Quality of Early Maternal–Child Relationship and Risk of Adolescent Obesity

WHAT'S KNOWN ON THIS SUBJECT: The quality of the relationship between mother and child affects the child's neurodevelopment, emotion regulation, and stress response. Extreme or sustained stress responses are associated with dysregulation of physiologic systems involved in energy balance, which could lead to obesity.

WHAT THIS STUDY ADDS: The prevalence of obesity in adolescence was more than twice as high among those youth who in early childhood had poor-quality relationships with their mothers compared with those with better relationships.

abstract

OBJECTIVE: The goal of this study was to determine whether obesity in adolescence is related to the quality of the early maternal–child relationship.

METHODS: We analyzed data from 977 of 1364 participants in the Study of Early Child Care and Youth Development. Child attachment security and maternal sensitivity were assessed by observing mother–child interaction at 15, 24, and 36 months of age. A maternal–child relationship quality score was constructed as the number of times across the 3 ages that the child was either insecurely attached or experienced low maternal sensitivity. Adolescent obesity was defined as a measured BMI $\geq$ 95th percentile at age 15 years.

RESULTS: Poor-quality maternal–child relationships (score: ≥ 3) were experienced by 24.7% of children compared with 22.0% who, at all 3 ages, were neither insecurely attached nor exposed to low maternal sensitivity (score: 0). The prevalence of adolescent obesity was 26.1%, 15.5%, 12.1%, and 13.0% for those with risk scores of ≥ 3 , 2, 1, and 0, respectively. After adjustment for gender and birth weight, the odds (95% confidence interval) of adolescent obesity was 2.45 (1.49–4.04) times higher in those with the poorest quality early maternal–child relationships (score: ≥ 3) compared with those with the highest quality (score: 0). Low maternal sensitivity was more strongly associated with obesity than insecure attachment.

CONCLUSIONS: Poor quality of the early maternal–child relationship was associated with a higher prevalence of adolescent obesity. Interventions aimed at improving the quality of maternal–child interactions should consider assessing effects on children's weight and examining potential mechanisms involving stress response and emotion regulation. *Pediatrics* 2012;129:132–140

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KEY WORDS

attachment security, maternal sensitivity, parenting, obesity, BMI, Study of Early Child Care and Youth Development, children, adolescents, prospective

ABBREVIATIONS

AQS—Attachment Q-sort

CI—confidence interval

NICHD—Eunice Kennedy Shriver National Institute of Child Health and Human Development

OR—odds ratio

SECCYD—Study of Early Child Care and Youth Development

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Most childhood obesity prevention strategies are focused on energy balance¹ and target behaviors and environments that directly affect energy intake or expenditure, such as increasing physical activity, reducing sedentary behavior, or limiting intake of energy-dense foods and beverages.² The limited success of these strategies^{3–5} underscores the importance of considering new approaches.

We have proposed that insecure attachment may be a risk factor for obesity in preschool-aged children.⁶ The mechanism underlying this association is uncertain. However, attachment security reflects the development of children's emotion regulation and stress response.^{7,8} These capacities could influence adiposity through their effects on appetite, sleep, and activity.^{9–11} Despite the potential of attachment security to affect the neurodevelopment of physiologic systems regulating weight, no studies have examined the association between attachment security and obesity beyond the preschool age.

Assessment of attachment security is based on a child's behaviors during interactions with a primary caregiver, usually the mother. Secure attachment is 1 indicator of the quality of the mother–child relationship. Specifically, it reflects the child's awareness that the mother can be used as a “secure base” from which to explore and that returning to the mother after a stressful experience will be comforting.^{12,13} Maternal sensitivity, another indicator of maternal–child relationship quality, refers to the mother's capacity to recognize the child's emotional state and respond with comfort, consistency, and warmth.¹⁴ Although a child's secure attachment is more likely to develop within the context of maternal sensitivity,^{15,16} additional factors such as the child's temperament, innate capacity for self-regulation, relationships with other caregivers, or the household

environment may also influence attachment security.^{17,18}

Evidence suggests that obesity is more prevalent among adults who have been abused or neglected as children,^{19,20} but, to the best of our knowledge, few studies have examined the relationship between the quality of early maternal–child relationships and obesity. Two prospective studies suggest that greater maternal sensitivity during early childhood is associated with lower risk of obesity later in childhood,^{21,22} but this was not found in another study.²³

