

The Association between Sibship Composition and Maternal Feeding Behaviors

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Abstract. *Objective:* To examine the association between sibship composition and maternal feeding behaviors. *Methods:* A total of 309 Saudi mothers of children aged 3 to 5 years old were recruited. The study questionnaire, comprising of the previously validated Child Feeding Questionnaire-Arabic (CFQ-A) and questions assessing sibship composition and sociodemographic characteristics, was completed over the telephone. Descriptive and bivariate analyses, and multiple linear regression adjusting for covariates were performed. *Results:* We found a negative association between number of siblings (β : -0.11, 95% CI: -0.15, 0.01), number of older siblings (β : -0.15, 95% CI: -0.13, -0.02), and number of older sisters (β : -0.17, 95% CI: -0.29, -0.05) and perceived responsibility. There was a negative association between number of siblings (β : -0.16, CI: -0.16, -0.03), number of older siblings (β : -0.14, 95% CI: -0.12, -0.02), and number of older sisters (β : -0.21, 95% CI: -0.29, -0.09) and monitoring. Increase in number of siblings was associated with higher concern about child's weight (β : 0.17, 95% CI: 0.01, 0.23) and higher concern about child's diet (β : 0.14, 95% CI: 0.02, 0.23). *Conclusion:* Children who have more siblings, specifically older siblings and older sisters may experience unique maternal feeding behaviors that have been previously linked to poor dietary patterns, as mothers may share feeding responsibilities with older siblings/sisters. Further research is needed to identify the association between sibship composition and dietary habits/intake. Educating older siblings and older sisters on healthy eating may help them become positive reinforcers of a healthy lifestyle for younger siblings.

Key words: Siblings, Maternal Feeding, Monitoring, Perceived Responsibility, Preschoolers

Introduction

The home environment can play a fundamental role in shaping health-related behaviors among children and ultimately health status and chronic disease risk (1). Parents orchestrate routines and activities and establish rules and boundaries that create features of the home environment (2). Parenting behaviors have long been known to influence child behavior and outcomes (3). Parenting behaviors that are specific to feeding, or parental feeding behaviors, have been linked to child eating behaviors, diet quality, and weight status starting from early childhood years (4-6). Responsive maternal feeding strategies and involvement such as

reasoning and modeling healthy behaviors have been associated with better diet quality and vegetable consumption (6,7); Monitoring has been linked to lower child body mass index (BMI) cross-sectionally and over time (5,8). On the contrary, increase in non-responsive parental control or demanding feeding strategies have been linked to poorer diet quality and greater child weight gain over time (5,7).

Family size and structure can influence family functioning and the way that mothers and fathers parent their children (9). According to Strohschein et al., 2008 who tested the Resource Dilution Hypothesis, parenting resources are reallocated (rather than diluted) following the addition of new children to the

household (10). Thus, parents may reallocate their time and attention when parenting according to the number of children they have (9); Increase in the number of children in the household has been associated with less parental attention being centered around each individual child, and a more authoritarian approach, as parents assume a more autocratic role (9,10). Younger children in larger families are often expected to submit to parents and older siblings, and their autonomy and independence are less often encouraged compared to children with fewer siblings (9). Among adolescents, siblings' relationship quality as well as quality of relationship with parents has been linked to health attitudes, exercise behaviors, and overweight risk (11). However, the association between family size/structure and parental behaviors around feeding is not well-established. Specifically, the relationship between sibship composition and maternal feeding behaviors has been underdeveloped. Some studies found that mothers may more often use maladaptive feeding behaviors with children when they have older siblings (12,13). Among preschoolers, the youngest child in the sibship has been found to receive less maternal praise during feeding (12), less structured mealtime routines, and greater exposure to unhealthy foods (13). Others found that mothers were more likely to use food as a reward with only children who have no siblings (14). These maladaptive feeding strategies used with youngest siblings and only children were suggested to be the underlying mechanism for increased obesity risk of children with these birth orders (15).

