Parental feeding practices and child weight status in Bahraini families

Zahraa Sharaf, Maryam Alrashid, Safa Aburowais, Fatema Alrayes, Noor Altooq, Walaa Alherz, Sarah Alaraibi, Safa Abdulrahman, Mariam Abdulla, Fatema AlKhabbaz

College of Medicine and Medical Sciences, Arabian Gulf University, Manama, Bahrain.

Correspondence to: Noor Altooq, E-mail: nonatouq-98@live.com]

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ABSTRACT

Background: Home environment shapes the eating behavior of children thus their weight status. Parental feeding practices (restriction, pressure to eat, and monitoring) are behaviors taken by parents to manage a child's dietary intake. Objectives: Raising awareness on the role of parental feeding practices in childhood obesity to allow for early parental intervention. Materials and Methods: In this cross-sectional study, a sample size of 332 children (6-11 years old) was chosen conveniently form eight health centers in Bahrain in August-September 2018. A translated Arabic version of the Child Feeding Questionnaire (CFQ) was filled by parents. Anthropometric measurements of children were conducted. Descriptive statistics were used to describe mean item scores of the CFQ. Correlation tests determined relationships between parental feeding practices and body mass index (BMI)-for-age Z-scores. Chi-square statistics and independent sample t-tests compared parental perception of child weight and feeding practices. Results: The prevalence of obesity among Bahraini children aged 6-11 years was estimated to be 16.87% and overweight was 14.46%. Obesity was more prevalent among males, while overweight in females. The predominant feeding practice was monitoring followed by restriction. Child BMI was negatively correlated with pressure to eat and positively correlated with restriction in males. No significant correlation was found with monitoring. About 56.0% of parents were found to misperceive their child weight status, 50.9% underestimated the weight status. Conclusion: Childhood obesity has reached alarming levels, which may persist due to the parental misperception of child weight status. Avoiding restrictive feeding could limit this problem.

KEY WORDS: Child Feeding Questionnaire; Childhood Obesity; Parental Feeding Practices; Weight Perception

INTRODUCTION

Obesity is a polygenic multifactorial disease characterized by excessive fat accumulation in the adipose tissue.^[1] Childhood obesity is an international public health concern worth exploring as it is well documented that children with obesity are more likely to develop obesity during adulthood with its comorbidities.^[2]

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To define childhood obesity, the World Health Organization (WHO) recommends using weight-for-height Z-scores. The prevalence of obesity among children aged 10–13 years in Bahrain was ranged from 15.7% to 28.9% among males and from 21.1% to 30.7% among females in 2014.^[3]

Children are exposed to different environments. Home environment including the feeding dynamics between children and parents and their facilitation of overeating.^[4,5] Parenting may be explored through two dimensions, parenting styles, and practices that are assessed through the Child Feeding Questionnaire (CFQ), which is a validated parental self-report measure built on the basis of the parenting style theory.^[6]

Parental feeding practices are specific behaviors and actions taken by parents to manage a child's dietary intake. These

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include restriction, pressure to eat, and monitoring.^[7,8] Restriction represents parental constraint of the child's access to certain foods and "pressure to eat" includes behaviors like forcing the child to finish the plate of food, while "monitoring" refers to the parent supervising the child's intake.^[8]

The aim of this study is to raise the awareness of the role of parental feeding practices in childhood obesity to permit an identification of the root of the problem, thus allowing for early parental intervention.

MATERIALS AND METHODS

Research Design

This was a cross-sectional study.

Data Collection

Using a self-administered questionnaire as well as anthropometric measurements, the data for this study were obtained during the period of August 2018–September 2018. A multistage sampling technique utilizing both stratified and convenience samplings was followed. The strata are the four governorates of Bahrain. The data were collected from the health centers and the number of participants was proportional to the population density at each governorate.

Ethical Considerations

Permission was obtained from the Arabian Gulf University Research Committee and from the Research and Technical Team Committee in the Ministry of Health. A written informed consent was obtained from all parents before participation, and they were ensured about the confidentiality of their information.

