Auctus: The Journal of Undergraduate Research and Creative Scholarship

2018

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Abstract

Postpartum Depression (PPD) is the most common childbearing-related illness around the globe affecting both mothers and their children; yet minimal longitudinal research has been done to study the effect of depressive symptomatology on breastfeeding. This study analyzes how the benefits of breastfeeding past six months, postpartum, can be used as a treatment mechanism for postpartum depression (PPD) with the major contributing factor of gestational weight gain (GWG) in Hispanic women recently immigrated to the United States. I investigated journal articles in four main domains: the likelihood of women presenting with depressive symptomatology as a result of weight gain to initiate and continue breastfeeding, the negative association between increasing maternal antepartum weight and breastfeeding, the possible biological explanations for PPD in women who don't breastfeed, and the benefits that breastfeeding past six months postpartum can have on MDE and GWG in women. I identified that a correlation between antepartum weight and GWG increases the rate of MDE among women, which has an inverse relationship on women's likelihood to initiate and continue breastfeeding. Cessation of breastfeeding can put women at risk for increased weight gain and toxic levels of retinoids (Vitamin A) that can lead to cognitive disturbances. Since no longitudinal studies have been conducted specifically examining this comorbidity, more data needs to be collected to support the hypothesis. In order to effectively treat this comorbidity, both biological and psychological causes need to be examined in order to diagnose a major depressive episode (MDE). These methods coupled with a culturally appropriate counseling system can be used to effectively educate women on the benefits of breastfeeding past six months, postpartum, as a treatment mechanism for postpartum depression (PPD) with the major contributing factor of gestational weight gain (GWG) in Hispanic women recently immigrated to the United States.

Introduction

Postpartum Depression (PPD) is currently the most common childbearing-related illness affecting 25% of women worldwide (Shieh & Wu, 8). Many factors can contribute to the development of postpartum depression such as hormonal imbalances, life changes, poor social support, infant colic, and physical symptoms and complications during the postpartum period, but the combination of two or more factors can increase the risk of postpartum depression in women (Howell et al., 58).

Current research focuses heavily on the negative effects of PPD on mothers, their children, or the mother-child relationship, but minimal longitudinal research has been done to study maternal weight—in particular being overweight and obesity—as a major contributing factor of PPD and the role of this comorbidity on breastfeeding rates during the postpartum period. Studies that investigate the role weight plays in depressive symptomatology analyze pre-gestational weight, gestational weight gain (weight gain throughout the pregnancy), and postpartum weight retention. Pre-gestational weight and gestational weight gain have been shown to increase the rate of mental depressive episodes in women, while postpartum weight retention can increase the rate of developing PPD in later pregnancies.

Both PPD and high pre-gestational weight and gestational weight gain have been shown to decrease the rate of breastfeeding in women independently. However, when combined, the breastfeeding rate decreases even more significantly. Hispanic women that have immigrated to the United States are a particularly at risk population for PPD and decreased breastfeeding rates due to the combination of triggers they tend to experience through the process of acculturation. Additionally, Hispanic women are 1.36 times more likely to be obese than non-Hispanic white women, resulting in the aforementioned comorbidity that can dramatically influence their likelihood to initiate and continue breastfeeding (Shieh & Wu, 10).

Breastfeeding rates during the postpartum period are crucial because aside from the nutritional value it can afford infants, women can also experience a multitude of benefits, two of which are weight loss and reduced depressive symptomatology. Women who breastfeed at least past six months postpartum (and more often one year) have been

shown to experience weight loss, but many women cease breastfeeding before the weight loss occurs. Additionally, biological processes have been found to explain the reduction of PPD symptoms in women who breastfeed well into the postpartum period (at least three months but especially past six months). When women lactate, a buildup of retinoids (Vitamin A) develops in their system that at high concentrations can create mood and cognitive alterations that can potentially develop into a major depressive episode. Therefore, when women breastfeed, they reduce the concentration of retinoids in their system, decreasing the likelihood of developing PPD. Breastfeeding has also been found to release oxytocin—a neuropeptide hormone—which can reduce stress and depressive symptomatology in women as well.

Because the Hispanic population is the largest growing minority in the United States, with a growth rate three times the total population of the United States between 2002 and 2006, a culturally appropriate educational program on the risk factors associated with PPD and lifestyle choices that could reduce the chances of developing PPD could greatly benefit Hispanic women (Gill, 244). Programs like "Proyecto Mama" by Lisa Chasan-Taber et al. have researched the positive effects individually and culturally tailored programs can have on increasing breastfeeding rates in Hispanic women.

Even though postpartum depression (PPD) is the most common childbearing-related illness around the globe affecting both mothers and their children, minimal longitudinal research has been done to study the effect of depressive symptomatology on breastfeeding. Recent data indicates that correlations between antepartum weight and gestational weight gain (GWG) increase the rate of mental depressive episode (MDE) among women, which has an inverse relationship on women's likelihood to initiate and continue breastfeeding. Additionally, the decreased rate of breastfeeding can put women at risk for increased weight gain and toxic levels of retinoids (Vitamin A) that can lead to cognitive disturbances. In order to effectively treat this comorbidity, both biological and psychological causes need to be examined in order to diagnose a major depressive episode (MDE). These methods coupled with a culturally appropriate counseling system can be used to effectively educate women on the benefits of breastfeeding past six

months, postpartum, as a treatment mechanism for postpartum depression (PPD) with the major contributing factor of gestational weight gain (GWG) in Hispanic women recently immigrated to the United States.