Recent investigation of feeding behaviors among mothers of preschoolers in Saudi Arabia (SA) has suggested that Arab/Middle Eastern mothers may employ greater restriction and monitoring, and have higher perceived responsibility towards feeding their children, compared to Western and other Asian samples (16). In a qualitative study, some Saudi mothers have stated that they view the task of feeding their preschoolers as highly stressful, and that they allocate a great deal of effort in feeding their children (17). However, whether or not family size and sibship composition (i.e., number of sons and daughters) influence Saudi mothers' feeding strategies is still unknown. Census reports for the year 2017 (during which study data were collected) indicate that the average number of live births among Saudi women was 2.40, compared to 1.60 and 1.70 live births

among British and American women, respectively (18). It is unknown whether the variation in maternal feeding behaviors between cultures is related to distinctions in sibship size. Understanding the relationship between sibship composition and maternal feeding behaviors can help inform culturally-sensitive, family-based programs that aim to optimize the mealtime environment. Thus, the objective of this study was to examine the relationship between sibship composition and maternal feeding behaviors. We tested our hypothesis that sibship composition was associated with feeding behaviors among Saudi mothers using a previously validated questionnaire, and we have adjusted our analysis for several covariates including child age, child sex, maternal education, and income level.

Materials and Methods

Sample and Procedures

This is a cross-sectional study of 309 mothers who were recruited from 10 different preschools around the city of Jeddah, SA. Five of the 10 preschools were private preschools, while five were public (government-subsidized). School principals were formally contacted by the research team who presented a description of the study protocol. Upon approval of school administrations, eligibility screening as well as consent forms were sent to mothers via children's backpacks. Mothers who met the eligibility criteria and returned signed consent forms were enrolled in the study. Inclusion criteria were that the mother is a permanent resident of SA, a native Arabic speaker, and has a child who is between 3 and 5 years old enrolled in the preschool; Child is not suffering or has a history of any serious medical illness or food allergies. Mothers who were not living in the same household as the index child were excluded from the study. Research assistants contacted participating mothers and completed the study questionnaire with them over the telephone. The study questionnaire included the Child Feeding Questionnaire-Arabic (CFQ-A), as well as questions that assessed sibship composition and sociodemographic characteristics. Ethical approval to conduct this study was obtained from the Unit of Biomedical Ethics at King Abdulaziz University, Jeddah, SA.

Measures

Maternal Feeding Behaviors. Maternal feeding behaviors were assessed using the CFQ-A; A modified, Arabic version of the Child Feeding Questionnaire (CFQ) (19). The CFQ-A was previously validated among mothers of preschoolers in SA (16). The CFQ-A includes a total of 9 factors: Perceived responsibility (3 items), perceived parent weight (4 items), perceived child weight (4 items), concern about child weight (3 items), restriction (4 items), pressure to eat (4 items), monitoring (3 items), in addition to the two newly developed factors: use of food as a reward (4 items), and concern about child's diet (7 items).

In the modified CFQ-A, the "restriction" scale was adapted by removing two items pertaining the mother's use of food as a reward. Further, two additional items were removed due to results of confirmatory factor analysis and low correlation between items (16). Hence, a new "use of food as a reward" subscale was developed by adopting six items from The Meals in Our Households (MOH) Questionnaire. In addition, seven items from the MOH questionnaire that assessed the maternal concern about child's diet were utilized in order to develop the subscale "concern about child's diet" (20).

Five- and six-point Likert response scales were employed, and factors were calculated as mean of contributing items. Internal reliability calculated as Cronbach's Alpha for each maternal feeding behavior factor is shown in Table 1. Cronbach's alpha values of at least 0.60 are considered "good" while alphas of at least 0.70 are considered "favorable" (21).

Sibship Composition. Mothers completed questions assessing sibship composition. These included questions about the total number of siblings of the index child, the total number of older siblings, the total number of older sisters, the total number of older brothers, the total number of younger siblings, the total number of younger sisters, and the total number of younger brothers.

