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Eating Behaviors and Quality of Life in Pre-Adolescents at Risk for Obesity with and without Abdominal Pain

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Abstract

Objectives—We evaluated eating behaviors and quality of life (QOL) in pre-adolescent children at risk for obesity with and without abdominal pain (AP).

Methods—Participants were parent-child dyads enrolled in a randomized, controlled obesity prevention trial. The children were between 5 and 10 years of age and at risk for obesity (70th–95thile of BMI; n = 420). Parents completed measures of their child's eating behaviors, quality of life, abdominal pain, and bowel function and their own depression status, concern about child weight, and feeding practices. Children's height and weight were also measured.

Results—Children with frequent AP (≥ 2 per month; n=103) were compared to children reporting infrequent AP (< 2 per month; n=312). Age and BMI did not differ between groups, but AP was more prevalent in females. Child emotional overeating and parental depression scores were higher in the frequent AP group (P<0.01), and child QOL was lower (P < 0.01). In multivariable analysis, female gender (OR 2.18; 95% CI 1.20 – 3.97), emotional overeating (OR 2.28; 95% CI 1.37 – 3.81), and parental depression (OR 1.23; 95% CI 1.12 – 1.35) were associated with more frequent AP. Secondary analyses were completed for children who met Rome III criteria for irritable bowel syndrome (IBS).

Conclusions—Clinicians working with children with AP at risk for obesity should consider assessing for and, when appropriate, addressing parent and child factors that could potentially exacerbate AP.

Keywords

Obesity; Overweight; Eating Behaviors; Abdominal Pain; Adolescent

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Introduction

There has been increasing recognition that the rising prevalence of obesity in adults is also a serious problem in pediatric populations (1, 2). Obesity has been associated with reduced health-related quality of life among adults (3, 4), and studies have also shown that obese children have lowered quality of life (5–8), as well as numerous adverse health sequelae (9).

Child eating behaviors (i.e., emotional overeating, fast eating rate, eating in the absence of hunger) and parental characteristics (including parental feeding practices such as monitoring intake and emotional feeding) have been linked to the development and maintenance of childhood obesity (10–12). Studies have also shown obesity and disordered eating behaviors in children to be linked to common functional gastrointestinal disorders (FGIDs) (13, 14). Obese children appear to have higher rates of FGIDs, greater intensity and frequency of symptoms, more abdominal pain, and greater disability than non-obese children (14–16). Research on GI symptoms and obesity, however, has not been extended to children who are *at risk for* obesity or are currently overweight (but not obese) or to pre-adolescents with FGIDs. Such research could have important implications for intervention/prevention efforts.

The primary aim of this study was to evaluate the association between children's eating behaviors and parent feeding practices among pre-adolescent children at risk for obesity with and without AP who were enrolled in an obesity prevention study (17). We hypothesized that emotional overeating would be associated with more frequent abdominal pain in pre-adolescent children at risk for obesity. The secondary aims were to evaluate quality of life in pre-adolescent children at risk for obesity with and without AP, and to assess the prevalence of Rome III lower GI symptoms, including Rome III irritable bowel syndrome (IBS) within this cohort.

Materials and Methods

Recruitment and enrollment

Baseline data from an ongoing a randomized controlled, primary-care based obesity prevention intervention trial, The Healthy Homes/Healthy Kids (HHHK 5–10) study, were used in these analyses (17). Families were recruited from those making a well-child visit with a pediatric primary care provider at one of 20 clinics in the greater Minneapolis-St. Paul area. Eligibility criteria for the study were as follows: 1) 5–10 year old child attending a well-child visit conducted by a pediatric or family practice care provider; 2) child BMI was between the 70th and 95th percentile according to 2000 CDC age and sex reference standards (18); 3) the child's parent/guardian and child agreed to participation in the study and were not planning to move out of the state in the next 24 months; 4) English speaking parent and child; 5) no medical problems that would preclude study participation as determined by the physician conducting the well-child visit (e.g., a chromosomal abnormality, chronic condition such as kidney disease, Type I diabetes, lupus, or cancer); 6) child was not using a steroid medication for more than one month; and 7) child was not participating in another health-related research study.