A Review of the Established Benefits of Breastfeeding on Mothers and Infants

Extensive research has been conducted to quantify the benefits of breastfeeding for both mother and child, yet very minimal longitudinal research has been done to study the effect of depressive symptomatology—postpartum depression in particular— on breastfeeding.

In a study titled "Predictors of Breastfeeding in Overweight and Obese Women: Data from Active Mothers Postpartum (AMP)," authors Katrina M. Krause, Cheryl A. Lovelady, and Truls Ostbye state that it is well known both in the scientific field and through common knowledge that breastfeeding is the preferred feeding method for infants, showing positive impacts on both mother and child (2). Because breast milk is produced for the purpose of feeding an infant, it is logical to study the nutritional value and growth benefits associated with breastfeeding versus other dietary supplements on children. Krause, Lovelady, and Ostbye state that many organizations such as the World Health Organization, the American Academy of Pediatrics, Breastfeeding in Healthy People 2010, and the US Preventative Services Task Force recommend breastfeeding through six months of infant life and preferably past one year (2). Many studies such as "The Relationship among Breastfeeding, Postpartum Depression, and Postpartum Weight in Mexican American Women," by Elizabeth Reifsnider, Jenna Flowers, Michael Todd, Jennie Bever Babendure, and Michael Moramarco reiterate this point (760). Krause, Lovelady, and Ostbye also state that these organizations have set guidelines and programs to try to facilitate the accomplishment of these recommendations (2), because as Elizabeth Howell, Susan Bodnar-Deren, Amy Balbierz, Michael Parides, and Nina Bickell state in, "An Intervention to Extend Breastfeeding Among Black and Latina Mothers After Delivery," "each week of breastfeeding confers benefits" (239). Therefore, much of the research that has been conducted on a longitudinal scale concerns the health benefits of breastfeeding on children throughout the first six-months to one year of life.

In a study titled "Breastfeeding Cessation and Symptoms of Anxiety and Depression: A Longitudinal Cohort Study," Eivind Ystrom lists that some of the key benefits of breastfeeding for children are an increased cognitive and sensory development as well as an increase in protection against infections (2). Howell, Bodnar-Deren, Balbierz, Parides, and Bickell support Ystrom's claim that breastfeeding lowers the risk of infection rates in children and include additional benefits such as lower obesity and post neonatal death among children (239).

In "Does Breastfeeding Offer Protection Against Maternal Depressive Symptomatology?" Jennifer Hahn-Holbrook, Martie G. Haselton, Christine Dunkel Schetter, and Laura M. Glynn state that the benefits of breastfeeding on children have been studied extensively, but studies on the benefits for mothers are limited (2). Even though breastfeeding is a physiological process that occurs in women's bodies in order to nutritionally sustain their child, breastfeeding itself is a "dynamic, bidirectional, biological dialogue" as Tonse N. J. Raku states in, "Breastfeeding Is a Dynamic Biological Process—Not Simply a Meal at the Breast" (257). The research described below illustrated how breastfeeding changes women biologically, hormonally, biochemically, and psychologically, therefore, it is crucial to understand the potential benefits or consequences associated with breastfeeding or the lack of breastfeeding.

Some of the known benefits of breastfeeding include reduced risk for type-2 diabetes, cardiovascular disease, breast cancer, and reduced stress and depressive symptoms due to the release of the hormone oxytocin in the brain (2). Researchers such as Anthony Mawson and Xueyuan Wang — authors of "Breastfeeding, Retinoids, and Postpartum Depression: A New Theory"— reaffirm these protective benefits (1130), while Ystrom includes the additional benefit of decreased risk of ovarian cancer in women who breastfeed (2).

A majority of the research that has been conducted on the effects of breastfeeding for both mothers and their children pertains to concrete biological benefits that can be quantified and more easily measured. The more challenging research is studying the causal relationship between breastfeeding and psychological outcomes, whether positive or negative for either mother or child. While the aforementioned benefits of breastfeeding

have been found in mothers, limited research has been conducted on the psychological and psychosocial aspect of breastfeeding. In particular, researchers are beginning to look more closely at the correlations between breastfeeding and postpartum depression, but as Reifsnider et al. explain, the maternal benefits of breastfeeding have not been thoroughly investigated in correlation with maternal weight as a major contributing factor of postpartum depression (PPD) particularly on a culturally appropriate level (760).

Defining Breastfeeding

It can be challenging to compare the results of current published studies due to the varying definitions of what constitutes "breastfeeding." However, the three most comprehensive and commonly used differentiations of breastfeeding are: 1) exclusive breastfeeding, which the use breast-milk as the sole dietary supplement of a child for a designated period (three or six months), 2) non-exclusive breastfeeding, which is the use of other solids or liquids such as baby formula to supplement a child's diet in addition to breastmilk, and 3) exclusive formula feeding, which is the use of sole formula or other liquids and solids to supplement a child's diet other than breastmilk.