Both attachment security and maternal sensitivity may be linked to obesity through development of children's capacity to modulate their responses to internal emotional states, such as those that occur with stress.^{24,25} These stress responses can be both physiologic (eg, increased cortisol levels) and behavioral (eg, increased food consumption), and may lead to obesity if the stress is extreme or sustained.^{26,27} Although healthy emotion regulation may be a mechanism for protection against development of obesity, young children's capability for emotion regulation is difficult to directly assess in epidemiologic studies.²⁸ In the absence of such data, we examined how obesity in adolescence is related to quality of the early maternal–child relationship using direct observation of 2 factors that reflect emotional regulation—attachment security and maternal sensitivity.

METHODS

Study of Early Child Care and Youth Development

We used data from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD), a prospective cohort study of children born in 1991 that was

designed to examine the impact of nonmaternal care on children's developmental outcomes.²⁹ To achieve a sample of children from families with diverse sociodemographic characteristics, investigators recruited children at birth from 24 hospitals located in 9 US states.^{30,31} Exclusion criteria included maternal age <18 years, nonsingleton birth, lack of English fluency, postbirth hospitalization for >7 days, or plans for adoption.^{30,31} Study protocols were approved by the institutional review boards of participating universities.

Study Subjects

Our study examined 977 children, which is 71.6% of the original cohort ($n = 1364$). To be included in our analyses, subjects required data on BMI assessed between 12.0 and 15.9 years of age.

Study Variables

Adolescent Obesity

Adolescent obesity was defined as a gender-specific BMI ≥ 95 th percentile of the Centers for Disease Control and Prevention growth reference.³² We calculated BMI (kilograms per meters squared) by using height and weight measurements obtained in a laboratory setting using a standardized protocol.³³ To maximize the number of youth included in our analyses, we defined adolescent obesity relative to the BMI percentile at the 15-year assessment. For those missing BMI data at 15 years, we used the BMI measured at the oldest age after 12.0 years.

Early Maternal–Child Relationship Quality

At 15, 24, and 36 months of age, child attachment security and maternal sensitivity were assessed by direct observation of mother–child interaction. We combined information from these assessments to characterize the quality of the early maternal–child relationship.

Maternal sensitivity was coded from a standardized, videotaped, 15-minute play session conducted in the home (15 months) or a child development laboratory (24 and 36 months). Mothers were instructed to play with their child using the contents of 3 bags, each containing a different toy. Videotapes were coded at a central location by trained coders who were unaware of other information about the child's family. Coders met regularly with an investigator who ensured they maintained consistent expertise.³¹ Maternal sensitivity was computed as the sum of ratings on 3 aspects of observed maternal behavior toward the child. At 15 and 24 months, these aspects were sensitivity to nondistress, intrusiveness (reverse coded), and positive regard; each was rated using a 4-point scale where 1 = not at all characteristic and 4 = very characteristic. At 36 months, a 7-point scale was used, and the 3 aspects of maternal behavior rated were supportive presence, respect for autonomy, and hostility (reverse coded).³⁴ Maternal sensitivity scores were skewed toward high values; we used the lowest quartile to define low maternal sensitivity (scores ≤ 8 at 15 and 24 months, and scores ≤ 15 at 36 months).