Four hundred twenty one parent child dyads were randomized to one of two study conditions: 1) a primary care based obesity prevention intervention and 2) a primary care based attention control condition focused on general health, safety, and injury prevention. (17) The data reported in the present study were collected at the baseline visit of the HHHK 5–10 study. This project was approved by the Institutional Review Board at Health Partners on 1/4/2010.

Measures

Demographic characteristics were collected with a 19-item parent-reported questionnaire and the child's Electronic Medical Record (EMR). Child age and gender were retrieved from the EMR and subsequently confirmed with parents. Parents reported on their child's characteristics (ethnicity, race, and absences from normal activities), and their own characteristics (age, gender, ethnicity, race, marital status, employment status, and educational achievement). Child weight and height were measured by study staff in the family home using a Seca 876 flat scale and Seca 217 stadiometer (Seca Corp., Hanover, MD). BMI (body mass index) percentile was then calculated using the CDC 2000 Growth Charts.

Parent feeding practices were measured using the Child Feeding Questionnaire (CFQ), a 31-item measure of parent feeding practices (19). Seven factor-analytically-derived subscales assessed the following constructs: perceived child weight, perceived parent weight, concern about child weight, feeding responsibility, monitoring, restriction, and pressure to eat. The subscales for parental concern about child weight, monitoring, restriction, and pressure to eat were evaluated. Item scores were averaged to compute subscale scores.

Children's eating style was measured using the Children's Eating Behavior Questionnaire (CEBQ). This parent-report instrument has 8 subscales assessing food responsiveness, enjoyment of food, emotional overeating, emotional under-eating, desire to drink, satiety responsiveness, slowness in eating, and fussiness (20). The subscales assessing food responsiveness, enjoyment of food, and emotional overeating were included. Items were rated on a 1–5 ("never" to "always") scale and were averaged to produce a subscale score.

Health-related quality of life (HRQOL) in children was assessed using the Pediatric Quality of Life Inventory, Parent-Report for Young Children (ages 5–7)-Version 4.0 Short Form (PedsQL™ 4.0 SF15 (21). Items from the parent-proxy report, short-form version were used to assess parent perceptions of child HRQOL. Instructions for the standard version ask the rater to determine how much of a problem each item has been during the past 1 month on a 5-point Likert scale (with 0 being never and 4 being almost always) across the core dimensions of physical, mental, social, and school domains. Items were reverse scored and linearly transformed to a 0–100 scale (0=100, 1=75, 2=50, 3=25, 4=0) such that higher PedsQL scores indicate better HRQOL (fewer symptoms). For the PedsQL, a 4.4 point change in the Total Score for child self-report and a 4.5 point change in the Total Score for parent proxy-report represent a minimal clinically important difference, or MCID (22). The MCID, determined by calculating the Standard Error of Measurement (SEM) (23), is

defined as the smallest difference in a score that would mandate a change in clinical management (24).

Abdominal pain and bowel function were assessed using 8-items from the Rome III Childhood Functional GI Disorders: Child/Adolescent form for the diagnosis of irritable bowel syndrome (IBS) (25). Parents were asked to indicate the frequency of child belly pain or discomfort in the past 3-months using the following response options: “never,” “less than 1 day/month,” “1 day/month,” “2–3 days/month,” “1 day/week,” “greater than 1 day/week,” and “every day.” Parents reported the duration of the pain or discomfort (response options: “less than 2 months,” “2 months,” “3–5 months,” “6+ months,” and “no pain”). Restrictions or limitations in daily living as a result of GI issues and the frequency of relief after a bowel movement were also assessed. Parents were also asked to report whether the child had more or less frequent bowel movements, loose bowel movements, or hard stools after the GI issues started. These questions used the response options “no pain,” “never (0%),” “sometimes (25%),” “often (50%),” “most of the time (75%),” and “always (100%).” More frequent abdominal pain (“frequent AP”) was defined as 2 pain episodes or more per month. Less frequent abdominal pain (“infrequent AP”) was defined as less than 2 pain episodes per month.