Even though each field has specific language and terminology that usually only experts in a field understand and use, it is crucial to define terms within individual studies and articles because variations in language can lead to easily misinterpreted data. Studies that examine the effects of breastfeeding either on mother, child, or both can vary in the terminology associated with levels of breastfeeding. Many studies have no specified degrees or rates for "non-exclusive breastfeeding," but the aforementioned definitions of breastfeeding will be used for the purpose of this research paper.

Cultural Trends Related to Breastfeeding in Hispanic Populations

Hispanic women in their native countries are more likely to engage and continue breastfeeding due to cultural norms such as the fact that their mothers and grandmothers breastfed before them, the reduced pressure to work and care for their child instead, and the reduced accessibility to nutritional supplements such as formula. Because of this, Hispanic women have higher breastfeeding initiation rates than non-Hispanic white

women, but the percentages begin to decrease as they become more acculturated to lifestyles in the United States.

In "Breastfeeding by Hispanic Women," Sara L. Gill states that the breastfeeding initiation rate of Hispanic women is an astounding 79.8%, but it differs among women of different Hispanic origins as well as their level of acculturation (245). Acculturation is the process of adopting a new culture along with its customs and traditions while not completely rejecting the "old" one. As Gill states, the more acculturated Hispanic women become and the longer they remain in the United states, the less likely they are to both initiate breastfeeding as well as continue breastfeeding during the postpartum period (245). Hispanic women listed breastfeeding barriers such as lack of latching by the child, nipple pain and tenderness, the need to return to work or school, the reduced social life, embarrassment associated with breastfeeding in public, lack of support by family or healthcare providers, and receiving formula samples from hospitals that reduced their likelihood to initiate and continue breastfeeding (247). Reifsnider et al. concur with Gill's research, claiming that in a study conducted in Texas titled, "Breastfeeding attitudes and behavior among WIC mothers in Texas" by Vaaler, Stagg, Parks, Erickson, and Castrucci, Hispanic women recently immigrated to the United States who still held strong cultural values (not acculturated to US customs) were most likely to engage in breastfeeding while more acculturated Hispanic women had the lowest rate of breastfeeding across all Hispanic races (761).

Reifsnider et al. state that over the last few years, breastfeeding past six months has dropped to 17% across all races according to the 2007 National Survey of Children's Health (760). In particular, Reifsnider et al. emphasize that in 2008; Hispanic women initiated breastfeeding at 80% but dropped to 45% at six months postpartum and 26% 12 months postpartum (760). These decreasing trends are crucial to both analyze and understand because the Hispanic population is the largest growing ethnic group, making up 44.3 million people in the United States as of 2006 with a growth rate of over three times the total population between 2002 and 2006 (Gill, 244).

In addition to the decreasing rate of breastfeeding initiation and continuation in acculturated Hispanic women, Reifsnider et al. express the critical nature of these

statistics since Hispanic women have higher weights and higher rates of PPD than white women, particularly in women who are young, have a lower socioeconomic status, less educated, have poor social support, which has been attributed to decreasing the rate of breastfeeding in women (760). Howell, Bodnar-Deren, Balbierz, Parides, and Bickell support Reifsnider et al.'s claim, stating that "although national data suggests Latina women have breastfeeding rates similar to those of white women, significantly different patterns of breastfeeding continuation rates exist among certain low-income subgroups of Latina women" (239).

Because the Hispanic population is the largest growing minority in the United States and a majority of the population is undergoing the process of acculturation, Hispanic women are at the highest risk for decreasing rates of breastfeeding initiation and continuation, not reaping the potential benefits of breastfeeding for both themselves and their children during the postpartum period.

Risk Factors Associated with Excessive Weight, Gestational Weight Gain, and Postpartum Weight Retention and Their Correlation with Postpartum Depression

The average weight of Hispanic women entering pregnancy has significantly increased to levels categorized as overweight and obese which has caused increased gestational weight gain (GWG) and weight retention during the postpartum period. These factors can put women at risk for gestational complications, such as caesarean deliveries, hypertension, preeclampsia, and gestational diabetes mellitus. These factors can also put their children at risk for complications such as large-for-gestational-age, adiposity, and morbidity. In addition to the physical complications that can result from excessive body mass index (BMI), women who are overweight before, throughout, and after their pregnancy have a higher risk of developing postpartum depression.

In "Factors Associated with Depressive Symptoms in the Early Postpartum Period among Women with Recent Gestational Diabetes Mellitus," Jacinda M. Nicklas et al. state that 7% of women develop Gestational Diabetes Mellitus (GDM) throughout their pregnancies and an increased rate is associated with overweight and obese women (1). Nicklas et al. state that having GDM can double the risk of type two diabetes and that

adopting new lifestyle methods such as healthy diet, healthy exercise, and breastfeeding can reduce the likelihood of developing these diseases.