Sociodemographic Characteristics. Mothers completed questions that assessed demographic characteristics including the child's sex and date of birth, the mother's nationality, educational level, and employment status, as well as the family's total monthly income. Birthdates and dates of interviews were used to calculate child age.

Statistical Analysis

Analyses were conducted using IBM SPSS Statistics 21.0 (Armonk, NY, USA). Descriptive statistics were used to examine sample characteristics. Spearman correlations were estimated to examine bivariate associations between sibship composition variables and maternal feeding behaviors. Maternal feeding behaviors that were significantly correlated with sibship composition variables were then used as dependent variables in regression models; We ran unadjusted and adjusted linear regression models to examine the association between sibship composition variables and the selected maternal feeding behavior variables. Models were adjusted for child age, child sex, maternal education (\geq college education vs. not), and total monthly income (\geq 10,000 SR (equivalent to 2,666 USD) vs. not). For all statistical analyses, significance level was set at 0.05.

Results

Sample Characteristics

Around half (52.8%) of the children in the study were female. Mean child age was 4.78 years (SD= 0.74). The majority of mothers were Saudi (68.0 %) and had at least a college education (79.6 %). About

Table 1. Internal Reliability for Maternal Feeding Behavior Factors¹

Maternal Feeding Behaviors	
Factor	Cronbach's Alpha
Perceived Responsibility (3 items)	0.74
Perceived Parent Weight (4 items)	0.66
Perceived Child Weight (4 items)	0.74
Concern about Child Weight (3 items)	0.86
Restriction (4 items)	0.61
Pressure to Eat (4 items)	0.54
Monitoring (3 items)	0.83
Use of Food as a Reward (4 items)	0.71
Concern about Child's Diet (7 items)	0.83

¹Internal reliability of factors was estimated by Cronbach's Alpha. Cronbach's alpha values of at least 0.60 are considered good and alphas of at least 0.70 are considered favorable.

half of the mothers reported that they were employed (48.8%), and that they had a total family monthly income of at least 10,000 SR (52.1%) (Table 2).

Associations between Sibship Composition and Maternal Feeding Behaviors

Spearman Correlation. Bivariate analysis showed a negative correlation between number of older brothers and perceived responsibility ($r = -0.14$, $P < 0.01$). There was a negative correlation between number of older siblings and monitoring ($r = -0.13$, $P < 0.05$), as well as between number of older sisters and monitoring ($r = -0.13$, $P < 0.05$). On the other hand, number of siblings, number of older siblings, and number of older sisters were each positively correlated with concern about child's weight ($r = 0.16$, $P < 0.01$, $r = 0.12$, $P < 0.05$, and $r = 0.14$, $P < 0.01$, respectively). Number of siblings was also positively correlated with concern about child's diet ($r = 0.12$, $P < 0.05$) (Table 3).

Multiple Linear Regression. We conducted separate linear regression models to examine the association between sibship composition variables and maternal feeding behavior variables that were selected

based on bivariate analysis (i.e., perceived responsibility, monitoring, concern about child's weight, and concern about child's diet) (Tables 4-7).

Adjusting for covariates, number of siblings (standardized beta coefficient (β): -0.11, 95% confidence interval (CI): -0.15, 0.01), number of older siblings (β : -0.15, 95% CI: -0.13, -0.02), and number of older sisters (β : -0.17, 95% CI: -0.29, -0.05) were each negatively associated with perceived responsibility (Table 4). Similarly, number of siblings (β : -0.16, CI: -0.16, -0.03), number of older siblings (β : -0.14, 95% CI: -0.12, -0.02), and number of older sisters (β : -0.21, 95% CI: -0.29, -0.09) were each negatively associated with monitoring (Table 5). Increase in number of siblings was associated with higher concern about child's weight (β : 0.17, 95% CI: 0.01, 0.23) and higher concern about child's diet (β : 0.14, 95% CI: 0.02, 0.23). No associations were observed between number of younger siblings and any of the maternal feeding behavior variables.

