing the scores for the relevant items. The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety, and stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21, therefore, has no direct effect on allocating patients to discrete diagnostic categories postulated in classificatory systems, such as the Diagnostic and Statistical Manual of Mental (DSM) and International Classification of Diseases (ICD). The short version of this questionnaire contains 21 questions that evaluate mood changes by seven different phrases and has been accredited for the Iranian society (Asghari-Moghadam *et al.*, 2010)

It was used demographic questionnaire includes the following information: age, weight, height, education level, and income of the family; and also age, weight, and height of the child.

The Wardle Parental Feeding Style Questionnaire (PFSQ) is a tool for the efficiency of the styles used by parents to feed their children which includes how they interact during a meal, and the Persian version of this questionnaire includes 25 questions (Wardle *et al.*, 2002). This questionnaire identifies four aspects in the feeding style known as encouragement, emotional, instrumental, and controlling style that have been accredited for the Iranian society by the authors.

The PFSQ is one of the few psychometrically sound tools available to assess parental feeding styles. The instrument was developed and validated in the United Kingdom, and has proved to possess adequate to good internal consistency (Cronbach's alpha ranging from 0.67 to 0.83) and excellent 2-week test–retest reliability (r = 0.76–0.83) (Wardle *et al.*, 2002)

A translation–back-translation procedure was applied to create the Iranian version. The Iranian version of the PFSQ had also been validated by the authors (Ahadi and Davoodi, 2019). The Cronbach's alphas for instrumental feeding, emotional feeding, prompting or encouragement to eat, and control over eating were 0.78, 0.85, 0.80, and 0.74, respectively.

Ethical considerations: The study was performed in accordance with the ethical standards (IR.IAU.SHIRAZ.REC.1398.011). All the participants gave their informed consent prior to their inclusion in the study. Details that might disclose the identity of the participants were omitted.

Data analysis: Descriptive analysis was used to analyze the data, including simultaneous multiple regression analysis, cluster analysis, and two-way analysis of variance (ANOVA).

Results

Three hundred and five number of families were invited to participate in the study and 298 number responded to the survey; 49% of mothers had high school diploma or lower and 51% had bachelor's degree or higher. Among these families, 45.7% were in the lower financial tier. **Table 1** shows the frequency and percentage of frequency of the children's gender participating in the sample group. In this table, the mean (standard deviation) age of the children is given on a monthly basis.

Children's BMI is inversely related to family income and instrumental, emotional, and

encouraging feeding styles (**Table 2**). As family income and the scores of instrumental, emotional, and encouraging feeding styles increase, the children's BMI decreases. These results also show that the child's BMI is directly and significantly related to depression and anxiety levels of the mother. As the mother's depression and anxiety scores increase, so does the child's BMI.

In order to investigate the moderating role of the parental feeding style in the study population, simultaneous multiple regression analysis was used to identify the familial and psychosocial risk factors affecting childhood obesity. Parental anxiety level, education level, and income of the mothers were identified as the familial and psychosocial risk factors affecting childhood obesity.

Furthermore, the z-score of anxiety level of the mother, education level, and income were used as psychosocial and familial risk factors affecting childhood obesity in order to classify the sample individuals in cluster analysis. To determine the number of interpretable clusters, first, 2 clusters, then, 3 clusters, and finally, 4 clusters were analyzed for classification. The results showed that clusters could only be interpreted when three clusters were extracted. **Table 4** reveals the results of cluster analysis using three clusters with mean variables in each cluster.

Mean scores (all were standard scores) were used in order to name the clusters. At the third step, the families were classified based on parental feeding styles. In order to classify families according to parents' eating habits, the scores of the four parenting styles were first converted to standard z-scores. Then, these scores were used for each member of the sample group, and the feeding (or eating) style that had the highest z- score was considered as the dominant style for that family. Based on this process, 80 families with controlling, 75 families with instrumental, 63 families with emotional, and 80 families with an encouraging feeding styles were identified.

Finally, in order to investigate the modifying role of parental feeding styles in relationship between psychosocial and familial risk factors and childhood obesity, factor variance (two-way) analysis was used. Variables of psychosocial and familial risk factors were identified with three levels of (anxiety, rich-educated, and moderate) as independent variables; feeding style variable was identified with four levels as modifier variables (second independent variable); and the z-score which is the controlled BMI was analyzed as a dependent variable.