Parental depression status was assessed using the Patient Health Questionnaire (PHQ-9). The PHQ-9 consists of 9 items addressing the DSMV-IV depression symptoms with 4-point Likert scale responses ranging from 0 (“not at all”) to 3 (“nearly every day”). A total score was calculated by summing all items (26).

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 20.0; Armonk, NY: IBM Corp). Frequency distributions were evaluated for all categorical variables. Student’s t-tests or analysis of variance (ANOVA) were performed to evaluate differences between study groups. P-values were adjusted for inequality of variances based on Levene’s test for t-tests, or adjusted using the Welch test for ANOVA. Tests for proportionality between groups were made using the Chi-square test. Multivariable logistic regression was used to estimate odds ratios and 95% confidence intervals using unconditional entry methods to evaluate the association between potential predictors and frequent AP. A variant of the purposeful selection process was used to select covariates as described by Hosmer and Lemeshow (27). Briefly, all hypothesized variables having a significant univariate test at the 0.10 level were selected as candidate variables for the multivariable analysis. A list of all variables evaluated is shown in Table 3. Following an iterative selection process, covariates were then removed from the multivariable model if they were found to be non-significant or non-confounding on entry. Summary statistics included point estimates and standard deviations or 95% confidence intervals. All significance levels were evaluated at the 2-tailed, $p < 0.05$ levels.

Results

Demographics

Questionnaires were completed by 420 parents (49% female; 72% Caucasian). However, some questions were not completed by all parents (including 5 parents who did not answer questions about GI symptoms, presumably because their child did not have them) and were therefore excluded from analyses. The mean (SD) age was 80 (20) months (range 57–131 months). The mean (SD) BMI was 17.75 (1.41) kg/m². The average (range) percentile of child BMI for age and gender was 85% (70 – 95%). Questionnaires were completed by the parent who enrolled in the study, most often the child's mother (92%). The majority of parents were married (55%), employed full or part-time (84%), with at least some college or professional training (87%).

Child Abdominal Pain Characteristics

To evaluate Rome III lower GI symptoms, eating behaviors, quality of life, and parental characteristics in pre-adolescent children at risk for obesity, children with more frequent AP (n=103) were compared to children having less frequent AP (n=317). A higher proportion of females reported frequent AP compared with males (Table 1). No differences were seen in age, race or other physical characteristics between the groups, $p > .05$. There were also no associations between AP frequency and other sociodemographic characteristics (i.e., parental marital status, education, and employment), $p > .05$.

Of the total sample, 36% (150/420) of parents reported child abdominal pain at least one day per month. However, only 10% reported abdominal pain at least one day per week. As shown in Table 2, 24.5% (103/420) of children were identified by their parents as having frequent AP defined as at least 2 episodes per month. Of these, approximately 40% of parents reported that their child's pain occurred at least weekly. The duration of AP in these children was reported to be 2 months or more in 68% of children. Abdominal pain was reported to limit or restrict children's daily activities (e.g., school, play activities) at least 25% of the time in 32% of the total sample. Frequency of AP was associated with changed bowel habit, defined as more or less frequent and/or looser or harder stool, in 86% of children. In our sample, 4.8% of children fulfilled the Child/Adolescent Rome III criteria for IBS. This compares to a recent community based sample where 2.9% of children met Rome III criteria for IBS (28). Rome III lower GI symptoms were significantly more common in children with more frequent AP (Table 2).

Univariate analyses of eating behaviors, quality of life and parental characteristics by frequency of AP are shown in Table 3. The Emotional Overeating scale on the CEBQ and the PHQ-9 Total Score were significantly higher in children with more frequent AP. Overall HRQOL, measured with the PedsQL Total Score, was rated significantly lower in children with more frequent AP. Specifically, more frequent pain was associated with decreased Emotional and Social domain scores on the PedsQL (Table 3, Figure 1), but not with Physical or Social functioning. No significant group differences were found on the Child Feeding Questionnaire subscales in univariate analyses.