At 15 and 36 months, attachment security was assessed in the laboratory using the Strange Situation procedure,^{31,35} which involved observation and coding of the child's behavior during a standardized separation from and reunion with the mother.^{12,36} Based on the Strange Situation procedure, children were classified as securely or insecurely attached. Attachment security was assessed at 24 months using the Attachment Q-sort (AQS).³⁷ Mother and child were observed in their home for ~2 hours by a trained observer from the SECCYD research staff. After this, the observer completed the AQS by sorting 90 statements about behaviors

children may exhibit relative to how well each statement described the behavior of the child; the AQS security score reflects the correlation of the child's score (range: -1.0 to 1.0) with that of a "prototypically secure" child.³⁷ The validity of the AQS has been established.³⁸ For interpretability and comparability with our previous work,⁶ we defined insecure attachment at 24 months as the lowest quartile of the AQS security score, which in this sample was <0.16 . The Strange Situation procedure and AQS provide related but complementary information.^{39,40}

To describe the maternal-child relationship experience across early childhood, we created a maternal-child relationship quality score using 2 measures (attachment and maternal sensitivity) at each of 3 time points (15, 24, and 36 months). We created this score as an aggregate measure of the relationship experience because we conceptualized insecure attachment and low maternal sensitivity as overlapping but complementary risk factors⁴¹ and because neither would necessarily be expected to track strongly during early childhood.⁴⁰ The score was based on a count of the number of times over the 3 assessments that the child was characterized as insecurely attached or the mother displayed low levels of sensitivity, and had a possible range of 0 to 6; we defined poor maternal-child relationship quality as a score ≥ 3 , which was approximately the lowest quartile.

Additional Variables

At enrollment, mothers reported their educational attainment and their child's gender and racial-ethnic group. Birth weights of children were recorded from birth certificates. At the 24-month interview, mothers reported household size and income, which were used to determine the household income-to-poverty line ratio.⁴² When the children

were 15 years old, mothers self-reported their current height and weight, and we used these data to assess maternal obesity ($\text{BMI} \geq 30$).

Statistical Analysis

By using χ^2 tests, we compared the characteristics of children in our analytic sample with those not included due to missing data on adolescent obesity. For each of the 3 early childhood time periods, we used logistic regression⁴³ to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for adolescent obesity associated with insecure attachment, low maternal sensitivity, and their combination. We examined the association between sociodemographic characteristics and the prevalence of both adolescent obesity and of poor maternal-child relationship quality. We used logistic regression to calculate the odds (95% CI) of adolescent obesity associated with maternal-child relationship scores of ≥ 3 , 2, and 1 relative to scores of 0. In a separate analysis, we calculated the odds (95% CI) of adolescent obesity associated with the number of times the child had insecure attachment and the number of times the mother displayed low sensitivity. We present both sets of regression analyses with and without adjusting for 2 potentially confounding variables (gender and birth weight). Birth weight was modeled as a continuous variable after confirming that it was linear in the logit.⁴³ We also present analyses adjusted for maternal obesity and sociodemographic characteristics. However, we did not consider these as our primary analyses because these variables may be part of a causal chain or pathway leading to adolescent obesity that also involves insecure attachment and/or low maternal sensitivity.⁴⁴

RESULTS

There were some differences in characteristics between children in our

analysis ($n = 977$) and those ($n = 387$) not included due to missing data on adolescent obesity (Table 1). However, at each time period neither the prevalence of low maternal sensitivity nor insecure attachment was significantly different between the children in the analytic sample and those not in the sample (data not shown).

Low maternal sensitivity at 15, 24, and 36 months was associated with an increased odds of adolescent obesity (Table 2). At 24 months, insecure attachment was associated with increased odds for adolescent obesity but not at 15 or 36 months. At 24 and 36 months, the combination of insecure attachment and low maternal sensitivity was associated with greater odds

of adolescent obesity than either was alone.

Based on a maternal–child relationship quality score of ≥ 3 , a total of 241 children (24.7%) were classified as having a poor relationship during early childhood. Of these children, 215 experienced low maternal sensitivity and insecure attachment at least once, whereas only 19 never experienced low maternal sensitivity and only 7 were never insecurely attached. Lower household income and maternal education were related to adolescent obesity and to relationship quality (Table 3).