Discussion

Our cross-sectional study of 309 mothers of preschoolers showed that sibship composition was associated with maternal feeding behaviors. We found that increase in the number of siblings, number of older siblings, and number of older sisters was each associated with lower perceived responsibility and monitoring among mothers, with the associations being strongest with "number of older sisters". Additionally, we found that increase in the number of siblings was associated with higher maternal concern about child's weight and higher concern about child's diet.

Our findings, showing an inverse association between number of siblings and perceived responsibility and monitoring among mothers, may reflect the hypothesized reallocation of parental resources with the addition of children to the household (10). Lower perceived responsibility has been previously associated with lower consumption of nutrient-dense foods; 4-year old children whose mothers had lower perceived responsibility consumed less fruits, vegetables, and dairy products (22). Lower maternal perceived responsibility may therefore be associated with a

Table 2. Sample Characteristics¹

Variables	Total (n=309)
Child Sex, N (%)	
Male	146 (47.2)
Female	163 (52.8)
Child Age, M (SD)	4.78 (0.74)
Mother Nationality, N (%)	
Saudi	210 (68.0)
Non-Saudi	99 (32.0)
Maternal Education, N (%)	
< College education	63 (20.4)
≥ College education	246 (79.6)
Maternal Employment, N (%)	
Employed	102 (48.8)
Unemployed	107 (51.2)
Total Monthly Income, N (%)	
< 10,000 SR	148 (47.9)
≥10,000 SR	161 (52.1)

¹ Table showing distribution of child, maternal and demographic variables: Means (M) and standard deviations (SD) for continuous variables or counts (n) and percentages (%) for categorical variables.

Table 3. Correlation between Sibship Composition Variables and Maternal Feeding Behaviors

	Perceived Responsibility r (P value)	Monitoring	Perceived Parent Weight	Perceived Child Weight	Concern about Child Weight	Restriction	Pressure to Eat	Use of Food as a Reward	Concern about Child's Diet
Number of Siblings	-0.70	-0.11 [†]	-0.02	-0.04	0.16 **	0.05	0.00	-0.04	0.12 *
Number of Older Siblings	-0.10 [†]	-0.13 *	0.00	-0.06	0.12 *	0.06	0.03	-0.06	0.09
Number of Older Sisters	-0.01	-0.13 *	0.60	-0.05	0.14 **	0.01	0.04	-0.04	0.07
Number of Older Brothers	-0.14 **	-0.10 [†]	-0.04	-0.02	0.03	0.08	-0.00	-0.08	0.06
Number of Younger Siblings	-0.03	-0.01	-0.06	0.05	0.07	0.05	-0.04	0.06	0.06
Number of Younger Sisters	-0.07	-0.06	-0.04	-0.04	0.03	0.01	0.00	0.05	0.04
Number of Younger Brothers	0.04	0.04	-0.05	0.08	0.05	0.03	-0.05	0.04	0.04

** P -value < 0.01

* P -value < 0.05

[†] P -value < 0.10

Table 4. Associations Between Sibship Composition Variables and Perceived Responsibility (n=309)

Primary Predictor	Unadjusted Standardized β Coefficient (95% CI)	<i>P</i> value	Adjusted Standardized β Coefficient (95% CI)	<i>P</i> value
Number of Siblings	-0.11 (-0.15, 0.01)	0.05	-0.11 (-0.15, 0.01)	0.05
Number of Older Siblings	-0.15 (-0.13, -0.02)	0.01	-0.15 (-0.13, -0.02)	0.01
Number of Older Sisters	-0.17 (-0.29, -0.06)	0.003	-0.17 (-0.29, -0.05)	0.004
Number of Older Brothers	-0.08 (-0.12, 0.02)	0.18	-0.08 (-0.12, 0.02)	0.16
Number of Younger Siblings	-0.06 (-0.22, 0.06)	0.28	-0.04 (-0.20, 0.09)	0.44
Number of Younger Sisters	-0.09 (-0.30, 0.03)	0.11	-0.07 (-0.27, 0.06)	0.22
Number of Younger Brothers	0.03 (-0.15, 0.26)	0.57	0.03 (-0.15, 0.26)	0.59

Regression models adjusted for child age, child sex, maternal education (> high school degree vs. not), and total monthly income (< 10,000 SR vs. not).

