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Effect of Stress, Emotional Lability and Depression on the Development of Pregnancy Complications

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2013

Abstract

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by

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Psychology

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Abstract

Chronic stress and other emotional factors may have relevant impacts on pregnancy outcomes because they are related to neuroendocrine changes that lead to alterations in immunomodulation during pregnancy. In this quantitative prospective cross-sectional study, the relationship of emotional lability, depression, and stress during pregnancy and the development of preterm labor, preeclampsia, placental abruption, and low birth weight for gestational age babies was examined. Additionally, social support scores were compared to levels of stress/anxiety, depression, and emotional lability in pregnant women. Two hundred and forty two pregnant women who received prenatal services at the National Institute of Perinatology in Mexico City were evaluated during the 2nd or 3rd trimester of pregnancy and followed until pregnancy termination. Logistic regression analyses showed that being single significantly predicted preeclampsia and preterm birth, and the presence of social support significantly decreased the likelihood of preterm birth development. In the logistic regression model, family income significantly predicted the development of abruptio placentae. MANCOVA results revealed a significant difference among the social support categories on the combined dependent variables (stress/anxiety, depression, and emotional lability). The ANCOVA reported significant differences between social support scores, and stress/anxiety and depression scores. ANCOVA also showed significant differences between the number of pregnancies and stress scores. A 2X2 factorial analysis of variance showed a significant main effect of stress and depression on newborn weight. By promoting awareness of the importance of emotional factors during pregnancy among healthcare workers and pregnant women, this study contributed to positive social change.

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Dedication

I dedicate this work to my kids, Lucia, Andres, and Fernando. You have been the reason to continue my personal growth. You inspire me to be a better professional, and a better person. Lucia, Andres, and Fernando, I want you to remember that you can be whatever you want to be. Be free, be respectful, and be joyful. This dissertation is the result of many hours and months of hard study, as you know. You have been my always-present companions in the pursuit of knowledge. May you also conquer your dreams, whatever they may be, with hard work and perseverance.

I also dedicate this work to my husband, José. I know it has been hard for you as well. Thanks for understanding my need to explore new things and to engage in hard-to-reach but rewarding goals. I have finally finished. I will always work and learn, but my life as a graduate student is finally ending. Thanks for growing with me.

To my parents, who have supported me throughout my learning journey, in many ways. We have been through good and bad times, and we have learned from each other, and from life. You gave me the bases to be able to fight for my dreams. Thank you.

I also want to dedicate this work to Dr. Cover. Diana, you have been a guide and a friend. Thanks for helping me see things from different perspectives. Thanks for helping me grow as a person.

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Chapter 1: Introduction to the Study

Introduction

The concept that emotional factors may regulate biological responses is not a new one. Since the 1800s, medical professionals have reported the development of diseases in individuals experiencing terrible fear, without finding explanations for fatal outcomes (Risse, 1988). Among many researchers, the idea that emotions could have an effect on health was seen as folklore (Angell, 1985). Cannon (1957) was one of the first to point out the importance of social environments in biological systems. He identified the effects of rage and fear on the nervous system, especially in the activation of the sympathetic nervous system (Cannon, 1942). Years of research on the mechanisms that participate in the stress response have helped scholars understand the multiple biological consequences of this response and the emotional factors that may participate as triggers. Researchers now know that the sympathetic nervous system participates in conjunction with the hypothalamus-pituitary-adrenal axis in the stress response (Glei, Goldman, Chuang, & Weinstein, 2007). Knowledge regarding the activation and the regulatory mechanisms that participate in the response to stress has increased in recent years as well (McEwen, 2005).

One of the most relevant leaps into the understanding of emotional factors as promoters of disease development was made by Ader (1975) in his psychoneuroimmunological theory. He was the cofounder of the psychoneuroimmunology field and the first to contradict the principle that the immune system is autonomous. Ader showed that behavioral conditioning processes could

suppress immune responses. He revealed the connections between the central nervous system and the immune system (Pincock, 2012).

Psychoneuroimmunological concepts may be useful in several areas of medical practice, such as endocrinology, rheumatology, infectology, and neurology. Nevertheless, psychoneuroimmunology is especially important in the reproductive area, particularly during pregnancy, when the immune system is finely regulated in order to promote maternal acceptance of the fetus. Emotional phenomena during pregnancy may lead to neuroendocrine changes that can alter this delicate regulation and lead to the development of disease.