The prevalence of obesity in adolescence was 26.1% among children who experienced poor early maternal–child relationships (score: ≥ 3) and was

15.5%, 12.1%, and 13.0% for children with better relationships (scores of 2, 1, and 0, respectively) (upper section of Table 4). After adjustment for gender and birth weight (model 2), the odds (95% CI) of adolescent obesity were 2.45 (1.49–4.04) times higher for those with the poorest relationships (score: ≥ 3) compared with those with the best relationships (score: 0). With additional adjustment for race/ethnicity, maternal education, and household income-to-poverty line ratio, the OR (95% CI) was attenuated to 1.56 (0.90–2.73), and with inclusion of maternal obesity to 1.42 (0.76–2.63). Low maternal sensitivity was more strongly related to adolescent obesity than was insecure attachment (lower section of Table 4).

TABLE 1 Characteristics of Subjects in the Analytic Sample Compared With Subjects Not Included in the Analytic Sample

Characteristic	Analytic Sample ^a	Not in Analytic Sample ^b	<i>P</i> ^c
Gender			
Female	492 (50.4)	167 (43.2)	.02
Male	485 (49.6)	220 (56.8)	
Racial-ethnic group			
White	788 (80.7)	309 (79.8)	.73
Nonwhite	189 (19.3)	78 (20.2)	
Birth weight, g			
2000–2999	159 (16.3) ^d	65 (16.8)	.87
3000–3999	673 (68.9)	261 (67.4)	
≥ 4000	145 (14.8)	61 (15.8)	
Maternal education			
Graduate degree	153 (15.7)	45 (11.7)	<.001
Bachelor degree	219 (22.4)	65 (16.8)	
Some college or associate degree	324 (33.2)	131 (33.9)	
High school degree or equivalent	201 (20.6)	86 (22.3)	
Less than high school degree	80 (8.2)	59 (15.3)	
Household income-to-poverty line ratio			
≥ 5.00	216 (23.2)	57 (22.4)	.69
3.00–4.99	262 (28.1)	81 (31.9)	
1.86–2.99	205 (22.0)	47 (18.5)	
1.00–1.85	139 (14.9)	37 (14.6)	
<1.00	111 (11.9)	32 (12.6)	
Adolescent obesity ^e			
BMI <95th percentile	816 (83.5)	NA	NA
BMI ≥ 95 th percentile	161 (16.5)		

Values are given as number (%). Percentages may not total to 100% due to rounding. NA, not applicable.

^a Participants in analytic sample ($n = 977$). Of these, 44 were missing data on household income.

^b Participants not included in analytic sample because of missing information on adolescent obesity ($n = 387$). Of these, 133 were missing data on household income and 1 was missing data on maternal education.

^c *P* values from χ^2 tests comparing characteristics of participants in the analytic sample with those not in the analytic sample.

^d Preterm birth (<37 weeks' gestation) was an exclusion criterion for the SECCYD; 24 of these 159 children weighed between 2000 and 2500 g.

^e Gender-specific BMI-for-age percentile from height and weight measured at a mean $\pm$ SD age of 14.9 ± 0.6 years. BMI was measured between 15.0 and 15.9 years for 605 (61.9%) participants, between 14.0 and 14.9 years for 287 (29.4%) participants, and between 12.0 and 13.9 years for 85 (8.7%) participants.

DISCUSSION

In these prospective analyses, we found that children who experienced poor-quality early relationships with their mothers, as measured by insecure attachment and low levels of maternal sensitivity, had a greater risk of obesity in adolescence. This conclusion is consistent with our previous finding in a larger and nationally representative cohort that insecure attachment at 24 months was associated with obesity at preschool age.⁶

Children's ability to regulate their emotions and cope with stress is developed in the context of their early interactions with their parents.⁴⁵ Although not the sole determinant, sensitive parenting increases the likelihood that a child will have a secure pattern of attachment and develop a healthy response to stress.^{7,46,47} The areas of the brain that govern energy balance are also involved with stress response and emotion regulation, and extreme and/or sustained stress is associated with dysregulation of these areas of the brain.^{10,26,48} Animal studies have shown that stress preferentially increases

