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Jennifer Wiltbank

*The College at Brockport*, [jlwiltbank@gmail.com](mailto:jlwiltbank@gmail.com)

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The Effect of Maternal Obesity on Breastfeeding at 6 Months

A Senior Honors Thesis

Submitted in Partial Fulfillment of the Requirements  
for Graduation in the Honors College

By

Jennifer Wiltbank

Health Science Major, Healthcare Administration

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Thesis Director: Dr. Briana Jegier, Assistant Professor, Health Science

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## **Introduction**

Breastfeeding, whether directly at the breast or through hand or pump expression, is associated with improved health outcomes for both the mother and the infant. Mothers who breastfeed have better health outcomes including reduced time to lose weight or return to pre-pregnancy body mass index (BMI) (Kitsanas, 2012), and decreased risk for breast cancer, ovarian cancer, and type 2 diabetes (Godfrey, 2009). Infants who are breastfed, either directly at breast or by receiving expressed breast milk in a bottle, also have better health outcomes including lower risk for otitis media, gastroenteritis, obesity, and sudden infant death syndrome (SIDS) (Ip, 2007). Despite the many health benefits of breastfeeding, recent data from the Centers for Disease Control and Prevention (CDC) demonstrates that 20.8% of mothers in the United States do not initiate breastfeeding and thus must use infant formula for their infants (Breastfeeding Report Card, 2014). There are many factors that can affect a woman's decision to initiate breastfeeding, such as pre-pregnancy BMI, lactation difficulties, mechanical challenges, social support, beliefs about breastfeeding, and socioeconomic status (Kitsantas, 2012). For the purposes of this thesis, breastfeeding is defined as a mother who provides breast milk to her infant either directly at the breast or through hand or pump expression.

One factor that breastfeeding impacts that has received significant attention among medical and public health practitioners is obesity. Obesity, defined as having a BMI  $\geq 30$ , is a prominent public health topic because it is associated with poor health outcomes, including cardiovascular disease and cancer, as well as high societal costs (Disability and Obesity, 2014). Studies demonstrate that breastfeeding has a protective effect on obesity for infants who are breastfed and on a breastfeeding mother's health due to faster return to pre-pregnancy BMI and lower risk for cardiovascular disease and cancer (Schwarz, 2009, Kitsanas, 2012, Godfrey,

2009). Specifically, infants that were fed formula only or a combination of breast milk and formula for four months had an increased risk of overweight/obesity between ages 2 and 6, compared to infants fed exclusive breast milk for 4 months (Dattilo, 2012). Further, recent studies by Bartick, et. al demonstrate that if breastfeeding rates were increased to 90%, society would save \$13 billion in obesity-related infant health costs (Bartick 2010). Given, obesity is currently an epidemic in the United States (Kitsanas, 2012) and that breastfeeding is a widely-available, low-cost preventative treatment for obesity, it is important to continuously examine how obesity can affect mothers and their breastfeeding relationship with their infants. Thus, the purpose of this study is to explore how obesity impacts maternal breastfeeding duration at 6 months of infant life.

## **Literature Review**

### Impact of Maternal Obesity

A study revealed that the prevalence of obesity among mothers who are pregnant was 28.9% in 2010 and that this number will most likely continue to rise (Lepe, 2011). Maternal obesity during pregnancy is associated with many complications both during and after pregnancy (Lepe, 2011, Rasmussen, 2008, Lovelady, 2005, LaCoursiere, 2010). These complications include preeclampsia, gestational diabetes, birth defects, and increased risk for thromboembolisms (Lepe, 2011). Obese mothers are more likely to require a planned or emergency cesarean section, which increases the mother's recovery time compared to if she had delivered vaginally (Rasmussen, 2008). Obese mothers also may be more prone to poor perception of self, poorer mental health, and higher rates of postpartum depression (Lovelady, 2005, LaCoursiere, 2010).

## Maternal Obesity and Breastfeeding

These differences in baseline health status of obese mothers compared to mothers of normal weight may impact an obese mother's decision and/or ability to breastfeed. In fact, studies demonstrate that mothers who were obese prior to pregnancy were less likely to initiate breastfeeding and had short durations of breastfeeding (Kitsantas, 2012). There a variety of interconnected factors that contribute to the lower breastfeeding initiation by obese mothers including physiological issues, physical/mechanical issues, psychological issues and cultural/social issues (Kitsantas, 2010).