Several researchers have associated the role of stress and anxiety with the development of preterm labor (Holzman et al., 2009; Rondo et al., 2003), but its relationship with other psychosocial factors such as depression and emotional lability has not been fully explored. Moreover, the association of depression and emotional lability with the development of other pregnancy complications such as preeclampsia and abruptio placentae has not been clearly established. The identification of psychosocial risk factors for pregnancy complications may have positive implications for social change because psychosocial phenomena represent modifiable risk factors in pregnancy. By reducing risks for pregnancy complications, professionals can promote the birth of healthy babies.

Background

Pregnancy is a delicate period in terms of immunorregulation. The mother's immune system must change from a fully responsive system into a regulated system that

permits the existence of the fetus within the mother's body. Because the immune system is highly connected with neuroendocrine systems, it may be affected by increases in catecholamines or stress hormones (Bierhaus et al., 2003). The delicate regulation of the immune system during pregnancy may therefore be disrupted in the presence of chronic stress or other emotional factors that activate neuroendocrine responses. The psychoneuroimmunology of pregnancy has not been fully explored. While the role of stress and anxiety on the development of preterm labor is a well-known phenomenon (Dole et al., 2003; Kramer et al., 2009), the participation of emotional lability and depression in the origins of other pregnancy complications and the role of social support in the pregnant woman's emotional life have not been clarified yet.

Problem Statement

Existing research has shown that emotional factors may increase the risk of developing pregnancy complications (Roy-Matton, Moutquin, Brown, Carrier, & Bell, 2011). Stress, depression, and anxiety have been related to preterm labor (Dayan et al., 2002; Rondo et al., 2003). However, there is a knowledge gap regarding the effect of stress, depression, and emotional lability on the development of pregnancy complications different from preterm labor. The goal of this study was to further understand the participation of stress and anxiety in the development of pregnancy complications and to determine whether other emotional factors, such as emotional lability and depression, may be related to other adverse pregnancy outcomes.

The psychosocial environment of the pregnant woman, especially the availability of social support, may have an influence on her emotional experience and how she

perceives stressful situations. In order to better understand the role of social support on emotional phenomena during pregnancy, this study compared the amount of perceived social support to the presence of anxiety or depressive symptoms and to emotional lability. Lack of social support may also increase vulnerability to stress/anxiety, depression, or emotional lability in the pregnant woman.

Low birth weight in offspring has also been related to maternal stress and to stress-induced dysregulation of the hypothalamic-pituitary-adrenal axis (Khashan et al., 2008). However, there is still a need to determine whether depressive symptoms or emotional lability may increase the risk of delivering a baby below the 10^{th} percentile in weight.

Deductive research was performed in this study, in which psychoneuroimmunological and somatization theories were tested (Brown, 2007); all of these theories applied to stress/anxiety, emotional lability, and depression during the gestational period.

Purpose of the Study

The objective of this study was to quantitatively evaluate the effect of stress/anxiety, emotional lability, and depression during the first trimester of pregnancy on the development of any of the following pregnancy complications—preeclampsia, abruptio placentae, and preterm delivery—and on newborn outcomes, controlling for the effect of age, number of previous pregnancies, and socio-economic status (Creswell, 2009).

This study was also designed to determine whether birthweight was lower in the offspring of mothers with higher levels of stress/anxiety or emotional liability during pregnancy. Additionally, the study explored the issue of whether the amount of perceived social support may influence levels of stress/anxiety and/or emotional liability in pregnant women.

Research Questions and Hypotheses

The following research questions were derived from the review of previous literature in the area of stress, anxiety, depression, social support, and pregnancy complications.

Research Question 1

Is there a significant relationship between the presence of stress/anxiety, depression, and/or emotional lability, and the development of preeclampsia, abruptio placentae, preterm labor, and low birthweight for gestational age babies?

Hypothesis 1

Null Hypothesis (H_0): There is no significant relationship between stress/anxiety, depression, and emotional lability scores and the development of preeclampsia, abruptio placentae, preterm labor, and low birthweight for gestational age babies.

Alternative Hypothesis (H_1): There is a significant relationship between stress/anxiety, depression, and emotional lability scores and the development of preeclampsia, abruptio placentae, preterm labor, and low birthweight for gestational age babies.

Research Question 2

Does the availability or unavailability of social support during pregnancy have a relationship with the presence of stress/anxiety, emotional lability, and/or depression?

Hypothesis 2

Null Hypothesis (H_0): The availability of social support does not have a significant relationship with the presence of stress/anxiety, emotional lability, and/or depression during pregnancy.

Alternative Hypothesis (H_1): The availability of social support has a significant relationship with the presence of stress/anxiety, emotional lability, and/or depression during pregnancy.

Research Question 3

Is there a difference between the birthweight of the offspring of women who experience high levels of anxiety or emotional lability during pregnancy and of those who do not?

