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Colombian retrospective study of the association between breastfeeding duration and eating behaviors

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Abstract: The current retrospective cross-sectional study included 175 Colombian caregivers of children ranging between 24 and 59 months old ($M=47.08$, $SD=7.08$) enrolled in childcare centers located in the Caribbean region. 58% of the children are male, and all of them belong to low-income families. Breastfeeding duration ranged between children's 0 to 37 months old ($M=10.84$, $SD=8.48$); 64 of them had exclusive breastfeeding for during their first 6 months (i.e., no fed with bottle). Results showed that the variance of Food Responsiveness explained by the model was 2% ($R^2=.02$, $F(3,161)=1.081$, $p=.359$). Breastfeeding duration did not significantly predict Food Responsiveness ($\beta=.004$, $p=.219$), as well as age ($\beta=.004$, $p=.346$) and gender ($\beta=.056$, $p=.354$) did not significantly explain the dependent variable. Likewise, Satiety Responsiveness variance was not explained by duration of breastfeeding ($\beta=.002$, $p=.548$), age ($\beta=.003$, $p=.489$), and gender ($\beta=.040$, $p=.561$). Overall, the explained variance was less than 1% ($R^2=.008$, $F(3,161)=.428$, $p=.733$). Breastfeeding duration does not significantly change the child's likelihood of being unhealthy ($\beta=-.010$, $p=.616$), while being male and getting older increase the odds of being healthy. Future directions and limitations are discussed.

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Introduction

Duration of breastfeeding is an important subject of cross-national debate given the importance of breastfeeding for child development and parenting practices (Biks et al., 2015; DiSantis et al., 2011; Ip et al., 2007; Li et al., 2010, 2014; Rodríguez et al., 2009; Savino et al., 2009; World Health Organization, 2012, 2013). Studies in different countries like India, Egypt and Zimbabwe have revealed that social, economic and cultural factors may be potentially risky or protective for breastfeeding (Abou-EIWafa & El-Gilany, 2019; Borkhoff et al., 2018; Kumar et al., 2015; Miani et al., 2018; Reyes et al., 2014).

In terms of child nutrition, studies have reported that breastfeeding may influence different health dimensions, including weight (Falcão et al., 1991; Fiese et al., 2019; Gibson et al., 2017; Rogers & Blissett, 2016; Vogelezang et al., 2018), dietary habits (Borkhoff et al., 2018; Fiese et al., 2019), eating behaviors (Borkhoff et al., 2018) and others. Findings consistently showed significant correlations between breastfeeding and children's body mass index (BMI) (Borkhoff et al., 2018; Caleyachetty et al., 2013; Carling et al., 2014; Fiese et al., 2019; World Health Organization, 2013). Moreover, the literature also highlights the role of the duration of breastfeeding as a key factor of nutrition (Harder et al., 2005; Yan et al., 2014). For instance, Vogelezang and colleagues (2018) revealed that breastfed children in the Netherlands had lower BMI and a lower fat mass index than those who were never breastfed. In fact, larger breastfeeding may also

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decrease the risk of overweight or obesity (Caleyachetty et al., 2013; Harder et al., 2005; Rogers & Blissett, 2016; Yan et al., 2014).

Association among Eating Behaviors, BMI and Breastfeeding.

Eating behaviors such as food responsiveness and satiety responsiveness are associated with weight status (French et al., 2012). In fact, a predictive study conducted in the Netherlands concluded that children who have higher BMI tend to show more food responsiveness and less satiety responsiveness (Derks et al., 2018). In this study, satiety responsiveness is defined as the child's ability to recognize and adjust their food intake considering their physiological cues and their internal perception of satiety during and after the act of eating (Birch et al., 2001; Brown & Lee, 2015; Llewellyn et al., 2008; Obregón et al., 2014; Sinopolou et al., 2015). On the other hand, food responsiveness is defined as the child's reaction to an external stimulus, in this case the food, rather than their internal or physiological cues (Birch et al., 2001; Llewellyn et al., 2008; Obregón et al., 2014).