Participants and Sample Size

The sample size was calculated based on the prevalence of childhood obesity among Bahraini children using the following equation:

$$n = \frac{Z_{(1-\frac{a}{2})}^2 \times \hat{p}(1-\hat{p})}{E^2}$$

- $\alpha = \text{significance level} = 0.05 \rightarrow \frac{\alpha}{2} = 0.025, 1 \frac{\alpha}{2} = 0.975, Z$ (0.975) = 1.96
- \hat{p} = sample proportion (prevalence of obesity among Bahraini children) = 31.5% (as estimated by the WHO in 2012.^[9]
- E = margin of error = 0.05

$$n = \frac{(1.96)^2 \times 0.315 \times (1 - 0.315)}{0.05^2} = 331.57 \approx 332$$

Inclusion Criteria

The study included Bahraini children aged 6–11 years presenting to the health center for any health service. The selected children had to be living with both parents. The parent presenting with the child to the health center had to be the one responsible for feeding the child.

Exclusion Criteria

Children with severe food allergies or chronic medical problems restricting food intake or significantly affecting body composition, children with behavioral eating disorders, mentally disabled children, children with any acute disease that involves weight loss, and children with severe acute illness at the time of presentation were excluded from the study.

Study Instruments

The CFQ

The CFQ is a validated parental self-report measure, which was constructed on the basis of the parenting style theory (Costanzo *et al.*).^[6] It was originally written in English [Appendix 1]. Permission to translate the CFQ and use it in this study was obtained before this from Dr. Birch, one of its author. The CFQ was translated into Arabic by the researchers using backward and forward translation method, translators. It consists of 31 items assessing two major dimensions as follows:

- 1. Parents risk factors and concerns regarding child and parent weight
 - a. Perceived feeding responsibility
 - b. Perceived parent weight
 - c. Perceived child weight
 - d. Concern about child weight
- 2. Parental child feeding practices
 - a. Restriction
 - b. Pressure to eat
 - c. Monitoring

It should be noted that one item regarding the perceived child weight at age of 12–14 years old was omitted because the chosen sample was up to 11 years old.

Body Mass Indices

Weight (kg) and height (cm) of children were measured by the researchers by means of a digital scale and a stadiometer. The children had to be dressed in light clothes and weight measurements were taken to the nearest 0.01 kg while height measurements were to the nearest 1.0 cm. The average of three height and weight readings was calculated and subsequently used to calculate the body mass index (BMI) scores and the BMI-for-age Z-scores based on the WHO reference growth charts.

Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences. The BMI scores of all children were calculated using Microsoft Excel. WHO AnthroPlus software, which is based on the WHO growth charts, was used to calculate the BMI-for-age Z-scores.

Descriptive statistics were used to describe mean item scores of the CFQ. Chi-square test was used to link demographic characteristics and the CFQ scores within each child feeding category to the child weight status and to compare the perceived child weight status as analyzed by the questionnaire and the actual weight status based on the measured weight. In addition, Chi-square statistic was used to compare the perceived child weight to perceived parent weight.

Correlation tests were carried to evaluate correlations between mean CFQ scores and the BMI-for-age Z-scores. Independent sample t-tests were used to compare the mean differences of various parental feeding practices among different weight groups.

RESULTS

Characteristics of the children and their parents are presented in Table 1.

Table 1:	Sociodemographic	characteristics	of the study

	sa	mple		
Sociodemographic data	п	%	Standard deviation	Mean
Child gender			-	-
Male	153.0	46.1		
Female	179.0	53.9		
Parent gender			-	-
Male	108.0	32.5		
Female	224.0	67.5		
Educational level			-	-
Read and write	12.0	3.6		
Primary school	18.0	5.5		
Intermediate school	24.0	7.2		
High school	118.0	35.5		
University degree	160.0	48.2		
Child age (years)			1.7	7.8
6.0	116.0	34.9		
7.0	44.0	13.3		
8.0	61.0	18.4		
9.0	44.0	13.3		
10.0	41.0	12.3		
11.0	26.0	7.8		
Parent age (years)			6.6	37.7
20.0-29.0	33.0	10.1		
30.0-39.0	166.0	51.1		
40.0-49.0	105.0	32.3		
50.0-59.0	21.0	6.5		

The prevalence of obesity among Bahraini children aged 6–11 years was estimated to be 16.87% and overweight was 14.46%. A significant difference between both genders weight status was noticed (P = 0.031). Obesity was more common among males while overweight was more common among females [Table 2].