Hypothesis 3

Null Hypothesis (H_0): There is no difference in newborn birthweight between pregnant women who experience high levels of stress/anxiety or high emotional lability scores during pregnancy and those who do not.

Alternative Hypothesis (H_1): There is a difference in newborn birthweight between pregnant women who experience high levels of stress/anxiety or high emotional lability scores during pregnancy and those who do not.

Theoretical and Conceptual Framework for the Study

The theoretical basis of this study comes from theories related to mind-body interactions, such as functionalism, psychoneuroimmunogy, and allostatic load theories. The allostatic and psychoneuroimmunology theories better explain physiological changes associated with the development of diseases during pregnancy because they take into account neuroendocrine alterations that can affect immune system modulation. During pregnancy, there is an important regulation of maternal immune system responses so the fetus will not be rejected by the mother (Guleria & Sayegh, 2007). Thus, the activation of neuroendocrine pathways that can regulate the immune system may have deleterious effects on pregnancy outcomes.

According to Coussons-Read's (2005) psychoneuroimmunological theory, neuroendocrine changes induced by the stress response during pregnancy can lead to the secretion of proinflammatory cytokines and to a reduction of the cytokine IL-10, which is essential for immune system regulation during pregnancy (Coussons-Read, Okun, Schmitt, & Giese, 2005). This study relates to psychoneuroimmunological theory because it proposes that emotional lability, stress, or depression may affect pregnancy's immunorregulation and can lead to the development of pregnancy complications related to immune system activation, such as preeclampsia, preterm labor, and abruptio placentae.

The maternal hypothalamic-pituitary-adrenal (HPA) axis undergoes adaptations that can help decrease the effects of stress during pregnancy and glucocorticoid exposure for the fetus (Brunton & Russell, 2008; Brunton, Russell, & Douglas, 2008). However,

women who present pregnancy complications may not be able to regulate HPA responses, or the induced stress response may override the body's regulatory capacity. According to theory of allostatic load, a lifetime of allostatic load may cause some women to be particularly susceptible to the negative consequences of stress and the stress response (Hilmert et al., 2008). The theory of allostatic load may be related to pregnancy complications because chronic exposure to high levels of cortisol can modulate progesterone levels and put pregnancy in danger (Nepomnaschy et al., 2006).

Nature of the Study

As the goal of the study was to identify the relationship between emotional factors and the development of pregnancy complications, a prospective study was the most adequate design. Prospective studies identify correlational relationships as well as risk factors for disease development (Creswell, 2009). Different variables were assessed in this study because three different research questions were evaluated.

Operational Definitions

Stress: Stress may be understood from both a psychological and physiological perspective. *Psychological stress* is related to cognitive and emotional factors that are associated with the appraisal of a threatening event. *Physiological stress* is the body's potentially damaging reaction to certain events (Monat, Lazarus, & Reevy, 2007).

Anxiety: Anxiety is defined as a sensation of chronic fear that exists without any direct threat. It is commonly correlated with stress and with physiological stress reactions such as tachycardia, hypertension, nausea, sleep disturbances, and hypercortisolemia (Pinel, 2009).

Stress/anxiety: As anxiety is highly correlated with stress, for the purpose of this study, stress and anxiety will be considered as a single variable. They will also be managed as one variable because the Millon Behavioral Medicine Diagnostic Test's Scale AA measures stress and anxiety and provides a single score for both factors (Millon, Antoni, Minor, & Grossman, 2006).

Emotional lability: Patients with emotional lability experience intense endogenous moods and periods of apathy and dejection, mixed with anger, anxiety or euphoria. They have affect dysregulation and mood instability. Medical patients with emotional lability account for approximately 6% of patients with physical illnesses (Millon et al., 2006).

Depression: Depressive symptomatology includes sadness, incapacity to experience pleasure, despair, and incapacity to meet essential requirements of daily life such as eating or maintaining personal hygiene (Pinel, 2009).

Low stress score: A score that ranges from 0 to 50 in the Millon Behavioral Medicine Diagnostic Test's Scale AA (Millon et al., 2006)

High stress score: A score that ranges from 51 to 100 in the Millon Behavioral Medicine Diagnostic Test's Scale AA (Millon et al., 2006).

Low emotional lability score: A score that ranges from 0 to 50 in the Millon Behavioral Medicine Diagnostic Test's Scale DD (Millon et al., 2006).

High emotional lability score: A score that ranges from 51 to 100 in the Millon Behavioral Medicine Diagnostic Test's Scale DD (Millon et al., 2006)

Preeclampsia: Preeclampsia is a pregnancy disorder that typically starts after the 20th week of gestation in which women present increased blood pressure (systolic

pressure of 160mmHg or higher, or diastolic pressure of 110 or higher) and protein in urine (2.0 grams or higher in 24 hours) as a result of kidney problems. Preeclamptic patients also present an increase in serum creatinin (higher than 1.2mg/dl). Preeclampsia affects the placenta, and it can affect the mother's kidneys, liver, and brain (National Institutes of Health, 2012).