Several studies revealed that children tend to demonstrate certain predominant eating behaviors according to their nutritional status (Carnell & Wardle, 2007; Croker et al., 2011; Denney-Wilson & Campbell, 2008; Gregory et al., 2010; A. Jansen et al., 2003; P. W. Jansen et al., 2012; McCarthy et al., 2015; Santos et al., 2011; Spence et al., 2011). For instance, Webber, Hill, Saxto, van Jaarsveld, & Wardle (2009) identified that obese/overweight children showed higher scores of responsiveness to food cues and lower scores of satiety responsiveness. Croker and colleagues (2011) reported that food responsiveness mean scores decreased across weight categories (M=2.1 for underweight, M=2.4 for healthy weight, M=2.8 for overweight and M=3.1 for obese), while satiety responsiveness mean scores increased across weight categories (M=3.1 for underweight, M=2.7 for healthy weight, M=2.6 for overweight and M=2.1 for obese). Consistent findings were reported for Chilean children. Children with higher BMI were more likely to show high scores in food responsiveness, while children with higher BMI showed lower scores in satiety responsiveness (Santos et al., 2011).

Beyond weight, eating behaviors may be also associated with breastfeeding. A considerable number of studies have revealed that breastfeeding is also associated with practices and interactions of individuals during food consumption in the early years (Borkhoff et al., 2018; Brown & Lee, 2015; Hathcock et al., 2014; Li et al., 2014; Mallan, Nambiar, et al., 2014) across different cultural contexts and geographical regions (Abou-ElWafa & El-Gilany, 2019; Caleyachetty et al., 2013; Muchacha & Mtetwa, 2014). Likewise, a study with Chilean Latino adolescents showed that shorter breastfeeding duration decreased the presence of satiety responsiveness and increased the risk of suffering overweight (Reyes et al., 2014). However, the existing literature has also revealed a lack of association between breastfeeding and satiety responsiveness. For example, Hathcock and colleagues (2014) did not reported mediation effect of satiety responsiveness on the association between breastfeeding and nutritional status in the early years

Breastfeeding Practices in Colombia

There is well-established evidence about the short-term and long-term benefits of breastfeeding for improving quality of life and decreasing the risk of death of young children living in middle-low income countries (World Health Organization, 2013). Duration of breastfeeding is one important factor that influences the estimation of the overall effect of breastfeeding. The recommended duration is exclusive breastfeeding (EBF) for first six months of life, and partial breastfeeding (breastfeeding combined with solids) until two years old (World Health Organization, 2013). Several breastfeeding duration studies using Colombian samples have reported inconsistent results (Benjumea et al., 2011; Cabrera et al., 2004; Gómez-Aristizábal et al., 2013; Mateus, 2012; Niño, 2014; Rodríguez-García & Acosta-Ramírez, 2008). Most of these studies concluded that breastfeeding duration was shorter than the recommended breastfeeding duration proposed by international organizations and the Colombian government (Benjumea et al., 2011; Cabrera et al., 2004; Gómez-Aristizábal et al., 2013). Conversely, Niño (2014) found higher EBF rates than the duration proposed by national and regional governmental intervention programs in Colombia.

Given the inconsistency of the existing literature and considering breastfeeding and eating behaviors

as a multidimensional construct determined by socio-emotional, cultural and economic factors (Behar et al., 2018; DeCosta et al., 2017; Llewellyn et al., 2011; Mallan, Daniels, et al., 2014; Sparks & Radnitz, 2012; Wardle et al., 2001), more research is needed to address the debate about breastfeeding duration and eating behaviors in different contexts like Colombia. Consequently, using a sample of 175 caregivers who are served by childcare centers of the Colombian Caribbean Region, the current retrospective cross-sectional study aimed to analyze the association between breastfeeding duration and eating behaviors of Colombian children ranging between 24 and 59 months old. In addressing this objective, the study will make a key contribution to the literature by providing a detailed understanding of the similarities and differences in the breastfeeding practices of Colombian low-income families from a cultural-responsive perspective.