The study showed a significant difference between the child weight status and the perceived weight by parents (P < 0.001) [Table 3]. The prevalence of misperception of the children's weight status was 56.0%, with a predominance of underestimation (50.9%), with it being 85.7% among obese children and 79.1% among overweight children. Parental underestimation was more prominent among male children (53.59%) than female children (48.60%). However, fathers weight status with a predominance of underestimation (55.56%) as compared to mothers (48.66%).

Spearman's correlation was used to determine the relationship between the perceived parent weight and the perceived child weight. There was a weak positive monotonic correlation between the perceived parent weight and the perceived child weight (rho=0.178, P=0.001). However, the correlation was only significant among mothers (rho=0.204, P=0.002). Mothers who perceived themselves to be obese were found to have the least underestimation (37.5%) and the highest overestimation (12.5%) as compared to mothers who perceived themselves to have lower weight status.

Monitoring was the most common parental feeding practice (46.6%) followed by restriction (37.1%).

The BMI-for-age Z-scores were not found to have a significant correlation with monitoring CFQ score. Although restriction was not significantly correlated with BMI-for-age Z-score, it showed a significant positive correlation in males. Among females, restriction was found to be negatively correlated with the BMI-for-age Z-scores. Pressure to eat CFQ score had a significant negative correlation with the BMI-for-age Z-scores. Using food as a reward was inversely correlated with BMI-for-age Z-scores in children. When this correlation was compared between parents, it was only significant in mothers [Table 4]. The BMI-for-age Z-scores were found to have a significant positive correlation with concern CFQ score. However, when subdividing the sample by the child weight status, this correlation was only significant among obese children (P = 0.004).

DISCUSSION

Childhood obesity is a growing epidemic that calls for concern. The prevalence of obesity and overweight collectively was estimated to 31.4% among 6–11-year-old Bahraini children. There is a high prevalence of parental

Gender	Child weight status											
	Severe	ly thin	Th	in	Nor	mal	Over	weight	Ob	ese	Total	<i>P</i> -value
	п	%	n	%	n	%	n	%	n	%	n	
Males	3.0	2.0	13.0	8.5	86.0	56.2	18.0	11.8	33.0	21.6	153.0	0.031
Females	0.0	0.0	10.0	5.6	116.0	64.8	30.0	16.8	23.0	12.8	179.0	
Total	3.0	0.9	23.0	6.9	202.0	60.8	48.0	14.5	56.0	16.9	332.0	

Table 3: Child weight status and parental perception

CEO factors secure	Pearson's correlation	<i>P</i> -value
CFQ factors scores and child gender	coefficient with BMI-	<i>r</i> -value
and ennu genuer	for-age Z-score (r)	
Responsibility	-0.093	0.092
Male	-0.990	0.225
Female	-0.093	0.218
Concern	0.372	< 0.001
Male	0.479	< 0.001
Female	0.268	< 0.001
Restriction	0.079	0.152
Male	0.233	0.004
Female	-0.123	0.102
Pressure to eat	-0.283	< 0.001
Male	-0.260	0.001
Female	-0.318	< 0.001
Monitoring	0.023	0.680
Male	0.073	0.373
Female	-0.041	0.589
Using food as a reward	-0.158	0.004
Male	-0.144	0.076
Female	-0.179	0.016

underestimation of the children's weight status. The common parental feeding practices used were monitoring followed by restriction. Meanwhile, pressure to eat had a significant negative correlation with the BMI-for-age Z-scores.

Despite the lack of studies done in Bahrain with a similar age group, and the differences in the references used for defining childhood obesity, a study was conducted in Bahrain in 2013 estimated the prevalence of obesity and overweight among children aged 10–13 years old using the WHO reference.^[3] It showed that among 10-year-old children, there is a 2-fold increase in the prevalence of obesity in males (13.7–28.6%) and overweight in females (14.8–33.3%).

The prevalence of obesity in this study was similar to that in the Arabian Gulf countries, as Qatar showed a prevalence of 19.0% among 6–12-year-old children in 2013,^[10] and Kuwait showed a prevalence of 16.8% among 6–10-yearold children in 2010.^[11] However, both Qatar and Kuwait showed much higher rates of overweight, 20.2% and 20.0%, respectively. Studies conducted in Bahrain are essential to help target possible causes of childhood obesity, especially since it has seldom been explored in the literature. The aim of this crosssectional study was to examine the correlations between parental feeding practices and childhood obesity, while also considering parental perception as a possible mediator.