Preterm birth: Preterm labor is defined as labor that begins before 37 weeks of pregnancy. It is also called *premature labor* (National Institutes of Health, 2013).

Abruptio placentae: The premature separation of the placenta, before the baby's birth. It is a cause of vaginal bleeding in the second half of pregnancy and is associated with significant perinatal mortality and morbidity (Oyelese & Ananth, 2006).

Apgar score: The Apgar score is used in the delivery room for the assessment of newborn babies. It evaluates respiratory effort, heart rate, muscle tone, reflex irritability, and color. For each parameter, a score of 0 to 2 may be assigned, so the total score for Apgar may be 10. The Apgar is evaluated at the first minute and 5 minutes after the baby's birth (Lopriore, Burk, Walther, & Beaufort, 2004)

Birthweight for gestational age: To evaluate if the offspring's weight is adequate, the weight is compared with gestational age, using male and female weight curves according to each gestational week (Kramer et al., 2001).

Low birthweight for gestational age: Birthweight that falls in the 10^{th} percentile or below, according to male and female curves of weight for gestational age (Kramer et al., 2001)

Normal birthweight for gestational age: Birthweight that falls in the 50th percentile, according to male and female curves of weight for gestational age (Kramer et al., 2001)

High birthweight for gestational age: Birthweight that falls in the 90th percentile or higher, according to male and female curves of weight for gestational age (Kramer et al., 2001)

Social support: Defined as the availability of people on whom one can count. Social support is about having someone who lets the patients know that they are loved, valued, and cared about (Sarason, Levine, Basham, & Sarason, 1983).

High income: Family income higher than or equal to 85,000 Mexican pesos per month, which equals approximately 6,600 USD per month, considering an exchange rate of 12.7 (Asociación mexicana de agencias de investigacion de mercado y opinión pública, 2012)

Medium income: Family income that ranges from 11,000 to 84,000 Mexican pesos per month, which is an income that ranges from 860 to 6,500 USD per month, considering an exchange rate of 12.7 (Asociación mexicana de agencias de investigacion de mercado y opinión pública, 2012).

Low income: Family income that ranges between 0 to 10,000 Mexican pesos per month, which is an income that ranges from 0 to 850 USD per month, considering an exchange rate of 12.7 (Asociación mexicana de agencias de investigacion de mercado y opinión pública, 2012).

Infections during pregnancy: Any type of infection that the woman might present during pregnancy that requires pharmacological therapy was considered in this study. The number of registered infections during pregnancy was recorded. The infections that were included were upper respiratory tract infections, gastrointestinal infections, genitourinary tract infections, and sexually transmitted diseases. Sexually transmitted diseases during pregnancy were also evaluated because they have been related to adverse pregnancy outcomes (Mullick, Watson-Jones, Beksinska, & Mabey, 2005)

HPA axis: Hypothalamic-pituitary-adrenal axis. The hypothalamus produces hormones called *vasopressin* and *corticotrophin-releasing hormone* (CRH). The latter stimulates the production of *adrenocorticotrophic hormone* (ACTH) from the pituitary. ACTH acts on the cortex of the adrenal gland and stimulates the production of cortisol (Vedhara & Irwin, 2007).

CRH: Corticotrophin releasing hormone (CRH) is produced by the hypothalamus and stimulates the production of adrenocorticotrophic hormone (ACTH) by the pituitary (Vedhara et al., 2007).

ACTH: Adrenocorticotropic hormone (ACTH) is produced by the pituitary gland and stimulates the production of corticosteroids by the adrenal gland (Monat et al., 2007).

Cortisol: Cortisol is produced in the cortex of the adrenal glands and modulates many stress-related responses. Cortisol effects include an increase in glucose levels and the inhibition of reproductive functions. Cortisol has anti-inflammatory properties because it can down-regulate immune processes, such as cytokine production and leukocyte activation (Kendall-Tackett, 2010).

Progesterone: Progesterone is a steroid hormone that belongs to the group of the progestins. It is produced by the ovaries and the placenta, and it has a relevant role in the maintenance of pregnancy (Pinel, 2009).

Cytokine: A small protein produced by a cell that can affect the behavior of other cells. Cytokines act via specific cytokine receptors and have different functions (Murphy, Travers, & Walport, 2008).

Psychoneuroimmunology: This field involves the study of the interactions among the immune system, the nervous system, and behavior. It also considers the relationship among the stress response, the neuroendocrine system, and the immune system (Vedhara et al., 2007).