TABLE 2 Maternal Sensitivity and Child Attachment Security at 15, 24, and 36 Months in Relation to Adolescent Obesity

Factor	N (%) ^a	Adolescent Obesity,% ^b	Unadjusted OR (95% CI) ^c
15 months			
Maternal sensitivity			
Normal	732 (76.6)	14.5	1 (Referent)
Low	224 (23.4)	22.8	1.74 (1.20–2.53)
Attachment security ^d			
Secure	555 (59.6)	16.4	1 (Referent)
Insecure	376 (40.4)	16.8	1.03 (0.72–1.46)
Low sensitivity and insecure attachment			
Neither	436 (47.1)	14.0	1 (Referent)
1 only	391 (42.2)	18.2	1.36 (0.94–1.98)
Both	99 (10.7)	21.2	1.66 (0.95–2.88)
24 months			
Maternal sensitivity			
Normal	686 (74.1)	14.6	1 (Referent)
Low	240 (25.9) ^f	22.9	1.74 (1.21–2.52)
Attachment security ^e			
Secure	705 (75.2)	15.0	1 (Referent)
Insecure	232 (24.8) ^g	21.1	1.51 (1.04–2.21)
Low sensitivity and insecure attachment			
Neither	539 (58.6)	13.4	1 (Referent)
1 only	296 (32.2)	19.6	1.58 (1.08–2.31)
Both	85 (9.2)	25.9	2.27 (1.31–3.91)
36 months			
Maternal sensitivity			
Normal	731 (79.3)	14.4	1 (Referent)
Low	191 (20.7)	24.6	1.95 (1.32–2.87)
Attachment security ^d			
Secure	566 (62.2)	15.9	1 (Referent)
Insecure	344 (37.8)	17.7	1.14 (0.80–1.63)
Low sensitivity and insecure attachment			
Neither	475 (52.4)	14.5	1 (Referent)
1 only	328 (36.3)	16.5	1.16 (0.79–1.71)
Both	101 (11.2)	26.7	2.15 (1.29–3.57)

^a Of the 977 participants, the number missing information for maternal sensitivity, attachment security, and the combination of these 2 variables was $n = 21, 46$, and 51 , respectively at 15 months; $51, 40$, and 57 at 24 months; and $55, 67$, and 73 at 36 months. Percentages may not total to 100% due to rounding.

^b Gender-specific BMI-for-age percentile ≥ 95 th percentile.

^c ORs and 95% CIs from logistic regression.

^d Coded from Strange Situation procedure.

^e Lowest quartile of AQS security score.

^f Of the 240 children experiencing low maternal sensitivity at 24 months, 101 experienced it at 15 months, and 104 at 36 months.

^g Of the 232 children who were insecurely attached at 24 months, 106 were insecure at 15 months, and 103 at 36 months.

consumption of highly palatable foods, and eating these foods acts to calm the stress-perceiving areas of the brain.^{49–51} Maternal sensitivity could protect against obesity by improving children's ability to modulate their physiologic and behavioral responses to stress. Children whose stress response is well regulated may be less likely, for example, to eat in response to emotional distress, and may have longer sleep duration, which could also affect their risk for obesity.^{52,53}

We found that adolescent obesity was related to insecure attachment based on the AQS at 24 months but not to insecure attachment based on the Strange Situation procedure at 15 or 36 months. There may be several explanations. Compared with the Strange Situation procedure, the AQS involves a period of mother–child observation that is longer, occurs in the home, and does not explicitly involve a stress paradigm. Therefore, the AQS may yield different information about the maternal–child

relationship than the Strange Situation procedure. There is evidence that low scores on the AQS more strongly predict child outcomes, such as behavior problems, than does insecurity as assessed by using the Strange Situation procedure.³⁴ As reported by others examining the SECCYD data,³⁴ we found that a child's attachment security status was not consistent between 15, 24, and 36 months, and the reasons for this finding have been debated.⁴⁰