Over the course of the past few years the rapid rate of weight gain occurring at all ages and genders has caused concern among healthcare leaders. The aforementioned complications resulting from high maternal weight and excessive gestational weight gain have been largely overlooked, yet they are important to understand because it is these particular developments that can contribute to maternal postpartum depression. Therefore, the main focus of this research is determining if there is a correlation between maternal GWG and postpartum depression and then understanding that correlation, in order to apply breastfeeding as a potential method to reduce both GWG and postpartum depression in Hispanic women.

A great majority of sources follow guidelines established by the Institute of Medicine (IOM), which recommends that women who are overweight, with a BMI between 25 and 29.9, should gain no more than 15-25 pounds while obese women, with a BMI of 30 or above, should gain no more than 11-20 pounds (9). Specifically related to Hispanic women, Shieh and Wu state that these women are 1.36 times more likely to be obese than white women (10). A study titled "Prevalence of Overweight and Obesity Among Women of Childbearing Age: Results from the 2002 National Survey of Family Growth" by Anjel Vahratian stated that the higher weight average in Hispanic women could be attributed to lower socioeconomic status, lower education level, and varying levels of insurance coverage (270).

Nicklas et al. state that although no studies have directly investigated the role of PPD in women with GDM, the lack of continued healthy lifestyle behaviors has been associated with depression. Nicklas et al. state that PPD is common in women between 15-20%, but the rate has been found to be higher in women with GDM (3). Statistical testing conducted by Nicklas et al. indicated that both delivering by caesarean section and gestational weight gain was associated with postpartum depressive symptoms (5). Nicklas et al. found that 34% of women diagnosed with GDM develop PPD (score greater than 9 on EPDS). PPD can develop because of many different reasons. The presence of complications or comorbidities can heighten the chances of developing

depressive symptomatology, placing Hispanic women at an increased risk if they have multiple contributing factors.

In the study "Depressive Symptoms and Obesity/Weight Gain Factors Among Black and Hispanic Pregnant Women" Carol Shieh and Jingwei Wu state that the positive correlation between obesity and depression among recently delivered mothers is critical to study because both factors independently, but especially in combination, can seriously negatively affect mothers and their children (8). To represent the severity of these comorbidities, 25% of pregnant women have a depressive disorder, 50% are overweight or obese, and 50% gain excessive gestational weight throughout their pregnancy (8). Each can cause a variety of complication in the mother and child. For example, maternal depression can cause poor breastfeeding, preterm birth, and "poor infant adaptive behavior" (8), while maternal obesity can cause pregnancy related issues such as hypertension, large-for-gestational-age (LGA), gestational diabetes, and preeclampsia as aforementioned (8). In addition, retention of GWG after pregnancy can cause increased weight gain and obesity in following pregnancies. The increased weight during one gestation and the retention of that weight going into another pregnancy creates a cycle in which women are continuously at a higher risk for developing postpartum depression once they have delivered their child.

Shieh and Wu detail that even though research supports the correlation between excessive weight and postpartum depression, many studies that investigate this specific correlation are inconclusive due to the variety of methods used to diagnose depressive symptoms such as the Edinburgh Postpartum Depression Scale (9). In their study titled "Depressive Symptoms and Obesity/Weight Gain Factors among Black and Hispanic Pregnant Women," Shieh and Wu used a cross-sectional design including Black and Hispanic women above 18 years of age. The results suggested that 45% of the women were overweight, 21% were obese, and 45% had significant GWG (13). Thirty-five percent of obese/overweight women were considered depressed compared to 26% of non-overweight women who were considered depressed (14). The depressive symptoms were linked to BMI and weight during pregnancy, indicating that as weight continues to increase in women before pregnancy, through gestational weight gain, and postpartum

weight retention, the likelihood of developing depressive symptomatology increases significantly, placing women at an increased risk for postpartum depression.

The Role Breastfeeding Plays in Reducing Maternal Excessive Weight and Postpartum Weight Retention during the Postpartum Period

Women who are overweight or obese are less likely to initiate and continue breastfeeding with mechanical complications and lack of energy as two of the greatest contributing factors. However, breastfeeding for a period of at least 12 months or longer can cause weight-loss in postpartum women.

Reifsnider et al. claim that breastfeeding can contribute to significant weight loss, but women that tend to be unhappy with their post-pregnancy weight tend to stop breastfeeding and after six months postpartum and tend to stop believing breastfeeding could reduce their weight (760-762). Additionally, Reifsnider et al. state that women who are more obese tend to stop breastfeeding before the weight-loss results can occur. Krause, Lovelady, and Ostbye reaffirm the conclusion presented by Reifsnider et al. and express that overweight women are consistently shown to initiate breastfeeding at lower rates and continue breastfeeding at lower rates as well (2).

Gestational weight gain is prevalent at very high rates in women, and even more so in women with a previous history of gestational diabetes or women with certain demographic factors such as race and socioeconomic levels. Because the effects of weight gain can be so significant on a health level and psychological level, developing a plan that can help these women address pre-pregnancy weight is crucial to later development of comorbidities and secondary effects. By addressing weight before pregnancy or during pregnancy, the initiation of breastfeeding could increase (because of breast size reduction), allowing women who breastfeed past six months postpartum to reap potential weight-loss benefits.