Studies demonstrate that obese mothers are at an increased risk for a delay in the onset of lactogenesis II (Lepe, 2011). Lactogenesis II is defined as the copious secretion of milk (Neville, 2001). A physiological reason why obese mothers may face this delay is a lower prolactin concentration in obese mothers at rest after nursing (Lepe, 2011, Oddy, 2006). The reason that prolactin is so important for breastfeeding is because prolactin response is critical for milk production following delivery (Lovelady, 2005). Without the onset of copious milk secretion or milk production, mothers may not be able to exclusively breastfeed. Another physiological issue that can impact lactation that obese mothers face is a higher risk for c-section (Rasmussen, 2008). Mothers who have c-sections may not be able to initiate lactation immediately following birth (Kitsantas, 2010). Studies demonstrate that mothers who do not initiate lactation after birth may have a delay in the onset of lactogenesis II (Parker, 2012, Rasmussen, 2008). Obese mothers are already vulnerable to a delay in lactogeneiss II which can be compounded by the higher risk of a c-section.

There are also mechanical/physical factors to consider when addressing issues that inhibit breastfeeding. Obese mothers may have larger breasts and mothers with larger breasts may face

challenges when trying to breastfeed (Donath, 2000). It may be harder for an obese woman to hold her breast in place if her breast is heavier. An obese woman may have a tougher time trying to get her child to latch on to the breast or may have problems positioning the child properly (Lovelady, 2005). This mechanical factor may result in a mother not breastfeeding her infant often enough. Breastfeeding infrequently due to this mechanical factor could also compound the physiological factors, particularly lower prolactin response to breastfeeding for obese mothers (Lovelady, 2005).

Finally, psychological barriers can also prevent breastfeeding in overweight/obese mothers. Mothers that are obese might have negative attitudes toward breastfeeding for a variety of reasons. One reason might be poor self-image issues that could manifest as the woman being uncomfortable with breastfeeding in front of others or in public (Lepe, 2011). Self-image might be further lowered if a woman feels that she does not have a strong support system. Lack of self-image and lack of support may act together to lower the likelihood a mother will ask for help when it comes to breastfeeding (Donath, 2000).

## **Methods**

### Design

This study was secondary data analysis of maternal survey responses from mothers who participated in a prospective cohort study that examined infant feeding practices during the first 6 months of infant life and maternal return to work. The original prospective study included women with uncomplicated, singleton, term deliveries who were recruited from two urban community hospitals (n=842). This study specifically examined the impact of obesity on breastfeeding duration at 6 months. Mothers from the original study were eligible for this study

if they had complete data on obesity status and breastfeeding duration. Mothers with incomplete data for these measures were excluded from analysis. There were 829 mothers who had complete data and thus comprised this sample.

### Conceptual Framework

The conceptual framework that guided this study is depicted in Appendix A. This framework proposes that obesity impacts breastfeeding at 6 months. This model controls for various maternal demographic and health characteristics including age, WIC participation, and delivery type.

### Sample and setting

This study was conducted at the College at Brockport located in Brockport, NY. This study was approved by the institutional review board at the University of Rochester. The sample size for this analysis was 829. Using G\*Power, power calculation were conducted to assess the power of this study, Assuming a type I error rate of .05, a power of 80%, and a medium effect size, the study sample size exceeded the minimum sample size of 88 required for this analysis.

### Definition of measures

The independent, dependent, and control variables for this study were derived from the original cohort study database. The independent variable for this study was obesity status. This was a categorical variable that was defined as obese/overweight ( $BMI \geq 25$ ) and normal weight ( $BMI < 25$ ). The dependent variable for this study was duration of any breastfeeding in days during the infant's first 6 months of life or the time the mother provided her last survey. Some mothers returned their survey after 6 months and thus breastfeeding duration data was available beyond the infant's first 6 months of life. This was a categorical variable that was defined as yes if any breastfeeding at 6 months occurred or no if breastfeeding had been discontinued. The

control variables for this study were maternal age, minority status, WIC status, delivery type, employed/in school during pregnancy, planning to return to work/school within 6 months, infant in the NICU, mother on Medicaid, tobacco use, alcohol use, medical risk factors during pregnancy (e.g. hypertension), procedures during this pregnancy, depression during pregnancy, and pregnancy plan. Other variables were used in the original cohort study database but were excluded from this study.

There were four different forms of delivery type from the original cohort study database, which were spontaneous vaginal delivery, vaginal delivery – forceps low/outlet, vaginal delivery – vacuum, and cesarean delivery (c-section). Pregnancy plan was either indicated by mothers as intended or unintended. All other variables were either answered with a yes or no.