Similar to other studies, this study revealed a significant negative correlation between pressure to eat and the BMI-for-age Z-scores. Although some studies showed that this correlation is eligible only for males,^[12] this study showed that it is also significant in females. Pressure to eat may reduce the self-regulation of the child regarding his or her own intake and may have a negative connotation with food. The direction of the association could be the opposite or bidirectional. Obese children may be less likely to be pressured to eat as compared to normal or thin children.

Restriction showed a positive, but insignificant correlation with the BMI-for-age *Z*-scores. However, it was significant in males. Restriction is associated with an authoritarian parenting style^[13] and might, therefore, explain why males had a higher prevalence of obesity than females, for having higher restriction. This could further be attributed to the more rebellious nature of males in comparison to females, the more restricted they are, the more likely they are too emotionally and stubbornly overeat.

Excessive restriction can be due to the effort of the parents in preventing overeating rather than focusing on the quality of food.

Throughout the literature, restriction was usually associated with using food as a reward. Some studies showed that there is a positive correlation between BMI-for-age Z-scores and restriction, especially if food is used as a reward in females.^[13] However, in this study, there was a negative correlation only among female children. Females with higher BMI may be given less food as a reward. Alternatively, using food as a reward could allow for a lower BMI, perhaps attributed to more obedience and anticipation.

The third parental feeding practice – monitoring – showed similar findings to other studies, such that there was no significance in its association with child weight status.

The meditator that is thought to influence parental feeding practices is perception. The misperception was mostly in

Child weight status	Perceived child weight status										
	Severely thin		Thin		Normal		Overweight		Obese		
	n	%	n	%	n	%	n	%	n	%	
Severely thin	0.0	0.0	3.0	100	0.0	0.0	0.0	0.0	0.0	0.0	< 0.001
Thin	3.0	13.0	12.0	52.2	8.0	34.8	0.0	0.0	0.0	0.0	
Normal	7.0	3.5	73.0	36.1	117.0	57.9	5.0	3.5	0.0	0.0	
Overweight	0.0	0.0	3.0	6.2	35.0	72.9	9.0	18.8	1.0	2.1	
Obese	0.0	0.0	0.0	0.0	18.0	32.1	30.0	53.6	8.0	14.3	
Total	10.0	3.0	91.0	27.4	178.0	53.6	44.0	13.3	9.0	2.7	

Table 4: CFQ factors and their correlations with BMI-for-age Z-scores

the form of underestimation as 85.7% of parents of obese children underestimated their child's weight status while 72.9% of parents of overweight children considered their children weight to be normal.

High rates of underestimation were also seen in Saudi Arabia,^[14] where 90.0% of parents of overweight children classified their child's weight as normal and 65.0% of parents underestimated the weight status of their obese children. Accordingly, Bahrain's case might be more alarming as there is much more underestimation of the obese children. This could prompt for additional factors common to the Arabian Gulf region, such as a lack of awareness and misunderstanding of the classification of weight status, possibly due to the increase in obesity altering social norms and leading to a change in what the society regards as "normal." This is further attributed to the parental level of awareness and knowledge about childhood obesity and its causations. A cross-sectional study assessing maternal awareness of childhood obesity concluded that majority of mothers had poor knowledge about childhood obesity and its possible risk factors.^[15]

Male children were found to have more underestimation of their weight status by their parents. Such finding may be attributed to the influence of media on the society's attitude about the female body image, which favors a more westernized thin body image.

Mothers were found to have a better perception of their children weight status as compared to fathers, possibly due to having significantly higher responsibility scores.

Therefore, the emotion of guilt and responsibility toward the child weight may increase their awareness about their child's weight. This is supported by a study that revealed that mothers exhibit more awareness and dissatisfaction about their child's weight and eating habits.^[16]

Another possible explanation to the misperception could be due to the phenomenon of projection exhibited by parents, as there was a positive correlation between the mothers' perception of their own weight and their perception of their children weight status. This could also be linked back to the responsibility component and their concerns about the society criticism of female body image.

Limitations

Not all ages were equally represented in the sample of this study, especially the 11-year-old group. This may be due to the collection of data in the summer holiday, as most of the children presented to health centers for preschool screening, making it possibly better to have collected the data from schools rather than health centers.