Reifsnider et al. conducted a study with 75 women of Mexican origin in their third trimester of pregnancy with a BMI of 25 and higher. The results of the study indicated that "At 1 month, 23.9% of participants exclusively breastfed, 35.5% non-exclusively breastfed, and 40.6% did not breastfeed. At 6 months, 17.4% of participants

exclusively breastfed, 17.4% non-exclusively breastfed, and 65.2% did not breastfeed. The results indicate that over the course of months during postpartum period, women tend to decrease the rate of breastfeeding. However, regardless of this fact, Reifsnider et al. concluded that breastfeeding past six-months postpartum had a significant effect on reducing postpartum depression and postpartum weight, indicating that increasing the rate of breastfeeding can have significant psychological and physical benefits for women who are able to breastfeeding for at least six months and ideally past a year (6).

The nature of comorbidities suggests that the probabilities of a repeated negative cycle occurring are much higher. If postpartum women are overweight, they have a higher probability of developing depressive symptomatology. If they have depressive symptoms, recently delivered women might be less likely to initiate or continue breastfeeding. If women cease breastfeeding or do not initiate breastfeeding, they may be more likely to become even more depressed and not benefit from the potential weight-loss effects breastfeeding can have. Therefore, the energy and women's ability to engage in a particular program (whether it be for weight-loss or counseling) decreases in the presence of any of these symptoms. When combined, the rate of participation or willingness to breastfeed decreases even more, making it very difficult for women to escape this cycle.

Krause, Lovelady, and Ostbye conducted a study similar to Reifsnider et al. with the main objective of studying the effect of obesity on breastfeeding. They examined a group of overweight, recently delivered mothers as well as their race and their beliefs associated with breastfeeding (2). The results of the study indicated that "each unit increase in BMI reduced the lactation score by 0.22 ($P = 0.01$)" with lactation score measuring duration and exclusivity of breastfeeding past twelve months postpartum (4). Krause, Lovelady, and Ostbye determined that BMI was negatively correlated with breastfeeding and that "for every 5 units increase in BMI (e.g., every increase in BMI category—overweight to obese class I, class I to class II, etc.) the odds of initiating breastfeeding were reduced by ~20%, and the lactation score was reduced by about 1.1" (5). Krause, Lovelady, and Ostbye found that there was no statistical difference in the levels of breastfeeding among races but that education did play a large role in increasing

the level of breastfeeding especially in Black women (5). Breastfeeding was also found to increase weight loss but not until at least 6 months postpartum. Therefore, Krause, Lovelady, and Ostbye's results supported Reifsnider et al. indicating that as the higher the level of breastfeeding, the higher the rate of weight loss. However, the biggest issue is the fact that many women do not breastfeed long enough to reap those benefits.

While the results of several studies indicate that increased BMI and GWG reduce the levels of breastfeeding during the postpartum period, the effect of breastfeeding on postpartum weight is equivocal because there are many validated studies that have shown an inverse correlation between weight and breastfeeding. However, it is crucial to keep in mind that because many studies use varying definitions of breastfeeding and rates of breastfeeding, the comparison of data between studies can be skewed, requiring a uniform definition of breastfeeding rate that is consistently recorded and tested past six or 12 months postpartum for accurate results and comparisons.

The Effects of Postpartum Depression in Women

Because there has been a rise in the proportion of women entering pregnancy that are overweight or obese, the resulting increase in postpartum weight retention and gestational weight gain (GWG) rates have led to positive correlations with the development of a mental depressive episode (MDE) and postpartum depression (PPD). PPD has been shown to negatively affect mothers and their children since it can disrupt mother's parenting behaviors, mother-child bonding, and overall cognitive and emotional states in both.

According to Shieh and Wu, postpartum depression (PPD) is the most common childbearing-related illness affecting 25% of women around the globe (8). In "An Intervention to Reduce Postpartum Depressive Symptoms: A Randomized Controlled Trial", Elizabeth Howell et al. state that "situational factors such as postpartum physical symptoms, infant colic, overload from daily demands, and poor social support are associated with and likely trigger depressive symptoms" (58). Ystrom also attests to the expansive impact of PPD in his article by defining depression as a part of negative affectivity, which is the states of fear, sadness, stress, panic, and distress people can

experience (1). At high levels, Ystrom indicates that people can experience anxiety and depressive symptoms, which if occur over a two-week period of time can be categorized as a major depressive episode (MDE) (1). Ystrom states that when these symptoms occur in postpartum women, developmental delays as well as internalized problems can occur in their children (2). Supporting Ystrom's claims, Hahn-Holbrook, Haselton, Schetter, and Glynn state that PPD has been shown to negatively affect mothers and their children since it can disrupt mother's parenting behaviors, mother-child bonding, and overall cognitive and emotional states in both (2).