#### Procedures

The independent, control, and dependent variables were collected through retrospective review of the cohort study database. A senior research staff member provided the authors with an excel file and SPSS file containing the study variables.

#### Analysis Plan

Data for this study were managed using Microsoft Excel 2003 (Redmond, WA) and were analyzed using Statistical Package for the Social Sciences (SPSS) for Windows, version 22 (Chicago, IL). Frequencies were used to describe nominal data and descriptive statistics were used to describe ordinal and continuous data. Parametric tests were performed for normally distributed continuous data and non-parametric tests were performed for ordinal and non-normally distributed continuous data. Bivariate analyses, including chi-square and t-tests were conducted on all variables. A multivariable linear regression is planned for future study. A type I error rate of .05 was used for all statistical analyses.

## Results

Table 1 demonstrates the variables that were measured and tested to assess statistical significance by maternal obesity status. In this sample, 55.9% of mothers were considered overweight/obese. The mean number of days of breastfeeding for overweight/obese mothers was  $117.475 \pm 76.9156$  day and for normal weight mothers was  $99.880 \pm 76.9134$  days. The analysis indicates that compared to normal weight mothers, overweight/obese mothers breastfed longer ( $p=0.001$ ), were less likely to use WIC ( $p=0.013$ ), were less likely to have minority status ( $p=0.001$ ), were less likely to plan to return to work/school within 6 months ( $p=0.018$ ), were less likely to have used tobacco ( $p=0.030$ ), and were more likely to experience medical risk factors during pregnancy ( $p<0.001$ ). There were no statistical differences in maternal age ( $p=0.449$ ), employed/in school during pregnancy ( $p=0.164$ ), NICU admission ( $p=0.148$ ), Medicaid ( $p=0.464$ ), alcohol use ( $p=0.313$ ), procedures during this pregnancy ( $p=0.080$ ), depression during pregnancy ( $p=0.590$ ), and pregnancy plan ( $p=0.233$ ).

Table 1. Description of study sample by maternal obesity status (n=829)

| <b>Variable</b>                            | <b>Overweight/Obese<br/>Mean <math>\pm</math> SD or N(%)</b> | <b>Normal Weight<br/>Mean <math>\pm</math> SD or N(%)</b> | <b>p-value</b> |
|--|--|---|----------------|
| <b>Breastfeeding Days</b>                  | 117.475 $\pm$ 76.9156  | 99.880 $\pm$ 76.9314                                      | .001           |
| <b>Maternal Age (years)</b>                | 29.2 $\pm$ 5.4   | 29.5 $\pm$ 5.7  | .449           |
| <b>Minority Status</b>                     |  |   |                |
| No   | 377 (81.4%)  | 261 (71.3%)   | .001           |
| Yes  | 86 (18.6%)   | 105 (28.7%)   |                |
| <b>WIC</b>                                 |  |   |                |
| Yes  | 79 (17%)   | 88 (24%)  | .013           |
| No   | 384 (83%)  | 278(76%)  |                |
| <b>Delivery Type</b>                       |  |   |                |
| Spontaneous Vaginal Delivery               | 322 (69.5%)  | 222 (60.7%)   | <.001          |
| Vaginal Delivery – forceps low/outlet      | 5 (1.1%)   | 1 (0.3%)  |                |
| Vaginal Delivery – vacuum                  | 37 (8.0%)  | 17 (4.6%)   |                |
| Cesarean Delivery                          | 99 (21.4%)   | 126 (34.4%)   |                |
| <b>Employed/In School During Pregnancy</b> |  |   |                |
| No   | 93 (20.1%)   | 88 (24.0%)  | .164           |
| Yes  | 370 (79.9%)  | 277 (75.7%)   |                |