Assumptions

Although it is clear that the immune system participates in the initiation and the pathophysiology of preeclampsia and preterm labor, its participation in the mechanisms that lead to placental abruption are not fully known; neither have the participation of neuroendocrine responses and the immune system been clearly elucidated in this pregnancy complication. The activation of the immune system due to stress-induced neuroendocrine changes is a well-known phenomenon, but the specific amounts of stress, hormones, or neurotransmitters needed to induce immune system changes that will lead to the development of disease may vary from one person to another and are not fully known.

Scope and Delimitations

In this study, I attempted to establish a correlational relationship between emotional factors and the development of pregnancy complications; thus, internal validity was relevant because possible internal validity threats were the selection of the sample and the participation of confounding variables. These might have threatened my ability to draw the correct conclusions regarding the correlational relationship between the variables. To overcome issues regarding internal validity, a prospective cross-sectional design and moderating variables, such as age at current pregnancy, were included in the analysis to assess if the development of pregnancy complications could be attributed to stress, depression, or emotional lability and not to confounding factors. This project only explored psychoneuroimmunological theories during pregnancy regarding the effects of emotional factors on preterm labor, preeclampsia, and abruptio placentae. Thus, its results may only be applied to these disorders and not to others that may be present during the gestational period. As the sample was not randomly selected and a convenience sample was used, this study may have had issues regarding external validity because only women who attended a perinatology hospital were evaluated, and these women did not represent the absolute population of Mexican pregnant women.

Progesterone is essential for the adequate regulation of the immune system during pregnancy (Guleria et al., 2007). Immune system changes related to the development of disease in pregnancy have been associated with high levels of cortisol that decrease the production of progesterone (Nepomnaschy, Sheiner, Mastorakos, & Arck, 2007; Nepomnaschy et al., 2006). Due to this particular effect of cortisol on the secretion of

progesterone during pregnancy, the results of this study may not be generalized to pathologies not occurring during the gestational period. During chronic stress responses, high levels of cortisol are related to suppression of various functions of the immune system (Vedhara et al., 2007), which is different from what happens in the pregnant woman under stress. In pregnancy, high levels of cortisol lead to decreased progesterone levels. On the other hand, there may be possible generalizability of this study's results to other diseases that have been related to emotional factors in which high levels of cortisol are present, such as asthma and allergic rhinitis (Elenkov, Iezzoni, Daly, Harris, & Chrousos, 2005)

Limitations

This study had several limitations. First, no biological factors related to the stress responses were be measured, such as cortisol, progesterone, epinephrine, serotonin, and interleukin-10. A correlation between stress/anxiety scores, depression scores, and emotional lability scores would have been highly appropriate to establish an association among emotional factors, neuroendocrine and immune changes, and the development of pregnancy complications. Second, this study included pregnant women of all ages because I aimed to evaluate the effects of emotional factors in women of a wide range of ages. However, there are certain pregnancy disorders, such as preeclampsia, that are more prevalent before the age of 20 or after 40 (National institutes of health, 2012). The inclusion of women younger than 20 years, or older than 40, may be a confounding factor because age can increase the risk of developing preeclampsia per se. Third, this study

may have had external validity issues because the population that was assessed was not random and consisted of women mostly from low- to medium-income families.

The family income of pregnant women was considered because it may have had an influence on the study's outcomes, as low-income families in Mexico are associated with relevant economic difficulties that increase the probability of stressful situations. However, the level of social support in Mexican families is very high, and this may attenuate the effects of stress generated due to economic factors.

The Millon Behavioral Medicine Diagnostic, which is the instrument that was used to evaluate emotional lability, stress, and depression, had not been used to evaluate pregnant women, nor had it been used in the Mexican population, which may also have been a limitation to this study.

Significance of the Study

This study contributes to the knowledge regarding how pregnancy disorders may be related to emotional factors. Many researchers have already documented the effect of stress and anxiety on the development of preterm labor. However, there are research gaps regarding the effect of stress on the development of other pregnancy complications, such as preeclampsia and abruptio placentae. Furthermore, the participation of other emotional aspects such as emotional lability and depression has not been clearly identified in pregnancy complications.