Table 5. Associations Between Sibship Composition Variables and Monitoring

Primary Predictor	Unadjusted Standardized β Coefficient (95% CI)	<i>P</i> value	Adjusted Standardized β Coefficient (95% CI)	<i>P</i> value
Number of Siblings	-0.15 (-0.16, -0.02)	0.009	-0.16 (-0.16, -0.03)	0.007
Number of Older Siblings	-0.14 (-0.12, -0.01)	0.01	-0.14 (-0.12, -0.02)	0.01
Number of Older Sisters	-0.21 (-0.29, -0.09)	0.000	-0.21 (-0.29, -0.09)	0.000
Number of Older Brothers	-0.05 (-0.09, 0.03)	0.42	-0.05 (-0.09, 0.04)	0.38
Number of Younger Siblings	-0.04 (-0.18, 0.08)	0.46	-0.02 (-0.16, 0.10)	0.68
Number of Younger Sisters	-0.08 (-0.25, 0.05)	0.18	-0.68 (-0.20, 0.09)	0.49
Number of Younger Brothers	0.04 (-0.12, 0.24)	0.50	0.19 (-0.15, 0.21) (P=)	0.50

Regression models adjusted for child age, child sex, maternal education (> high school degree vs. not), and total monthly income (< 10,000 SR vs. not).

poor-quality diet that is low in various nutritional elements including fiber and key vitamins and minerals, such as calcium, vitamin A, and folate. Furthermore, lower maternal monitoring may have negative consequences since greater monitoring has been previously associated with several favorable child eating behaviors;

Children of mothers who practiced greater monitoring had lower emotional overeating, lower food fussiness, and lower desire to drink (23). Monitoring has also been positively associated with vegetable consumption among children (24). On the contrary, higher concern about child's weight and dietary intake have been

Table 6. Associations Between Sibship Composition Variables and Concern about Child's Weight

Primary Predictor	Unadjusted Standardized β Coefficient (95% CI)	<i>P</i> value	Adjusted Standardized β Coefficient (95% CI)	<i>P</i> value
Number of Siblings	0.13 (0.02, 0.24)	0.01		0.04
Number of Older Siblings	0.04 (-0.05, 0.12)	0.44	0.03 (-0.06, 0.11)	0.58
Number of Older Sisters	0.09 (-0.04, 0.29)	0.13	0.08 (-0.04, 0.29)	0.15
Number of Older Brothers	0.00 (-0.10, 0.11)	0.97	-0.01 (-0.11, 0.09)	0.85
Number of Younger Siblings	0.10 (-0.03, 0.39)	0.08	0.07 (-0.08, 0.35)	0.20
Number of Younger Sisters	0.07 (-0.10, 0.29)	0.25	0.04 (-0.16, 0.34)	0.47
Number of Younger Brothers	0.06 (-0.15, 0.44)	0.33	0.05 (-0.17, 0.42)	0.39

Regression models adjusted for child age, child sex, maternal education (> high school degree vs. not), and total monthly income (< 10,000 SR vs. not).