Multivariable logistic regression analyses are shown in Figure 2. All hypothesized variables having a significant univariate test at the 0.10 level were selected as candidate variables for the regression analysis (See Table 3). Following an iterative selection process, covariates were then removed from the multivariable model if they were found to be non-significant or non-confounding on entry. Variables remaining in the model included gender, child emotional overeating (CEBQ Emotional Overeating subscale), and parental depression (PHQ-9 Total Score). Female gender (OR 2.18; 95% CI 1.20 – 3.97; $P=0.011$), CEBQ Emotional Overeating (OR 2.28; 95% CI 1.37 – 3.81; $P=0.002$), and the PHQ-9 Parental Depression score (OR 1.23; 95% CI 1.12 – 1.35; $P<0.001$) were associated with more frequent AP.

Exploratory analyses revealed significant differences between children with infrequent AP, children with more frequent AP, and children who met Rome III criteria for IBS (Table 4). The CEBQ Emotional Overeating score was significantly higher in the Rome III IBS children and children with more frequent AP compared to the children with infrequent AP.. An inverse pattern was noted for the PedsQL Total Score and the PedsQL Social and Emotional Functioning subscales such that children with IBS and children with more frequent AP had significantly lower scores (indicating poorer functioning) compared with the infrequent AP group. The PHQ-9 Parental Depression scale was significantly higher in both the IBS children and children with frequent AP compared to children with infrequent AP. No significant group differences were noted on the CFQ Concern subscale.

Discussion

As stated previously, prior studies have shown obesity and disordered eating behaviors to be linked to FGIDs and AP in children (13, 15). Obesity has also been associated with poor outcome and disability at long-term follow-up of standard medical treatment for these symptoms (16). Obese children are more likely to report higher intensity and frequency of symptoms, school absenteeism, and lower levels of daily functioning. (29, 30)

Until the present study, little attention has been paid to examining factors in the lives of children with AP who are not yet obese, but appear to be on this obesity trajectory. We found that parents of pre-adolescent children at risk for obesity reported abdominal discomfort or pain. More frequent AP was associated with increased limitations or restrictions of children's daily activities and lower overall QOL. Abdominal pain was also often associated with changed bowel habit. These findings suggest that frequent AP associated with altered bowel function is common in pre-adolescent children at risk for obesity and impacts quality of life, consistent with our prior study in adults (31). One limitation of the present study is that child self-reports of abdominal pain and QOL were not obtained. We do not know if their reports would differ (or to what extent) from those of their parents.

The salience of the Rome III diagnostic criteria for this sample was less evident. Parents of children who reported more frequent AP were more likely to also endorse Rome III criteria symptoms. However, only 4.8% (20/420) of children fulfilled the Child/Adolescent Rome III criteria for IBS in this sample. This compares to a recent community based sample where

2.9% of children met Rome III criteria for IBS (28). Relatively few children met the stricter Rome III criteria for IBS primarily due to the requirements that the criteria be fulfilled at least once per week for at least 2 months. Our preliminary findings suggest that the negative impact on QOL was similar in children with abdominal pain at least twice per month and those that met the stricter criteria for IBS. Whether this finding has implications for the development of less restrictive diagnostic criteria should be explored further. These findings should be confirmed in a larger number of children who meet IBS criteria.

We found that frequent AP was associated with female gender, emotional overeating, and parental depression. While some studies have pointed to the higher rates of AP in girls (32), others have shown no difference in prevalence of AP between boys and girls (33, 34). Similarly, while some studies have shown minimal to no associations between parental depression and child AP (35, 36), other studies have found that children with AP are more likely to have parents with a history of depressive symptoms (37, 38). The mechanisms contributing to this association are unknown and under investigation (39). It is also possible that since children's abdominal pain was reported by parents, a common practice in the abdominal pain literature, parents who are more depressed might engage in maladaptive cognitions. While the literature to-date does not appear to have investigated the pathway from parent depression to parent catastrophizing to child pain, studies have documented associations between depression and catastrophizing (40, 41) and between parent catastrophizing and both parent and child-reported pain (42–45). It stands to reason that depressed parents may be more likely to catastrophize, and therefore report greater pain frequency or intensity in their children. While exploring the reasons for the depression/pain association is beyond the scope of the present study, future research should build on our findings by exploring these mechanisms. Additionally, a limitation of our study was that we only assessed parental depression. As child depression could be associated with reports of abdominal pain, future studies should include child reports of depressive symptoms.