Method

Sample

Data come from a dissertation study, entitled *Feeding practices of families with preschoolers in Colombia and USA: A cross-cultural multiple case study* (Escalante, 2016). The study was approved by the IRB from University of Nebraska-Lincoln (U.S.). The subjects of this current retrospective cross-sectional study were 175 Colombian caregivers of children ranging between 24 and 59 months old ($M=47.08$, $SD=7.08$) enrolled in childcare centers located in the Caribbean region. 58% of the children were male, and all of them belonged to low-income families. Breastfeeding duration ranged between children's 0 to 37 months old ($M=10.84$, $SD=8.48$); 64 of them had exclusive breastfeeding for during their first 6 months (i.e., no fed with bottle).

Measures

Breastfeeding Duration. Caregivers were asked to fill a demographic questionnaire that included retrospective questions to report whether the children were breastfed, its duration, and the age at which they were bottle-fed (Escalante Barrios, 2016).

Eating Behaviors. Data was collected using the Child Eating Behaviors Questionnaire (CEBQ) (Wardle et al., 2001), which was completed by parents. Specifically, two scales of the CEBQ (Wardle et al., 2001) were used: food responsiveness and satiety responsiveness. Validation evidences of data collected with this instrument in the Caribbean region showed close model fit of the factor satiety responsiveness ($\chi^2(5)=12.334$, $p=.0305$; CFI=.956; SRMR=.037) and a good model-data fit of the factor responsiveness to food ($\chi^2(4)=5.107$, $p=.2765$; CFI=.997; SRMR=.019) (Escalante Barrios, 2016).

Body Mass Index (BMI). Information about children's size and weight was reported by nutritionist and/or nurses who worked at the health services of the childcare centers (Escalante Barrios, 2016). BMI and nutritional status (underweight, normal range, overweight, obese) were estimated using WHO Child Growth Standards conventions (World Health Organization, 2011).

Data analysis plan

Regression analysis was conducted in order to test the hypothesis of whether breastfeeding duration predicts eating behavior (food responsiveness, satiety responsiveness) and BMI, after controlling for children's age and gender. The Shapiro-Wilk hypothesis of normal distribution failed to be rejected for eating behavior variables at 0.01 level of significance; while it was rejected for BMI. Therefore, BMI was dichotomized such as the subjects were classified as healthy if nutritional status was normal range for the child, and unhealthy otherwise (underweight, overweight or obese) and logistic regression was conducted on this data. Food responsiveness and satiety responsiveness were treated as normal, and thus multiple linear regression was used to model the data. There was no missing data for any of the dependent variables, age, and gender; while breastfeeding duration had 7.4% of missing values. These cases were not included in the models. The analysis was conducted using SPSS 21 (IBM Corp, 2012).

Results

Table 1 shows the descriptives of children's eating behaviors scales as well as their correlation with breastfeeding duration. As can be seen, the correlation coefficients are low, and statistically not different from zero, for both food responsiveness ($r=-.092$, $p=.242$) and satiety responsiveness ($r=.051$, $p=.519$). Likewise, the table reports the duration of breastfeeding for those children who were encountered to be healthy ($M=10.6$, $SD=7.67$) to be close to those found to be unhealthy ($M=11.1$, $SD=9.42$), on average. It is expected, then that the models report similar results.

Table I

Children's Eating Behaviors

| Dependent variables | M | SD | Min | Max | <i>r</i> with breastfeeding duration |
|------------------------|------------|------|------|------|--------------------------------------------------------------------------------------------------|
| Food Responsiveness | 2.95 | .38 | 2.11 | 4.14 | -0.092, $p=.242$, $n=162$ |
| Satiety Responsiveness | 3.48 | .44 | 2.30 | 4.60 | 0.051, $p=.519$, $n=162$ |
| HealthyC | 0.56 (56%) | 0.50 | -- | -- | Healthy $M=10.60$, $SD=7.64$, $n=162$ Unhealthy $M=11.12$, $SD=9.42$, $n=162$ |