Reiterating the data found in other studies such as Ystrom's, Mawson and Wang state that between 10% and 15% of women develop postpartum depression (129). Mawson and Wang state that some of the known contributors to postpartum depression (PPD) include previous history of mental disorders, social support, low socioeconomic levels, low education, negative life events during pregnancy, not breastfeeding, smoking, complications during labor or pregnancy, lower maternal age, and smaller infant birth weight (1129). Additionally, in "Acculturative Stress Negatively Impacts Maternal Depressive Symptoms in Mexican-American Women during Pregnancy," Kimberly L. D'Anna-Hernandez, Brenda Aleman, and Ana-Mercedes Flores state that Hispanic women experience acculturative stress above other cultural stressors which can significantly increase depressive symptoms during the postpartum period (1).

Hahn-Holbrook, Haselton, Schetter, and Glynn reiterate Mawson and Wang's research stating that many studies and research has been done on depression in women because it is one of the childbearing illnesses that affects around 13% of women across the globe (2). Postpartum depression (PPD) can cause negative physical, emotional, and cognitive effects on women that can directly impact their children through means such as behavioral developmental issues. Hahn-Holbrook, Haselton, Schetter, and Glynn also state that in addition to affecting children, PPD can affect other family relationship and create marital complications (2).

Because there has been a rise in the proportion of women entering pregnancy that are overweight or obese, the resulting increase in postpartum weight retention and gestational weight gain (GWG) rates have led to positive correlations with the

development of a mental depressive episode (MDE) and postpartum depression (PPD). The name "postpartum depression" can imply that the depressive symptomatology associated with PPD will last only a short period after delivering a child, but PPD is an extremely important mental health issue that can put both women and their children at risk for serious consequences physically and psychologically. Additionally, being a psychological condition suggests that it can be a condition women struggle with for long periods of time, making it a critical women's health topic to address and implement strategies to minimize risks associated with PPD.

The Correlation between Breastfeeding and Depressive Symptomatology Associated with Postpartum Depression

Women with depressive symptomatology are less likely to initiate and continue breastfeeding due to lower engagement levels, yet the physical act of breastfeeding can cause two physiological processes that would alleviate their MDE: 1) reduce retinoid (Vitamin A) levels in women's systems which at high levels have been linked to cognitive disturbances and increased risks for MDE, and 2) breastfeeding releases oxytocin, a neuropeptide hormone, which can both reduce stress levels and depressive symptomatology in new mothers.

Since breastfeeding and depression have not been studied together extensively, Hahn-Holbrook, Haselton, Schetter, and Glynn asked whether breastfeeding can reduce women's chances of PPD or whether women who are depressed are less likely to breastfeed or both (2). Hahn-Holbrook, Haselton, Schetter, and Glynn emphasize that women with PPD have been found to breastfeed less frequently and cease breastfeeding much sooner around 2.3 months postpartum (2). Over the course of the longitudinal study, sixty-nine percent of mothers were found to engage in any breastfeeding at three months postpartum; however, this percentage dropped to 53.2 % at 6 months, 24 % at 12 months, and 4 % at 24 months. Breastfeeding rates dropped for women regardless of depressive symptomatology, but Hahn-Holbrook, Haselton, Schetter, and Glynn found that breastfeeding did have a statistically significant decline in depressive symptomatology in women who breastfed frequently at three months (and past three

months), making them more likely to have reduced depressive symptomatology over a two-year period (7). Overall, Hahn-Holbrook, Haselton, Schetter, and Glynn state that the study was consistent with an inverse correlation between depression and breastfeeding, supporting positive results for both mothers and children (13).

Throughout this research paper, one important element to keep in mind is that some women may find breastfeeding to heighten depressive symptomatology due to its physically and mentally demanding nature. Most women during the first two months after delivery have to breastfeed every one and a half to three hours, seven to nine times a day, and each feeding requires around thirty minutes. Therefore, it is also an extremely time consuming process, adding even more stress to mothers. Additionally, many women are unable to produce breast milk or enough breast milk to fully satisfy an infant, requiring mothers to make formula and bottle-feed their child. While breastfeeding has been found to be the preferred nutritional element for children by healthcare professionals and researchers, it is not to say that women should feel pressured or guilty for being unable to breastfeed. Therefore, this research paper purely attempts to synthesize the correlations between maternal weight and postpartum depression and how breastfeeding can impact the comorbidity in a positive way.

Mawson and Wang emphasize that while breastfeeding can cause benefits in women such as protection against type two diabetes, the cessation of breastfeeding has been shown to increase the rate of PPD in women (1130). Additionally, Mawson and Wang claim that in if PPD was to develop in a mother in a country where women exclusively breastfeeding, the PPD would most likely peak around nine months whereas PPD peaks earlier at around three months postpartum in women who cease breastfeeding (1130).

As aforementioned, the benefits of breastfeeding on mothers and their children has been thoroughly studied due to the quantifiable qualities they possess. Conversely, the correlation between breastfeeding and the reduction of postpartum depression is much harder to delineate due to its abstract nature. Ystrom brings up this point in his research stating that there is a gap in understanding of whether cessation of breastfeeding can predict postpartum anxiety and depression after six months beyond the initial levels

found antepartum (2). Ystrom also asks how the cessation of breastfeeding can affect women who are more prone to stress and anxiety. Ystrom's aim is to "investigate whether breastfeeding cessation is related to an increase in symptoms of anxiety and depression from pregnancy to six months postpartum" (1). Second, we also investigated whether the proposed symptom increase after breastfeeding cessation was disproportionately high for those women already suffering from high levels of anxiety and depression during pregnancy" (2).