Regarding emotional overeating, studies of adult populations have found associations between binge eating and GI symptoms such as abdominal pain, and bloating (46), particularly in obese individuals (31, 47). Although we did not measure binge eating directly in the current study, our findings mirror the adult literature and are among the first to explore these relationships in a pediatric sample.

As our sample was derived from children being seen for well-child visits (i.e., were not being seen for abdominal pain symptoms), we expected that our sample would have higher PedsQL scores than those of clinical samples. While PedsQL scores for our sample did not fall below the clinical cutoff scores (22), we found that emotional and social functioning scores were significantly lower for children who had more frequent AP; in fact, scores for the frequent AP group were similar to previously-reported scores for children with functional AP, organic GI disorders, and IBS (48) and children with other chronic health conditions (22) using the longer, 23-item PedsQL questionnaire (49). Given the cross-sectional nature of these data, however, it is not possible to determine whether children's social and emotional functioning are impacted by AP or whether these lower scores represent emotional and social contributors to children's AP.

We found that the differences in PedsQL Total scores between our frequent AP sample and less frequent AP sample represented a minimal clinically important difference (MCID). Similarly, PedsQL Total scores for our IBS sample demonstrated a MCID compared to our less frequent AP sample and published scores for healthy children (22). These findings suggest the need to adjust the clinical management of children with frequent AP and IBS to achieve better overall QOL.

Studies have suggested a higher prevalence of FGIDs (including functional abdominal pain) in obese and overweight children (13, 14), and data have shown relationships between obesity and AP in children with FGIDs (16), however, these studies did not include an evaluation of QOL. Studies that do investigate QOL in children and adolescents with AP have shown global impairments (48, 50), although BMI/weight status was not known in those populations. While our study investigated the interrelationships between AP and QOL in pre-adolescents who were *at risk* for obesity, a study of AP in already-obese children and adolescents that includes measures of QOL would thus be an important contribution to the literature.

Conclusions

Certain child eating behaviors and parent characteristics appear to be associated with abdominal pain in a sample of children at risk for obesity. Clinicians should consider assessing and possibly intervening in some of these areas to preventatively address future exacerbation of gastrointestinal problems. Research should systematically explore whether altering child eating patterns, parental characteristics or distress would improve clinical outcomes for these children in the short run, as well as into the future.

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Figure 1.

PedsQL scale scores comparing healthy children to children with abdominal pain. P values are shown for AP < 2 or > 2 months only. * indicates p value < .05. AP = abdominal pain. mo = months. Blue bar signifies values for healthy sample from Chan et al (2005) publication. Red bar signifies values for children with abdominal pain for less than 2 months. Green bar signifies values for children with abdominal pain for 2 or more months.

Figure 2.
Results from logistic regression showing odds ratios and confidence intervals for significant predictors of abdominal pain.

Table 1

Demographic Characteristics by Frequency of Abdominal Pain

	Abdominal Pain		P-Value
	< 2/mo (n=312)	>= 2/mo (n=103)	
Gender			0.003
Male; n (%)	171 (54.8%)	39 (37.9%)	
Female; n (%)	141 (45.2%)	64 (62.1%)	
Race			0.315
Caucasian	224 (74.2%)	74 (71.8%)	
African American	35 (11.6%)	8 (7.8%)	
Multiracial	31 (10.3%)	17 (16.5%)	
Other	12 (4.0%)	4 (3.9%)	
Age; mean (SD) mos	79.8 (19.9)	82.6 (20.7)	0.212
BMI; mean (SD) kg/m ²	17.7 (1.4)	17.8 (1.4)	0.510
BMI; mean (SD) %	84.8 (7.2)	85.1 (6.7)	0.705