Table 7. Associations Between Sibship Composition Variables and Concern about Child's Diet

Primary Predictor	Unadjusted Standardized β Coefficient (95% CI)	<i>P</i> value	Adjusted Standardized β Coefficient (95% CI)	<i>P</i> value
Number of Siblings	0.13 (0.02, 0.22)	0.02	0.14 (0.02, 0.23)	0.01
Number of Older Siblings	0.05 (-0.04, 0.11)	0.39	0.05 (-0.04, 0.11)	0.34
Number of Older Sisters	0.04 (-0.10, 0.22)	0.50	0.04 (-0.09, 0.21)	0.47
Number of Older Brothers	0.04 (-0.07, 0.13)	0.53	0.04 (-0.06, 0.13)	0.47
Number of Younger Siblings	0.10 (-0.02, 0.36)	0.07	0.07 (-0.07, 0.32)	0.19
Number of Younger Sisters	0.08 (-0.06, 0.38)	0.16	0.03 (-0.16, 0.29)	0.58
Number of Younger Brothers	0.05 (-0.15, 0.39)	0.37	0.07 (-0.11, 0.43)	0.25

Regression models adjusted for child age, child sex, maternal education (> high school degree vs. not), and total monthly income (< 10,000 SR vs. not).

linked to lower levels of health-promoting practices, such as parental participation in physical activity (25).

Since our study showed that children who have more siblings, specifically older siblings and older sisters, may experience lower maternal monitoring and perceived responsibility and higher maternal concern about child's weight and child's diet. This suggests that they may be at greater risk for poor dietary behaviors. Further research is needed to identify the association between sibship composition and dietary habits/intake.

In our study, the strongest association was found between having a greater number of older sisters and lower maternal perceived responsibility and monitoring. This is not surprising since older siblings, especially older sisters, are known to act as caretakers of their younger siblings and mothers may share with them

some of the caregiving responsibilities (26). Older siblings have also been found to act as caretakers during mealtimes and contribute to child feeding, particularly when mothers are less engaged during the meal (27). It may therefore be beneficial to evaluate interventions aiming to enhance maternal involvement and engagement in feeding among children with a greater number of older sisters. Mothers may be counseled on how to appropriately monitor and manage their children's dietary intakes, which can additionally help reduce concern about child's weight or child's diet. Older siblings and older sisters may also be educated on healthy eating so that they can become positive reinforcers of a healthy lifestyle for younger siblings.

Strengths of our study includes that our sample of mothers had various levels of socioeconomic status. However, because all of our participants are from an

Arab/Middle Eastern background, it is unclear how findings may translate in other cultures. Most Arab/Middle Eastern communities are highly traditional and family norms may emphasize older sisters as caretakers (28). Therefore, a cross-cultural comparison of the association between sibship composition and maternal feeding behaviors may be useful. Additionally, maternal feeding behaviors in our study were measured using an Arabic version of the CFQ that was previously validated among Saudi mothers of 3- to 5-year old children. Limitations of our study include our relatively small sample size and small correlation coefficients ($r < 0.30$). A larger sample size may provide greater statistical power and yield larger correlations. Our cross-sectional design also does not allow us to draw conclusions regarding causality or the influence of sibship over time. Cronbach's alpha for pressure to eat ($\alpha = 0.54$) fell below the 0.60 cutoff, which is consistent with findings from other studies that reported lower internal consistency for the pressure to eat subscale (29, 30). Future studies with larger sample sizes, various methods for measuring maternal feeding behaviors (e.g., direct observations), and longitudinal study designs are needed in order to further establish the association between sibship composition and maternal feeding behaviors.

Conclusion

Our study has detected associations between sibship composition and maternal feeding behaviors. A greater number of siblings, particularly older siblings and older siblings may be associated with lower maternal perceived responsibility and monitoring in feeding. A greater number of siblings may also be associated with greater concern about child's weight and child's diet. Additional studies are needed to further establish these associations, and to evaluate family-centered counseling and intervention strategies that incorporate siblings in order to improve the mealtime environment and child outcomes. Understanding the interrelationship between sibship composition, maternal feeding behaviors, and child nutritional status is warranted.

Conflict of Interest: None

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Authorship: RM designed the study, oversaw data collection, analyzed the data, wrote the manuscript, and approved the final version as submitted.

Ethical Standards Disclosure: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Unit of Biomedical Ethics at King Abdulaziz University (reference number HA-02-J-008). Written informed consent was obtained from all subjects.

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