The results of Ystrom's study indicated that 15.1% of women exclusively breastfed at six months postpartum, 68.8% breastfed in addition to other supplements, and 16.1% had completely stopped breastfeeding (3). Additionally, Ystrom indicates that the cessation of breastfeeding was a more severe risk factor for changes in anxiety and depression in postpartum women (4). Ultimately, Ystrom concludes that symptoms of anxiety and depression antepartum posed a higher risk for breastfeeding cessation postpartum as similarly as the cessation of breastfeeding can increase women's risk for postpartum depression after six months in women who previously presented no symptoms (5).

Due to the intangible quality associated with studying postpartum depression and the role breastfeeding can play in alleviating depressive symptomatology, many studies have been relatively unsuccessful at supporting the idea that breastfeeding can directly reduce PPD. Therefore, Mawson and Wang conduct a study that used biological reasoning to show breastfeeding can reduce PPD (1130).

Mawson and Wang hypothesized that reduced breastfeeding could be a cause of PPD due to an increased concentration of Vitamin A— also known as an accumulation of retinoids— to a toxic threshold in the brain, breasts, and liver of women (1130). Mawson and Wang explain that because breastmilk is rich in Vitamin A, when lactation occurs, the toxic levels decrease. Mawson and Wang state that it is because of this that breastfeeding past six months is crucial to reduce the risk of PPD (1129).

Most studies analyzing the positive effects of breastfeeding as a means to reduce the risk of postpartum depression have analyzed elements that are not biological. By moving away from the mostly abstract and intangible world of psychology, this study

applied the idea of biopsychology to bridge the gap between abstract psychological symptomatology and biological reasoning for those symptoms. The mechanism of reducing high concentrations of vitamin A compounds known as retinoids from mother to infant through breastfeeding could have evolved as an evolutionary mechanism that benefits both mother and child. The child benefits because she or he obtains nutrients while the mother benefits by reducing toxic levels of retinoids in her body that could potentially have mood and psychologically altering consequences. The longer women breastfeed, the more the vitamin A compounds levels will decrease, reducing women's chances of developing PPD.

Mawson and Wang did not actually test their hypothesis, but they detailed the methods for how said study could be conducted. Mawson and Wang explain that the retinoid concentration could be tested in women with PPD. These profiles could then be compared with women who breastfeed exclusively, non-exclusively, or never, and the length that they breastfeed their children for in order to determine whether breastfeeding has a biological basis for reducing PPD in postpartum women. In Additionally, one of the most common complications that women face when breastfeeding is inflammation of the breast or nipple that can lead to more severe symptoms due to milk drainage issues, which is commonly known as mastitis (Mawson & Wang 1132). However, Mawson and Wang indicated that the cause of mastitis could potentially be linked to high retinoid levels, suggesting that high vitamin A levels could cause many significant and potentially harmful effects on postpartum women (1132). Additionally, combining these findings with those of citation four could indicate that a correlation between the benefits of breastfeeding and reduced weight exists. For instance, if mastitis is a condition linked to retinoid levels that can occur in women, increased breast size due to being overweight could potentially exacerbate the already present complication (Mawson & Wang 1132).

Ystrom used the same principles as Mawson and Wang to find a biological reasoning for lowered depressive symptomatology in women as a result of breastfeeding. Ystrom states that the general association between maternal negative affect and breastfeeding cessation has been interpreted in several ways. The first interpretation is that breastfeeding has anxiolytic and anti-depressive effects due to oxytocin (2).

Oxytocin is a peptide hormone that is released, that may also be attributed to relieving some of the PPD symptoms women develop, suggesting that as the rate of breastfeeding increases, so too does the release of oxytocin.

A Call to Action with a Culturally Appropriate Plan

Since no longitudinal studies have been conducted specifically examining the comorbidity between weight and postpartum depression, more data needs to be collected to support the hypothesis. However, using biological and psychological explanations for a major depressive episode (MDE), a culturally appropriate educational plan could be effective in making women aware of potential risks factors of PPD before pregnancy.

Many women have preconception consultations with their obstetrician before deciding to become pregnant because it creates a dialogue of information and advice between patient and provider that can make a woman's pregnancy healthier and safer. These types of consultations would be beneficial for all women regardless of who they are or any conditions they may have. For overweight women however, these appointments could make them aware of the risks and complications that can occur during a gestation due to a higher weight. Instead of focusing on regulating weight during the postpartum period, focusing on weight regulation before pregnancy could reduce women's risk for weight retention at 12 months postpartum and increase breastfeeding past six weeks and hopefully 6 months postpartum.

With all of this research in mind, the main goals of the study "Proyecto Mamá: a lifestyle intervention in overweight and obese Hispanic women: a randomized controlled trial – study protocol" by Lisa Chasan Taber et al. was to apply a developed lifestyle program to "reduce GWG, increase postpartum weight loss, [and] improve maternal metabolic status among Hispanic women" (2).