Few studies have examined the association between maternal sensitivity and childhood obesity, and most have used data from SECCYD based on direct observation of maternal–child interaction. Rhee et al found that low maternal sensitivity at 4.5 years of age was associated with a greater risk of obesity in first grade,²¹ while Wu et al²² reported that low maternal sensitivity at 6 months of age was associated with higher BMI in preadolescence. Also in the SECCYD, a cross-sectional analysis of 15-year-olds found that obesity was associated with low maternal sensitivity as coded from videotaped conversations of adolescents discussing a topic of conflict with their mother.⁵⁴ To our knowledge, the only other study of maternal sensitivity and childhood obesity was a cross-sectional analysis of 4- and 5-year-old Australian children.²³ Maternal warmth was not associated with child obesity, but warmth was not assessed by direct observation of mother–child interaction.²³

The sensitivity that a mother displays in interacting with her child may be influenced by factors she cannot necessarily control. For example, it is challenging for caregivers to respond sensitively to children who have innate difficulties with self-regulation or who are temperamentally predisposed toward negative emotionality and reactivity.¹⁸ This situation may be particularly true for caregivers who are stressed by various hardships

TABLE 3 Associations Between Participant Characteristics, the Quality of the Early Maternal–Child Relationship, and Adolescent Obesity

Characteristic	Poor Maternal-Child Relationship Quality, ^a %	<i>P</i> ^b	Adolescent Obesity, ^c %	<i>P</i> ^b
Gender				
Female	21.7	.09	13.8	.02
Male	27.6		19.2	
Racial-ethnic group				
White	18.8	<.001	14.8	.005
Nonwhite	49.2		23.3	
Birth weight, g				
2000–2999	34.0		14.5	
3000–3999	23.6	.009	15.3	.03
≥4000	19.3		24.1	
Maternal education				
Graduate degree	10.5		9.8	
Bachelor degree	11.0		10.0	
Some college or associate degree	23.5	<.001	18.5	<.001
High school degree or equivalent	42.8		20.4	
Less than high school degree	48.8		28.8	
Household income-to-poverty line ratio				
≥5.00	12.0		7.4	
3.00–4.99	19.8		14.9	
1.86–2.99	22.9	<.001	17.1	<.001
1.00–1.85	31.7		21.6	
<1.00	56.8		30.6	
Maternal obesity ^d				
BMI <30	21.1	.005	9.6	<.001
BMI ≥30	30.0		33.9	

^a Poor maternal–child relationship quality defined as score ≥3 based on the number of times in early childhood (15, 24, and 36 months) child was classified as insecurely attached or mother displayed low sensitivity.

^b *P* values from χ^2 tests.

^c Gender-specific BMI-for-age percentile ≥95th percentile.

^d Maternal BMI ≥30 based on maternal self-report of height and weight when youth was 15 years of age, *n* = 888.

arising from their socioeconomic circumstances.^{17,55,56}

Our results are suggestive of a cumulative effect of the poor quality of the early maternal–child relationship on a child's obesity risk. Although maternal sensitivity was a stronger predictor than insecure attachment, the combination of both seemed to be a greater risk than either alone. In practice, any obesity prevention strategies that aim to alter either maternal sensitivity or attachment security are likely to affect both.

The causes of childhood obesity are multiple and interact with one another. Our findings suggest that consideration be given to obesity prevention strategies that do not focus exclusively on energy balance. Interventions are effective in increasing maternal sensitivity and enhancing young children's

attachment security and ability to regulate their emotions,^{57,58} but to our knowledge, the effect of these interventions on children's weight status has not been investigated. However, improving the quality of the maternal–child relationship may require addressing broader social determinants of health.⁵⁹ Poverty has broad effects on children's well-being.^{60–62} Parenting in the context of poverty is particularly difficult⁵⁹ and, as our data suggest, children living in poverty are more likely to be insecurely attached.¹⁵

We found that sociodemographic factors were related both to early maternal–child relationship quality and adolescent obesity. The strength of the association between a poor-quality maternal–child relationship and obesity was attenuated after adjustment for sociodemographic factors. This finding is

consistent with a causal pathway going from these sociodemographic factors to maternal–child relationship quality to obesity. Alternatively, these sociodemographic factors may confound the association between relationship quality and obesity. An observational study cannot distinguish between these possibilities.