Even though a random sampling technique is of less bias, the data collection setting had forced the choice of a convenience technique.

Since the questionnaire is based on the parent report, social desirability bias may also exist, along with perceived differences in certain subjective scales, for example, the interpretation of "often."

Some categories seem to assess beliefs more than behaviors. The parent may answer in accordance to what he or she believes should be the case rather than the actual implemented child feeding practice. It would, therefore, be preferable to have a questionnaire for children to assess their perceptions about the parental feeding practices applied on them, along with their attitudes and reactions toward these practices.

It is recommended to categorize restriction and pressure to eat with the type of food as some studies showed positive correlation with one another when restriction specifically applied to unhealthy food and pressure to eat to healthy food.

The perception of parents regarding their own weight may be further elaborated on through measuring their BMI too. This could allow for additional categorization to assess a possible link between the parent's weight and that of the child.

Confounding of unmeasured variables such as physical activity, socioeconomic status, and maternal depression could also play a role in childhood obesity. For example, maternal

depression has been suggested to moderate the parenting style and hence the child feeding practices.

Due to the study being cross sectional, we were unable to assess whether adapting a certain child feeding practice may be based on the child's different age-dependent needs and the direction of the relationship of each parental feeding practice to the child's BMI-for-age Z-score. Consequently, longitudinal studies assessing child feeding practices overtime and across ages are needed.

CONCLUSION

The uncontrolled increase in the prevalence of childhood obesity and overweight in Bahrain is a major challenge that requires attention. The first step to tackle this challenge is to intervene to eliminate the misperception among parents as the underestimation could interfere with the alertness of parents toward their child weight. A possible recommendation is to implement annual school anthropometric measurements of the children and update the parents about their children weight status. Ultimately, these results highlight the need for programs and interventions for educating the parents to limit excessive restriction, which is a very common feeding practice in Bahrain.