Implications for Social Change

The practical applicability of this study and its implications for social change reside in its identification of psychosocial risk factors that may contribute to the

development of pregnancy disorders related to poor pregnancy and newborn outcomes. The presence of a disabled child due to premature birth has important repercussions for families and the society in which they live; this is why addressing risk factors for pregnancy complications and preterm delivery can promote social change. The benefits of this study will not be directly reflected, in the short term, in the mothers who participated, or their children. However, the results obtained from the study offer information regarding the importance of emotional and social support factors during pregnancy that may help promote social change in the future. The information derived from this study may allow phsysicans or health psychologists to implement new parameters in health care attention for the pregnant woman and establish outlines for the prevention of pregnancy complications related to psychosocial factors. By evaluating psychosocial factors in the pregnant woman and establishing social support and stress management programs, healthcare workers may be able to promote better psychosocial environments during the gestational period, and this will lead to better pregnancy outcomes and healthy newborns in communities, thus promoting social change.

Summary

This study explored the effects of emotional factors such as stress, depression, and emotional lability on the development of preeclampsia, abruptio placentae, preterm labor, and low birthweight for gestational age in offspring. It also assessed whether social support has an effect on stress, depression, or emotional lability scores.

Several theories in the mind/body field may be related to this study, but this study's theoretical framework was based mostly in psychoneuroimmunology theories and

allostatic load theory, which propose that emotional factors and stressful responses lead to neuroendocrine changes that can alter cytokine profiles and immune system regulation.

A prospective cross-sectional design was used in order to evaluate if there is a causal relationship between the dependent and independent variables. Anxiety/stress, depression, and emotional lability scores were obtained by the application of the Millon Behavioral Medicine Diagnostic Test. Social support was evaluated by using the short version of Sarason's Social Support Questionnaire.

The following chapter will address a review of the existing literature regarding emotional factors and their relationship with pregnancy complications. The chapter begins with the theoretical foundations on which this study was based and it then describes the importance of the stress response and how neuroendocrine factors can affect the regulation of the immune system during pregnancy. Finally, associations between anxiety, depression, emotional lability, and low social support and pregnancy complications are addressed.

Chapter 2: Literature Review

Introduction

The literature review focuses on the relationship of emotional factors to maternal well being during pregnancy. The review revealed the need for further research regarding the biopsychological pathways involved in immune system activation during pregnancy and the development of pregnancy complications such as preeclampsia and preterm labor. More research is needed in the field of psychoneuroimmunology in pregnant women. Researchers have focused on the participation of the immune system in pregnancy disorders and, because the immune system may be affected by neurotransmitters derived from psychological stress and emotional factors (Elenkov & Chrousos, 2006), it is essential to identify psychological risk factors for negative pregnancy outcomes (Lobel et al., 2008).

Maternal psychological environments are very important for pregnancy success (Pluess, Bolten, Pirke, & Hellhammer, 2010). Environmental factors are frequently ignored by health care professionals, who focus mainly on the biological aspects of pregnancy, However, chronic stressors can negatively impact pregnancy outcomes (Coussons-Read et al., 2005), and traumatic life events may also lead to health problems through the modulation of the inflammatory response (Kendall-Tackett, 2009).

Preterm delivery is one of the most common pregnancy complications; it occurs in 5-10% of pregnancies. It is mainly caused by spontaneous preterm labor, and it is considered as a major obstetric complication. Spontaneous preterm labor has been considered a psychosomatic entity (Dayan et al., 2002).

Stress and the biological effects of the stress response can influence the neuroendocrine, immune, and vascular processes in the maternal and fetal compartments that have been implicated in the development of pregnancy complications (Wadhwa, Culhane, Rauh, & Barve, 2001). The biologic pathways that participate in stress-induced preterm labor, or other stress-related pregnancy complications, are not fully understood yet (Kramer et al., 2009).

Literature Search Strategy

A search of literature was performed through electronic medical and psychology databases. The databases used were Medline, PubMed, HighWire, EBSCO, OVID, and PsycINFO. The key words used to conduct the search were *stress, pregnancy, immune system, preeclampsia, preterm labor, anxiety, depression, emotional lability, HPA axis, cortisol, CRH,* and *abruptio placentae.* There was no limit in terms of the years searched, and the sources were mainly peer-reviewed journals.

Theoretical Foundation

The concept that stress can affect health is not a new one, and it comes from various research fields, such as endocrinology, psychology, and neurobiology (Chrousos, 2009). Several theories relate the development of disease to emotional factors. Among them are psychoneuroimmunology theories and allostatic load theory.