Our research has limitations. Causality cannot be established from observational studies, but reverse causality is unlikely because of the temporal separation between our assessment of exposure and outcome. We chose to control these analyses for a limited number of variables to avoid underestimating the risk relationship by controlling for factors potentially on the causal pathway. However, in doing so, we may have overestimated the risk of adolescent obesity associated with insecure attachment and low maternal sensitivity. Our measure of maternal obesity was limited because it was assessed when youth were adolescents rather than in early childhood, and data were missing for ~10% of participants. In our analyses, maternal obesity was associated both with adolescent obesity and having a poor early maternal–child relationship. However, after controlling for sociodemographic variables, further adjustment for maternal obesity changed the model estimates only slightly. We used logistic regression to estimate ORs; when an outcome is not rare, ORs will be farther from 1 than the equivalent risk ratio.⁶³ Finally, because we did not have adolescent obesity data on the entire cohort, we cannot exclude the possibility of selection bias.

CONCLUSIONS

Obesity is affecting even preschool-aged children, and we lack effective approaches for prevention.³ We provide evidence that the quality of the early maternal–child relationship is associated with risk for adolescent obesity.

TABLE 4 Association of Maternal–Child Relationship Quality and Adolescent Obesity

Predictor Variable(s)	N (%)	Prevalence of Adolescent Obesity, % (95% CI) ^a	Model 1, Crude OR (95% CI)	Model 2, Adjusted OR (95% CI) ^b	Model 3, Adjusted OR (95% CI) ^c	Model 4, Adjusted OR (95% CI) ^d
Maternal–child relationship quality score ^e						
0	215 (22.0)	13.0 (8.5–17.5)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
1	315 (32.2)	12.1 (8.5–15.7)	0.92 (0.54–1.54)	0.93 (0.55–1.57)	0.88 (0.51–1.52)	0.96 (0.53–1.74)
2	206 (21.1)	15.5 (10.6–20.5)	1.23 (0.71–2.12)	1.20 (0.69–2.09)	1.05 (0.59–1.87)	1.00 (0.53–1.90)
≥3 ^f	241 (24.7)	26.1 (20.6–31.7)	2.36 (1.45–3.86)	2.45 (1.49–4.04)	1.56 (0.90–2.73)	1.42 (0.76–2.63)
Maternal sensitivity and insecure attachment simultaneously						
No. of time periods with low maternal sensitivity ^g						
0	557 (57.0)	11.9 (9.2–14.5)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
1	237 (24.3)	20.7 (15.5–25.8)	1.91 (1.27–2.88)	1.88 (1.25–2.84)	1.50 (0.97–2.33)	1.26 (0.77–2.05)
≥2	183 (18.7)	25.1 (18.9–31.4)	2.43 (1.58–3.74)	2.47 (1.59–3.83)	1.47 (0.88–2.44)	1.48 (0.84–2.62)
No. of time periods with insecure attachment ^g						
0	321 (32.9)	13.4 (9.7–17.1)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
1	417 (42.7)	17.5 (13.9–21.2)	1.29 (0.85–1.94)	1.29 (0.85–1.95)	1.36 (0.88–2.09)	1.23 (0.77–1.97)
≥2	239 (24.5)	18.8 (13.9–23.8)	1.20 (0.75–1.93)	1.23 (0.76–1.97)	1.10 (0.67–1.81)	0.86 (0.49–1.51)

^a Gender-specific BMI-for-age percentile ≥95th percentile.