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# 1	Item	Response	Factor	#	Item	Response
1		options				options
	When your child is at home, how often are you responsible for feeding her/him?	1=Never 2=Seldom 3=Half of the time		18	I have to be sure that my child does not eat too much of her/his favorite foods	-
2	How often are you responsible for deciding what your	4=Most of the time 5=Always		19	I intentionally keep some foods out of my child's reach	
3	child's portion sizes are? How often are you responsible for deciding if your child			20	I offer sweets (candy, ice cream, cake, and pastries) to my child as a reward for good behavior	
4	has eaten the right kind of foods?	1-Markadhy		21	I offer my child her/ his favorite foods in exchange for good	
7	years old)	underweight			behavior	
5	Your adolescence	2=Underweight 3=Normal		22	If I did not guide or regulate my child's	
6 7	Your 20s At present	4=Overweight 5=Markedly			eating, she/he would eat too many junk foods	
erceived child 8 Your child during the light 1st year of life	•	1=Markedly underweight		23	If I did not guide or regulate my child's eating, she/he would	
9	Your child as a toddler	2=Underweight 3=Normal			eat too much of her favorite foods	
	preschooler	4=Overweight 5=Markedly overweight	Pressure to eat	eat 24	My child should	1=Disagree 2=Slightly
11	through 2 nd grade				food on her/his plate	disagree
12	Your child from child 3 rd through 5 th grade			25	careful to make sure	3=Neutral 4=Slightly agre 5=Agree
13	How concerned are you about your child eating too much when you are not around her/	1=Unconcerned 2=A little concerned 3=Concerned		26	If my child says "I'm not hungry," I try to get her/him to eat anyway	
14	iim?	4=Fairly concerned		27	If I did not guide or regulate my child's	
	you about your child having to diet to maintain a desirable	5=Very concerned			eating, she/he would eat much less than she should	
15	weight?		Monitoring	28	How much do you keep track of the	1=Never 2=Seldom
15	you about your child becoming overweight?				sweets (candy, ice cream cake, pies, and	3=Sometimes 4=Mostly 5=Always
16	I have to be sure that my child does not eat too many sweets	1=Disagree 2=Slightly disagree		29	child eats? How much do you keep	<i>c 11ajc</i>
	(candy, ice cream, cake, or pastries)	3=Neutral 4=Slightly agree 5=Agree			(potato chips, Doritos, and cheese puffs) that	
17	I have to be sure that my child does not eat too many high-fat			30	How much do you keep track of the high-	
	4 5 6 7 8 9 10 11 12 13 14 15 16	 deciding what your child's portion sizes are? How often are you responsible for deciding if your child has eaten the right kind of foods? Your childhood (5–10 years old) Your adolescence Your 20s At present Your child during the 1st year of life Your child as a toddler Your child as a toddler Your child kindergarten through 2nd grade Your child from child 3rd through 5th grade How concerned are you about your child eating too much when you are not around her/ him? How concerned are you about your child having to diet to maintain a desirable weight? How concerned are you about your child becoming overweight? Io How concerned are you about your child becoming overweight? Io How concerned are you about your child becoming overweight? Io How concerned are you about your child becoming overweight? Io I have to be sure that my child does not eat too many sweets (candy, ice cream, cake, or pastries) 	 Fesponsible for deciding what your child's portion sizes are? How often are you responsible for deciding if your child has eaten the right kind of foods? Your childhood (5–10 underweight 2=Underweight Your adolescence 3=Normal 4=Overweight Your child during the 1st year of life 9 Your child as a toddler 1st year of life 2=Underweight 3=Normal 4=Overweight Your child as a toddler 1st year of life 2=Underweight 3=Normal 4=Overweight 5=Markedly overweight 5=Markedly overweight 5=Markedly overweight 5=Markedly overweight 5=Markedly overweight 5=Markedly overweight 5=Normal 4=Overweight 5=Normal 4=Overweight 5=Normal 4=Overweight 5=Markedly overweight 5=Normal 4=Overweight 5=Very concerned 3=Concerned 4=Fairly concerned 5=Very concerned 4=Fairly 4=Fairly 4=Fairly 4=Fairly 4=Fairly 4=Fairly 4=Fairly 4=Slightly agree 5=Agree 17 I have to be sure that my child does not eat too many high-fat foods 	responsible for deciding what your child's portion sizes are? 5=Always 3 How often are you responsible for deciding if your child has eaten the right kind of foods?	responsible for deciding what your child's portion sizes are? 3 How often are you responsible for deciding if your child has eaten the right kind of foods? 4 Your childhood (5–10 years old) 5 Your adolescence 6 Your 20s 4 – Overweight 7 At present 9 Your child as a todler 9 Your child as a todler 1 – Markedly underweight 9 Your child as a todler 1 – Markedly underweight 9 Your child as a todler 1 – Markedly underweight 9 Your child as a todler 1 – Markedly 1 Your child as a todler 1 – Markedly 0 Your child as a todler 1 – Markedly 1 Your child as a todler 1 – Markedly 1 Your child sa todler 1 – Markedly 1 Your child from child 3 – Normal 1 How concerned are you about your child eating too much when you are not around her/ him? 14 How concerned are you about your child having to diet to maintin a desirable weight? 16 I have to be sure that my child does not at too many high-fat 17 I have to be sure that my child does not eat too many high-fat 18 Monitoring 19 Sourd to diet to maintin a desirable 10 The sure that 10 The	responsible for deciding what your child's portion sizes are? S=Always Siller locks of high child's reach 3 How often are you responsible for deciding if your child has caten the right kind of foods? I offer sweets (candy, ice cream, cake, and pastrics) to my child as a reward for good behavior 4 Your childhood (5=10 years old) I=Markedly underweight 21 I offer sweets foods in exchange for good behavior 5 Your child during the I="year of life I=Markedly overweight 21 I did not guide or regulate my child's eating, she/he would eat too many inde/sign a-Normal 9 Your child as a toddler S=Markedly overweight 23 If I did not guide or regulate my child's eating, she/he would eat too much of her favorite foods 10 Your child sa toddler S=Markedly overweight Pressure to eat 24 My child should always eat all of the food on her/his plate 11 Your child kindergared you about your child eating too much when you about your child having to die to maintain a desirable I=Unconcerned you about your child eating too much when you about your child having to die to maintain a desirable Monitoring 24 My child should always eat all of the food on her/his plate 14 How concerned are you about your child having to die to maintain a desirable I=Oinseree area 25 I Awe to be sure that may child does not eat two many sigh-fat foods

APPENDIX

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