Chasan-Taber et al. claim that they have developed an effective study that is a "high reach, low cost" culturally specific exercise and a meal plan program that is adjusted and delivered to each person's convenience. Chasan-Taber et al. claim that since excessive gestational weight gain and pre-gestational obesity can lead to many complications for both mother and child, high risk women need to be identified more effectively and undergo preventative measures through programs such as the one they

developed (8).

Chasan-Taber et al.'s study was based in Massachusetts and used an ambulatory obstetrical practice. The Lifestyle Intervention program the study developed, which is a "culturally and linguistically modified" goal and personalized training and caloric intake program for Hispanic women, was applied to these women throughout their pregnancy (4). The main two elements that were focused on throughout the study were dietary and exercise plans. Lisa Chasan-Taber et al. state that up to 30% reduction in risk for exceeding GWG can be achieved by following the culturally appropriate dietary and weight-loss plan they established (8). The study found that Hispanic women that were able to participate in established healthcare programs improved their lifestyles more than women without those resources (8).

Following the same principles as the study conducted by Chasan-Taber et al., Howell, Bodnar-Deren, Balbierz, Parides, and Bickell also implemented a randomized trial in which self-identified black and Latina mothers soon after delivery were randomly separated, some receiving behavioral education intervention and others enhanced usual care (239). The education component entailed informative sessions on postpartum symptoms and experiences such as breast and nipple pain in order to "bolster social support and self-management skills," while enhanced usual care meant women received community resource options and a 2-week control call (239). Howell, Bodnar-Deren, Balbierz, Parides, and Bickell found that women in the behavioral educational intervention program even among low-income women, increased their rate of breastfeeding duration over the first 6 months postpartum by almost double (12.0 weeks) compared to the women that weren't in the intervention program (6.5 weeks) (239).

Conclusion

Postpartum depression can be a difficult topic to assess due to the many factors that can contribute to the depressive symptomatology associated with the psychological condition. Identifying those contributing factors is crucial to the overall treatment of women with PPD in order to increase their wellbeing and rates of breastfeeding during the postpartum period. While many independent relationships such as the positive

outcomes breastfeeding has on children have been thoroughly studied, the correlation between weight (being overweight and obesity) and depressive symptomatology on breastfeeding rates is relatively unexplored. Current research indicates that maternal excessive weight and obesity before pregnancy as well as gestational weight gain can significantly increase the risk of developing PPD. However, the effect postpartum weight retention has on depressive symptomatology has been shown to be equivocal, with varying results across studies as to whether it increases or decreases the risk of PPD or MDE. Additionally, research focusing mainly on depressive symptomatology and breastfeeding rates have conflicting data in certain cases due to the varying ranges in testing parameters and breastfeeding rate definitions. Many studies use exclusive breastfeeding and exclusive formula feeding to define the sole use of breast milk as nutrition for a child or the sole use of formula as nutrition for a child respectively. The complication arises when studies do not define "non-exclusive formula feeding," which indicates that the rate of breastfeeding is unknown and can't be quantitatively or qualitatively compared between studies.

Regardless of these hardships and variance in results, the majority of data indicates that weight can play a role in the development of postpartum depression and both of those factors combined can significantly lower the rate of breastfeeding during the postpartum period.

Because the correlation between weight and postpartum depression as well as the correlation between that comorbidity on breastfeeding rates have not been thoroughly explored, each factor needs to be independently researched with similar parameters and definitions over a longitudinal period of time. The independent factors include four domains: 1) the likelihood of women presenting with depressive symptomatology as a result of weight gain to initiate and continue breastfeeding, 2) the negative association between increasing maternal antepartum weight, gestational weight, and postpartum weight retention and breastfeeding, 3) the possible biological explanations for PPD in women who don't breastfeed, and 4) the benefits that breastfeeding past six months postpartum can have on MDE and GWG in women.

Most current longitudinal studies examine women between three to six months

postpartum with very few lasting past a year. Therefore, longitudinal studies should be conducted past one year postpartum in order to adequately assess the potentially reduced depressive symptomatology due to breastfeeding but especially the weight-loss component associated with breastfeeding since benefits usually occur after one year postpartum. Once completed, comparisons and unequivocal associations can be made between weight and PPD on breastfeeding rates to support existing data.

Most importantly, because PPD can develop as a result of a combination of social, situational, and physical factors, diagnosing and treating women with PPD should be carried out on a culturally and linguistically appropriate level. In a Hispanic population, the first step should be to establish the level of acculturation. A complete history and detailed lifestyle factors must also be recorded in order to better understand the potential factors contributing to depressive symptomology. The third step would entail creating an individually tailored dietary and exercise plan in order to help women reduce weight and maintain a balanced lifestyle in the context of their economic capabilities, in order to reduce the potential of developing PPD. Ultimately, the individually and culturally tailored program would be coupled with an educational program that clarifies misconceptions regarding the postpartum period in general as well as coping and stress relieving techniques.

Only with a complete understanding of the correlations between weight and postpartum depression and their joint effect on breastfeeding rates during the postpartum period can adequate diagnosing and treatment systems be put in place to help women alleviate their depressive symptomatology and increase their rate of breastfeeding through culturally appropriate educational support systems.

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