^b Adjusted for gender and birth weight (grams), $n = 977$.

^c Adjusted for gender, birth weight (grams), nonwhite race/ethnicity, maternal education, and household income-to-poverty line ratio, $n = 933$.

^d Adjusted for gender, birth weight (grams), nonwhite race/ethnicity, maternal education, household income-to-poverty line ratio, and maternal obesity, $n = 850$.

^e Number of times child was insecurely attached or mother displayed low maternal sensitivity at 15, 24, or 36 months.

^f Of the 241 participants with a poor maternal–child relationship (score ≥3), 134 (55.6%) had scores of 3, 66 (27.4%) had scores of 4, 32 (13.3%) had scores of 5, and 9 (3.7%) had scores of 6. Seventy-four of these children (30.7%) were both insecurely attached and experienced low maternal sensitivity at ≥2 time periods, 69 (28.6%) were insecurely attached at ≥2 time periods and experienced low maternal sensitivity at 1 time period, 72 (29.9%) were insecurely attached at 1 time period and experienced low maternal sensitivity at ≥2 time periods, 19 (7.9%) were insecurely attached at all 3 time periods but never experienced low maternal sensitivity, and 7 (2.9%) experienced low maternal sensitivity at all 3 time periods but were never insecurely attached.

^g ORs from models including both predictor variables: number of time periods the child experienced low maternal sensitivity, and number of time periods the child was insecurely attached.

Decades of research indicate that having a high-quality maternal–child relationship contributes to the cognitive, social, and emotional outcomes that most parents want for their children. The quality of this relationship could prevent obesity through its influence on the child's capacity for emotion-regulation and response to stress.^{7,26,46} If future research confirms these mechanisms, obesity prevention interventions could incorporate more emphasis on the quality of maternal–child relationships.

This strategy might be more acceptable to parents than interventions focused on energy balance, and would offer additional benefits to children's health and well-being aside from maintaining a healthy weight.

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THE GUM THAT BINDS US: *What plant is as essential to good ice cream and creamy condiments as it is to the oil industry? Stumped? The answer is guar. According to an article in The Wall Street Journal (Commodities: November 25, 2011), guar is an annual legume principally grown in India and Pakistan. While the bean can be used in animal feeds, guar is the source of a ubiquitous food emulsifier or stabilizer. The guar beans have a large endosperm that contains galactomannan gum. It is this gum that is so valuable to food producers, textile manufacturers, and the textile and cosmetic industries. Guar gum has several interesting properties. It forms a gel in water. Tiny amounts increase water viscosity and in cooking, guar gum is almost eight times more potent than cornstarch in thickening water. Guar gum impedes ice crystal growth. In the food industry, the largest commercial consumer, guar gum is used to thicken dairy products and help prevent crystals from forming in ice cream. It is used in condiments such as salad dressing to give the fluid a uniform appearance. In baked goods, guar gum is added to dough not only to make it more pliable but increase its shelf life. The gum also prevents water from seeping out of the dough. Guar gum is commonly found in toothpaste, cosmetics, and even pharmaceutical products as a binder. Now, demand for guar has dramatically jumped. As reported in the article, the oil industry also takes advantage of the unique properties of guar gum. Guar gum is added to water, thickening it, and suspending particles of sand and beads. Huge quantities of the resultant slurry are used in hydraulic fracturing to release oil and gas from shale formations. While only tiny amounts of guar gum are necessary in a half gallon of ice cream, each shale well uses a huge amount of guar, roughly the amount generated from hundreds of acres cultivated vines. The demand for guar has caused prices to skyrocket, so much so that many food processors have had to turn to alternative agents. Fortunately, guar is renewable and amazingly, can tolerate very arid environments. Little is produced in the U.S., only about 2% of the world’s supply, probably because there is no commodities market for it here and the crop is not insured by the U.S. government. Still, given the appetite for this legume, one would expect that more vines will be planted.*

Noted by WVR, MD