Table II

Regression Results

| Dependent variable | Type of analysis | Constant (s.e.) | Breastfeeding duration (s.e.) | Age (s.e.) | Gender (s.e.) | R^2 |
|------------------------|------------------|-------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|
| Food Responsiveness | Linear reg. | $\beta=2.797$ (0.205), $p=0.000$ | $\beta=-0.004$ (0.004), $p=0.219$ | $\beta=0.004$ (0.004), $p=0.946$ | $\beta=0.056$ (0.060), $p=0.354$ | $R^2=0.02$, $F(3,161)=1.081$, $p=0.359$ |
| Satiety Responsiveness | Linear reg. | $\beta=3.243$ (0.236), $p=0.000$ | $\beta=0.002$ (0.004), $p=0.548$ | $\beta=0.003$ (0.005), $p=0.489$ | $\beta=0.040$ (0.070), $p=0.561$ | $R^2=0.008$, $F(3,161)=0.428$, $p=0.733$ |
| Healthy | Logistic reg. | $\beta=3.158$ (1.216), $p=0.009$, $\exp(\beta)=23.5$ | $\beta=-0.10$ (0.19), $p=0.616$, $\exp(\beta)=0.990$ | $\beta=-0.052$ (0.024), $p=0.032$, $\exp(\beta)=0.949$ | $\beta=-0.89$ (0.335), $p=0.008$, $\exp(\beta)=0.411$ | |

Table 2 shows the results of the different regression analysis conducted on the data. As can be seen, the variables, as a whole, only explain a small proportion of the dependent variance. In the multiple linear regressions, the R^2 was very low. The variance of food responsiveness explained by the model was 2% ($R^2=.02$, $F(3,161)=1.081$, $p=.359$). Breastfeeding duration did not significantly predict food responsiveness ($\beta=-.004$, $p=.219$), as well as age ($\beta=.004$, $p=.346$) and gender ($\beta=.056$, $p=.354$) did not significantly explain the dependent variable. Likewise, satiety responsiveness variance was not explained by duration of breastfeeding ($\beta=.002$, $p=.548$), age ($\beta=.003$, $p=.489$), and gender ($\beta=.040$, $p=.561$). Overall, the explained variance was less than 1% ($R^2=.008$, $F(3,161)=.428$, $p=.733$). Breastfeeding duration did not significantly change the child's likelihood of being unhealthy ($\beta=-.010$, $p=.616$), while being male and getting older increased the odds of being healthy. That is, for an increase of 1 month in the child's age, the odds of being healthy are expected to change by a factor of .949, holding all other variables constant. While being male increases the odds of being healthy by a factor of .411, holding all other variables constant.

Conclusion and Discussion

The current retrospective cross-sectional study assessed the association between breastfeeding duration and eating behaviors of Colombian children ranging between 24 and 59 months old, using a sample of 175 caregivers who are served by childcare centers of the Colombian Caribbean Region. Our findings revealed that only 56% of children showed normal range of nutritional status, while the rest of children were identified as underweight, overweight or obese (World Health Organization, 2011). The high percentage of low-income preschool children that showed unhealthy weight suggest awareness of the efficiency and quality of the nutrition services provided by ECE centers in the Colombian Caribbean Region. Consequently, it is important to design and implement pertinent and relevant nutrition intervention programs with the purpose to address this public health problem. For this purpose, causal inferences might be necessary to identify children at risk for unhealthy nutritional status and provide targeted nutrition services based on their specific needs.

We hypothesized that breastfeeding duration may be associated with nutritional status (Falcão et al., 1991; Fiese et al., 2019; Rogers & Blissett, 2016). However, our findings showed that breastfeeding duration does not significantly change the child's likelihood of being unhealthy in this sample. In this regard, the study would need to be replicated in order to confirm this finding given the retrospective nature of the study in which the caregiver recall data method could generate bias (World Health Organization, 2013). Most of the children who participated in the study were 47 months old and the majority of them were reported by the caregivers as breastfeed until ten months old. Moreover, only 36% of children were exclusively breastfeed for six months. Consequently, the length of the recall was 37 months approximately, which could have an influence on the misclassification of the breastfeeding duration. After an elapsed time, higher than 24 months, caregivers may tend to report the desired duration rather than what was practiced (World Health Organization, 2013). Then if this were the case, the study would show a lower desired breastfeeding duration than the duration -six months for exclusive breastfeeding and 2 years for continued breastfeeding combined with solids- proposed by national governmental guidelines from Colombia and/or international organizations like WHO (Niño, 2014; World Health Organization, 2013).