Table 2

Distribution of Rome III Lower GI Symptoms Criteria by Frequency of Abdominal Pain

	Abdominal Pain		P-Value
	< 2/mo (n=317)	>= 2/mo (n=103)	
Abdominal pain at least 1 / wk; n(%)	0 (0.0)	41 (39.8)	NA
Limited or restricted daily activities 25%; n(%)	27 (8.5)	33 (32.0)	< 0.001
Pain or discomfort duration 2 month; n(%)	32 (10.1)	67 (65)	< 0.001
Pain associated with bowel habit; n(%)	135 (42.6)	89 (86.4)	< 0.001
Pain improved with defecation 25%; n(%)	135 (42.6)	89 (86.4)	< 0.001
More frequent bowel movements 25%; n(%)	85 (26.8)	52 (50.5)	< 0.001
Less frequent bowel movements 25%; n(%)	72 (22.7)	50 (48.5)	< 0.001
Pain associated with looser stools 25%; n(%)	80 (25.2)	48 (46.6)	0.001
Pain associated with harder stools 25%; n(%)	87 (27.4)	66 (64.1)	< 0.001
Met Rome III Criteria for IBS; n(%)	0 (0)	20 (19.4)	N/A

Table 3

Eating behaviors, quality of life and parental depression by frequency of abdominal pain

	Abdominal Pain*		P-Value
	< 2 / mo	>= 2 / mo	
<u>Child Feeding Questionnaire</u>			
CFQ Restriction	3.24 (.87)	3.22 (.73)	0.810
CFQ Monitoring	3.75 (.98)	3.70 (.99)	0.635
CFQ Concern	2.35 (1.24)	2.45 (1.23)	0.493
CFQ Pressure	2.17 (.91)	2.28 (.91)	0.292
<u>Children's Eating Behavior Questionnaire</u>			
CEBQ Enjoy Food	2.62 (.65)	2.62 (.62)	0.993
CEBQ Emotional Overeating	.51 (.56)	.74 (.65)	0.001
CEBQ Food Responsiveness	1.24 (.68)	1.37 (.70)	0.087
<u>Pediatric Quality of Life Inventory</u>			
PedsQL Physical	92.71 (14.25)	91.18 (18.02)	0.379
PedsQL Emotional	76.48 (15.63)	69.96 (16.28)	<0.001
PedsQL Social	84.64 (16.09)	78.56 (18.32)	0.001
PedsQL School	80.38 (20.69)	75.65 (25.63)	0.093
PedsQL Total	84.35 (11.67)	79.90 (14.82)	0.006
<u>Patient Health Questionnaire Parent Depression Status</u>			
PHQ-9 Total Score	2.29 (2.50)	4.35 (4.33)	<0.001

* Note: All values represent the unadjusted Mean (SD) for each variable.

Table 4

Outcomes by symptom severity

	Abdominal Pain		Rome III IBS _c (n = 20)	Group differences
	< 2/mo _a (n = 312)	>= 2/mo _b (n = 83)		
CEBQ Emotional Overeating	0.51 (0.56)	0.71 (0.63)	0.84 (0.70)	a<b,c *
PHQ-9 Total Score	2.18 (2.38)	4.32 (4.32)	4.43 (4.48)	a<b,c **
CFQ Concern	2.35 (1.24)	2.41 (1.20)	2.60 (1.36)	.662
PedsQL Physical	92.91 (13.61)	91.46 (17.35)	90.00 (21.03)	.548
PedsQL Emotional	76.37 (15.61)	70.71 (16.42)	66.88 (15.72)	b<a *; c<a **
PedsQL Social	84.65 (16.09)	79.52 (17.18)	74.58 (22.54)	c,b<a *
PedsQL School	80.56 (20.58)	75.61 (26.25)	75.83 (23.55)	.150
PedsQL Total Score	84.38 (11.54)	80.38 (14.51)	77.92 (16.28)	c,b<a *

Note: values represent Mean (SD).

*
p<.05,**
p<.01 based on Dunnett post-hoc analyses.

NS = not significant