Psychoneuroimmunology theories propose that stress may induce nonspecific changes in adrenocortical steroids, hormones, and neurotransmitters, which may provide activation or inhibition signals to lymphocytes and, therefore, suppress or enhance immune responses. (Ader, Felten, & Cohen, 2001). These theories also indicate that

psychosocial stressors, by modulation of the immune system, may influence certain diseases whose onset is influenced by proinflammatory cytokines (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002). Coussons-Read et al. (2005) proposed a theory in which they stated that stress, physiology, and immunity are importantly related to the pregnant woman's and baby's health and that perinatal stress experiences may be harmful to pregnancy success. They proposed that the presence of psychosocial stress, associated to low social support and low-self efficacy, may induce cytokine production by the maternal immune system and therefore lead to pregnancy complications (Coussons-Read et al., 2005). Kendall-Tackett proposed a psychoneuroimmunological theory that links psychological trauma with negative health effects based on empirical data obtained from patients with childhood trauma, posttraumatic stress disorder, and abuse. He proposed that traumatic life events increase levels of proinflammatory cytokines, which can alter immune function and increase the risk of health problems such as coronary disease, chronic pain syndromes, and so on (Kendall-Tackett, 2009).

The theory of allostatic load proposes that chronic stress promotes a cumulative cost to our neuroendocrine responses that may affect health outcomes (Glei et al., 2007). The concept of "allostatic load" was initially introduced to explain the cumulative physiological load that results from adaptive responses to challenges, in which wear and tear of the systems occur and promote biological dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, sympathetic nervous system activation (SNS), and the accumulation of allostatic load (Seeman, McEwen, Rowe, & Singer, 2001). Chronic

stress, thus, can lead to immune system modulation and alters metabolic and cardiovascular processes (Glei et al., 2007).

The concept that stress can affect health is not a new one, and it comes from various research fields, such as endocrinology, behavior, and neurobiology (Chrousos, 2009) .The evaluation of allostatic load in medical practice can help to predict various health outcomes related to cardiovascular disease, physical function, and mortality (Glei et al., 2007). Allostatic load in pregnancy may have relevant consequences because of the effects that cortisol and catecholamines have on the pregnant woman's immune system and overall physiology. Because of this, during normal pregnancies, the maternal HPA axis undergoes adaptations that can help decrease the effects of stress during pregnancy and glucocorticoid exposure for the fetus (Brunton et al., 2008; Brunton et al., 2008).

If the bases of the mind-body problem and its social influences are fully understood, researchers may be able to modulate some of the social factors that are contributing to the development of disease, making a positive change in this field.

The Stress Response and Its Association With Disease Development

Cannon (1957) studied the physiology of emotion and is considered the first scientist to do research in this area. He showed that during exposure to stress, the sympathetic-adrenal system induces changes in blood pressure and glucose levels. Cannon also defined the term *homeostasis,* which describes how physiological processes maintain a steady state in the body (Cannon, 1942; Cannon, 2002). Selye (1950) unified many of the observations done by other researchers who tried to explain how living organisms respond to stress, in the concept termed the *general adaption syndrome*. He

pointed out that stress can put life in danger, unless it is followed by an adaptive response. According to Selye, stress is an interaction between damage and defense that induces changes in the nervous and the endocrine systems that initiate with activation of the hypothalamus and the pituitary (Selye, 1950).

Selye used the term *stress* and proposed the general adaptation syndrome to explain the consequences of stress and the physiological and psychological events that occur in response to stress (Chrousos & Gold, 1992). The stress response activates the sympathetic nervous system (SNS; (Chrousos, 2009) and the HPA system (McEwen, 2007).

Pregnant women may also be susceptible to the effects of the stress response (Coussons-Read et al., 2005), and the physiological events that participate in this response can lead to pregnancy complications such as preterm delivery (Wadhwa et al., 2001)

The Stress Response During Pregnancy

During pregnancy and lactation, the HPA axis undertakes important adaptations that aim to decrease the effects of stress on the mother and her offspring (Brunton et al., 2008). Throughout the gestational period, the HPA axis's adjustments play an important role in modulating the effects of the stress response in the pregnant woman and reducing fetal exposure to maternal glucocorticoids, which are hormones produced by the adrenal gland cortex, and it responds differently depending on the stage of pregnancy. Lower cortisol levels at the beginning of pregnancy may promote implantation (Brunton et al., 2008), while higher levels are associated with early pregnancy loss. (Nepomnaschy et al.,

2007). During the first trimester of pregnancy the woman is more vulnerable to the effects of stress, and the stress response may affect the length of gestation (Hobel & Culhane, 2003).

An HPA hyporesponsiveness to immune challenges has also been reported in the third trimester of normal pregnancies, due to a reduced activation of the CRH-secreting neurons (Brunton et al., 2005). It is possible that chronic stress during pregnancy may lead to cortisol and progesterone changes later in pregnancy, which has been related to pregnancy complications. Prospective studies are still needed to provide answers regarding the effects of psychological stress during the gestational period (Nepomnaschy et al., 2007) and the biological mechanisms that participate in the stress-related override of the HPA hyporesponsiveness during pregnancy.