A statistically significant association was observed between moderating effect of parental feeding style and childhood obesity. These results indicate that feeding styles can moderate the effect of risk factors on childhood obesity.

Finally, to investigate the effects of risk factor variables on the feeding styles interaction, or in other words to investigate the impacts of feeding modifiers on childhood obesity risk factors, the values of mean z-score of children's BMI was compared in twelve research groups (3 groups of risk factors multiply 4 groups of feeding styles). To have a better understanding of the results, the mean z-score of children's BMI in all 12 groups are presented in **Figure 1**.

Table 1. Gender and age distribution of the children

Gender	N (%)	Mean ± SD of age (in month)	Overweight or at risk for obesity (%)
Girls	145 (48.7)	88.35 ± 15.49	12.4
Boys	153 (51.3)	105.04 ± 20.64	9.8
Total	398 (100)	96.92 ± 20.10	22.2

Table 2. The correlation between the children's body mass index and other research variables

Variables	Children's body mass index	Mothers' education	Family's income	Depression	Anxiety	Stress	Controlling	Instrumental	Emotional	Encouragement
Children's body mass index	1	-	-	-	-	-	-	-	-	-
Mothers' education level	-0.130	1	-	-	-	-	-	-	-	-
Family's income	-0.16	0.35	1	-	-	-	-	-	-	-
The depression, anxiety and stress score										
Depression	0.15	0.04	-0.06	1	-	-	-	-	-	-
Anxiety	0.17	0.07	-0.09	0.71	1	-	-	-	-	-
Stress	0.04	-0.04	-0.14	0.70	0.71	1	-	-	-	-
Feeding Styles										
Controlling	0.09	0.02	-0.08	-0.06	0.01	-0.03	1	-	-	-
Instrumental	-0.15	-0.11	-0.05	-0.02	0.05	0.05	0.12	1	-	-
Emotional	-0.26	-0.15	-0.08	-0.04	-0.04	0.02	0.13	0.53	1	-
Encouragement	-0.13	-0.08	-0.05	-0.08	0.01	0.07	0.23	0.19	0.35	1

Table 3. The regression coefficient of the familial and psychosocial risk factors used for predicting the child's obesity

Predictive variables	Regression coefficients					Linear statistics	
	Regression coefficient (B)	The standard Error	Impact factor (β)	T	Significance level	Tolerance	VIF
Constant	-0.145	0.473		-0.307	0.759		
Depression	0.051	0.030	0.159	1.708	0.089	0.357	2.800
Anxiety	0.069	0.028	0.217	2.446	0.015	3.397	2.522
Stress	-0.053	0.028	-0.179	-1.893	0.056	0.280	2.630
Education level	-0.093	0.47	-0.114	-1.978	0.048	0.845	1.184
Income	-0.257	0.077	-0.202	-3.329	0.001	0.844	1.185

Table 4. Results of the cluster analysis (the numbers in each column show the mean z-score of the variable in each cluster)

Variables	Clusters		
	Upper (Anxiety), n=83	Lower (Rich- educated), n=88	Mean , n=127
Income	-0.260	1.044	-0.487
Education level	0.021	0.862	-0.424
Mother's anxiety	1.155	-0.476	-0.487