Furthermore, we found no evidence that breastfeeding duration was associated with eating behaviors in the Colombian context. Specifically, our results showed that breastfeeding duration did not significantly predict neither food responsiveness nor satiety responsiveness. This finding is consistent with the results reported by Hathcock and colleagues (2014) who found a lack of association between satiety responsiveness and breastfeeding. Notwithstanding that many studies have shown an association between breastfeeding and eating behaviors (Borkhoff et al., 2018; Brown & Lee, 2015; Hathcock et al., 2014; Li et al., 2014; Mallan, Nambiar, et al., 2014), caregivers recall bias in breastfeeding duration may lead to underestimate the measure of potential association (World Health Organization, 2013). Therefore, recall bias may tend to decrease the likelihood of reporting significant associations between breastfeeding duration and other variables in research studies (World Health Organization, 2013).

In terms of eating behaviors, perceptions of caregivers may play an important role to explain the current results. Despite only 44% of children showed unhealthy nutritional status (World Health Organization, 2011), caregivers perceived that their children often show the ability to reduce the food intake at a mealtime in relation to their internal cues (medium-high satiety responsiveness). In fact, caregivers also considered that their children sometimes showed the tendency to eat in response to food cues in standard conditions (medium food responsiveness). Further in-depth exploration would contribute to examine if the current findings may be influenced by social desirability of the Colombian contexts and understand the perceptions of low-income caregivers regarding their children's eating behaviors and the nutritional status in this geographical region.

Moreover, gender and age may be key factors for the prevention of unhealthy weight in low-income population living in the Colombian Caribbean Region. Our findings revealed that being male and older increased the odds of being healthy in the early years. Consequently, an increase of one month in the child's age, the odds of being healthy are expected to change by a factor of .949, holding all other variables

constant. While being male increases the odds of being healthy by a factor of .411, holding all other variables constant. From this perspective, young girls would need to be closely monitored by ECE centers and families. Moreover, nutrition intervention programs targeting female preschool population may be beneficial to improve the nutritional status of children living in this geographical region.

Moreover, the current study provides a unique contribution to expand the literature on the breastfeeding duration and eating behaviors in Latino populations, especially for Latinos living in Colombia. Though, there were several limitations in the present study that would need to be addressed in future studies. First, given the cross-sectional nature of the study, the possibilities to explore causal effect among variables were limited. Second, the retrospective nature of the study and the maternal recall method data could generate bias. On the other hand, the current study may illuminate the selection of measures and methods of data collection (e.g. accrual method) for future studies about this topic in order to improve the quality of the data and the reliability of analysis (World Health Organization, 2011). Third, the sample was no probabilistic and relatively smaller and less homogenous than the samples used in research studies conducted in other countries such as Netherlands (Derks et al., 2018), United Kingdom (Brown & Lee, 2015) and even in Hispanic nations (Falcão et al., 1991; Reyes et al., 2014; World Health Organization, 2012). This methodological issue may lead to inconsistent results and may limit the generalization of the results.

Finally, similar studies conducted in Colombia and other countries have explored multiple socioeconomic variables (e.g., work, government policies) that were not considered in this study (Abou-ElWafa & El-Gilany, 2019; Benjumea et al., 2011; Cabrera et al., 2004; Caleyachetty et al., 2013; Mateus, 2012; Muchacha & Mtetwa, 2014; Rodríguez-García & Acosta-Ramírez, 2008). Thus, future studies would need to address these limitations in order to provide a wider and holistic picture of the association between breastfeeding duration and preschoolers' eating behaviors in low-income Latino populations living in their country of origin.

Declarations

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Authors' contributions:

R., C: literature review, methods, conclusion and discussion, editing

E., E: literature review, design of the study, methods, conclusion and discussion, editing, funding, project management

S., S: methods, data cleaning, results, conclusion and discussion

E., J: methods, data cleaning, results

A., M: literature review, editing

H., A: literature review

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