| <b>Variable</b>   | <b>Overweight/Obese<br/>Mean ± SD or N(%)</b> | <b>Normal Weight<br/>Mean ± SD or N(%)</b> | <b>p-value</b> |
|---|---|--|----------------|
| <b><u>Planning to Return to Work/School within 6 months</u></b> |   |  |                |
| No  | 52 (14.1%)                                    | 23 (8.2%)                                  | .018           |
| Yes   | 316 (85.9%)                                   | 259 (70.8%)                                |                |
| <b><u>NICU</u></b>  |   |  |                |
| No  | 455 (98.3%)                                   | 354 (96.7%)                                | .148           |
| Yes   | 8 (1.7%)                                      | 12 (3.3%)                                  |                |
| <b><u>Medicaid</u></b>  |   |  |                |
| No  | 284 (61.3%)                                   | 214 (58.5%)                                | .464           |
| Yes   | 146 (31.5%)                                   | 123 (33.6%)                                |                |
| <b><u>Tobacco Use</u></b>                                       |   |  |                |
| No  | 408 (88.1%)                                   | 302 (82.5%)                                | .030           |
| Yes   | 48 (10.4%)                                    | 56 (15.3%)                                 |                |
| <b><u>Alcohol Use</u></b>                                       |   |  |                |
| No  | 452 (97.6%)                                   | 352 (96.2%)                                | .313           |
| Yes   | 5 (1.1%)                                      | 7 (1.9%)                                   |                |
| <b><u>Medical Risk Factors During Pregnancy</u></b>             |   |  |                |
| No  | 296 (63.9%)                                   | 182 (49.7%)                                | <.001          |
| Yes   | 167 (36.1%)                                   | 184 (50.3%)                                |                |
| <b><u>Procedures During This Pregnancy</u></b>                  |   |  |                |
| No  | 423 (91.4%)                                   | 346 (94.5%)                                | .080           |
| Yes   | 40 (8.6%)                                     | 20 (5.5%)                                  |                |
| <b><u>Depression During Pregnancy</u></b>                       |   |  |                |
| No  | 286 (61.8%)                                   | 203 (55.5%)                                | 0.059          |
| Yes   | 128 (27.6%)                                   | 122 (33.3%)                                |                |
| <b><u>Pregnancy Plan</u></b>                                    |   |  |                |
| Unintended  | 92 (19.9%)                                    | 85 (23.2%)                                 | .233           |
| Intended  | 318 (68.7%)                                   | 239 (65.3%)                                |                |

## **Discussion**

This study examined the impact of maternal obesity on breastfeeding duration during the first six months of infant life. Unlike previous studies (Kitsanas, 2012, Lepe, 2011, Oddy, 2006, Lovelady, 2005), this study found that mothers who were overweight/obese breastfed longer than mothers who were normal weight. ( $p=.001$ ). This study also found that while normal weight women had a lower mean number of days of breastfeeding than that of overweight/obese women, normal weight women also had a higher maximum number of breastfeeding days

compared to overweight/obese women. The longer mean duration of breastfeeding and lower maximum breastfeeding duration among overweight/obese mothers in this sample suggest that overweight/obese mothers can initiate and sustain lactation though they may need further education or assistance to reach longer breastfeeding duration.

One possible reason that this study demonstrates that overweight/obese women have longer breastfeeding duration compared to normal weight women is that the normal weight women had higher risk for other factors known to impact breastfeeding duration including WIC status and delivery type (Kitsantas, 2010). Specifically, normal weight women were more likely to be enrolled in the WIC program (24%) compared to overweight or obese women (17%). Normal weight women were also more likely to have delivered by cesarean section (34.4%) compared to overweight/obese women (21.4%). Given that normal weight women were more likely to have these risk factors that lower breastfeeding duration, it is possible that these risk factors have a stronger effect on breastfeeding duration than the effect of obesity on breastfeeding duration.

Another possible explanation for the longer duration of breastfeeding among overweight/obese mothers is that a lower percentage of these mothers planned to return to work or school within 6 months of delivery. Specifically, 14.1% of overweight/obese mothers did not plan to return compared to 8.2% of normal weight mothers. The literature suggest that mothers who intend to return to work or school have lower breastfeeding duration and that mothers who do return are very likely to discontinue breastfeeding within the first month of returning to work. Thus, it is similarly possible that return to work plans impact breastfeeding duration more than obesity status (Kimbrow, 2006).

Finally, overweight/obese mothers were also more likely to have medical risk factors during this pregnancy compared to normal weight mothers. It is possible that given the increased medical risk factors, overweight/obese mothers had more visits with healthcare providers and thus possibly received more education about breastfeeding.

### Limitations

The data in this study were derived from survey responses of the mothers who were eligible for participation. The survey responses were self-reported, indicating a chance that there could be inaccuracy in data.

### **Conclusion**

This study demonstrated that overweight/obese mothers had longer duration of breastfeeding compared to normal weight mothers. This study also demonstrated that in this sample normal weight mothers were more likely to have other known risk factors that lower breastfeeding duration including participating in WIC, having a c-section, and planning to return to work or school within 6 months of delivery. Taken together, these findings suggest that these other risk factors might be stronger predictors of breastfeeding duration compared to obesity. Healthcare and public health practitioners can use this information to inform their breastfeeding education practices.

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