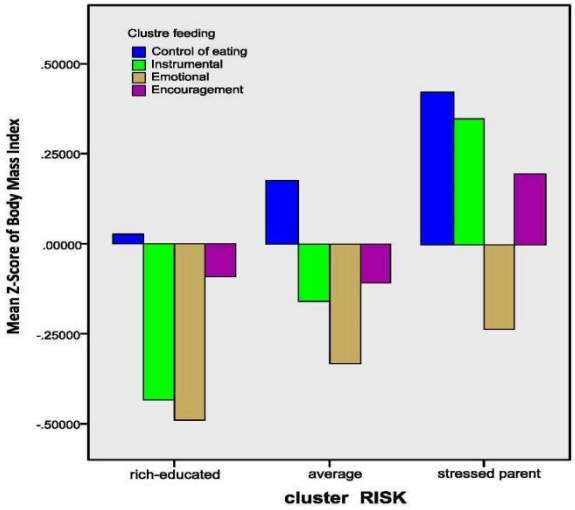

Figure 1. Comparing children's body mass index in 12 groups

The results showed that being in an anxious family with a controlling and emotional feeding style increases the child's risk of obesity at the highest possible level. In contrast, being in a wealthy-educated family which has emotional and instrumental style minimizes the risk of childhood obesity (increases the risk of malnutrition). Instrumental feeding style only reduces or controls the child's weight when the family is average or rich and educated; if this style is used by anxious families, it will make the child obese. Controlling feeding style is associated with childhood obesity; and if the anxious family uses this style, it will lead to obesity in the child. However, if a wealthy-educated family uses this style, the child's weight will be normal.

In general, anxious families are more likely to have overweight/obese children compared to other families; but if these families use an emotional feeding style, their children's weight will decrease. In general, rich-educated families have thinner children compared to other families; but if these families use a controlling and encouraging style, their children's weight may increase. Encouraging feeding style is the best feeding style to prevent child's obesity/overweight or underweight; therefore, it suggests that families regardless of socio-economic or psychological status may benefit from the feeding style leading to a lower BMI of the child and normal weight.

Discussion

The effect of parental feeding style as a new variable on child obesity in children aged 6-11 years was considered in this study and Wardle's PFSQ were validated and used for the first time in Iran. The results show that parental eating styles can moderate the association between psychosocial and familial risk factors and childhood obesity in a positive way.

Anxious families have more overweight children compared to other families; however, if these families use an emotional feeding style, their children's weight will decrease. This might be due to the natural-biological reaction in which children respond to emotional distress by refraining from eating. If these types of families use a controlling feeding style, the children's weight may be higher compared to other feeding style groups. Rich-educated families have more underweight children than other families; however, if these families use a controlling and encouraging feeding style, their children's weight will increase and become normal. Emotional feeding style is more frequent in families with higher income; since they have easier access to a variety of food sources and are able to provide more attractive and tasty food dishes (Musher- Eizenman *et al.*, 2007). The control style leads to obesity. Rich- educated families who use controlling styles emphasize on the type, amount,

time, and type of feeding which leads to obesity. Similarly, if an anxious family uses this style, it can lead to childhood obesity.

Encouraging feeding style is the best feeding style to prevent overweight or underweight in children. Studies have shown that regardless of economic, social or psychological conditions, this style of feeding will promote a normal BMI in children. Hubbs *et al.* reported that parental eating styles can be used to predict the parenting style (Hubbs-Tait *et al.*, 2008). Encouraging feeding style is associated with authoritative parenting style (Blissett, 2011, Hubbs-Tait *et al.*, 2008). Authoritative styles are associated with a child's normal weight (Horodynski *et al.*, 2018, Hubbs-Tait *et al.*, 2008). The authoritative style is associated with children's easy access to healthy fruits, vegetables, and foods with encouragement and motivation. It has been reported that children of authoritative parents who use the encouraging style consume high values of fruits, vegetables, and healthy foods (Patrick *et al.*, 2005). Gerards and Kremers reported that the encouraging feeding style, along with the parents' subtle control (hidden control) over the child's healthy eating is evident in a family with an authoritative parenting style which ultimately improves the child's weight (Gerards and Kremers, 2015).

An important point which must be considered at all influential stages is an important variable called culture. Different countries have different attitudes and opinions towards eating and feeding children. These beliefs affect the way parents choose to feed their children. Concerns about children's weight are not consistent among ethnicities, races, and cultures. In many Asian countries, including Iran, childhood obesity used to be considered a sign of health and wealth. It is recommended to consider the effect of culture on parental feeding style in future studies and opportunity to educate parents during planning parenthood.

Conclusion

In summary, it was shown that parental eating styles can moderate the association between psychosocial and familial risk factors and childhood obesity in a positive way. Encouraging feeding style is the best feeding style to prevent children becoming overweight or underweight; since it seems to promote a healthy BMI regardless of families' socioeconomic or psychological conditions.

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Authors' contributions

Davodi A and Ahadi A designed and conducted the research and also, analyzed the data, wrote the manuscript and both had primary responsibility for final content. All authors read and approved the final manuscript.

Conflict of interest

There is not any conflict of interest.

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