Stress-Related Immune System Activation During Pregnancy and the Development of Disease

Stress-related interactions between the nervous system and the immune system have been related to pregnancy complications due to deregulation of the immune and endocrine systems (Coussons-Read et al., 2005). Psychosocial stress has been identified as a risk factor for preterm birth and low birth weight for gestational age. These factors have been related to altered levels of corticotrophin-releasing hormone, which may have relevant immunoregulatory effects that can make the pregnant women more susceptible to infections and other complications (Hobel et al., 2003). Studies in mice have shown that stress reduces progesterone levels, and this decrease has been related to premature

delivery and abortion, because progesterone has important immunomodulating properties (Arck, Hansen, Mulac Jericevic, Piccinni, & Szekeres-Bartho, 2007).

Because many pregnancy complications can be related to an altered regulation of the immune system (Guleria et al., 2007) and the immune system can be modulated by emotional factors that activate the stress response (Graham, Christian, & Kiecolt-Glaser, 2006), psychosocial factors such as anxiety, depression, emotional lability, and low social support could be associated with the development of some pregnancy complications.

Stress/Anxiety and Its Relationship to Pregnancy Complications

Anxiety symptoms such as feelings of worry, apprehension, and nervousness are common among pregnant women (Catov, Abatemarco, Markovic, & Roberts, 2010), and anxiety disorders are considered risk factors for adverse pregnancy outcomes, which is why prompt identification and treatment of these disorders is warranted during pregnancy (Littleton, Breitkopf, & Berenson, 2007). Preterm birth is a pregnancy complication that is highly related to stress and severe life events. Severe life events present during the 6 months before pregnancy may pose a higher risk for preterm birth (Khashan et al., 2009). Anxiety related to pregnancy has been independently associated with preterm birth as well (Catov et al., 2010; Kramer et al., 2009) Moreover, high levels of anxiety are related to increased cortisol levels during pregnancy (Dayan et al., 2002) and to the release of corticotropin–releasing hormone (CRH) , which have been linked to preterm delivery (Mancuso, Schetter, Rini, Roesch, & Hobel, 2004; Wadhwa et al., 2001). Researchers have considered CRH a placental clock that participates in pregnancy termination because it may foretell when labor will start. CRH concentrations may be help predict

50% of women at risk for preterm delivery (Inder et al., 2001). However, not only stress-related hormones and cytokine changes are increased in the pregnant woman who is under stress. Holzman et al. (2009) found an association between high norepinephrine and dopamine urine levels and a higher risk for spontaneous preterm labor. This indicates that activation of the sympathetic nervous system participates in stress-induced pregnancy complications as well (Holzman et al., 2009).

Although most researchers have reported an association between psychosocial factors and pregnancy complications, others have not found such relationship. Littleton et al. (2006) performed a meta-analysis to evaluate the correlations between anxiety symptoms and adverse perinatal outcomes and did not find any associations (Littleton et al., 2007).

Depression and Its Relationship to Pregnancy Outcomes

Depression is another stress-related mental health concern that impacts many pregnant women. The age range in which the onset of depressive symptoms occurs in women is between 20 to 40 years, which is the age range when most women may become pregnant. As the incidence of major depressive disorder in pregnant women has been reported to be as high as 16%, it is important that healthcare workers become aware of the frequency of depressive symptoms in pregnant women and the health consequences that undetected or untreated depression can have on pregnancy outcomes (Marcus & Heringhausen, 2009). The presence of depression during the implantation period is not related to pregnancy cancellation and does not affect in vitro fertilization success rates (Lintsen, Verhaak, Eijkemans, Smeenk, & Braat, 2009). However, depression may affect

outcomes later in pregnancy because it is associated with higher levels of cortisol and a decrease in HPA axis negative feedback (Von Werne Baes, de Carvalho Tofoli, Martins, & Juruena, 2012). Increases in cortisol levels during pregnancy have been associated with the release of placental CRH, a hormone that is a key player in the initiation of labor (Dayan et al., 2006). Pregnant women with depression have a higher risk of developing preterm labor, delivering a low birthweight for gestational age baby (Grote et al., 2010), or delivering a baby with a low Apgar score (Goedhart et al., 2010; Grote et al., 2010). Also, obesity and stressful events may increase the effect of depression on preterm labor (Li, Liu, & Odouli, 2009). Furthermore, after delivery, the prevalence of proinflammatory cytokines and high cortisol levels have been associated with postpartum depression (Corwin & Pajer, 2008). This is why high cortisol levels and high psychological reactivity to stress during pregnancy may help identify those women who are likely to develop postpartum major depression (Nierop, Bratsikas, Zimmermann, & Ehlert, 2006).

Depression can also be considered a risk factor for preeclampsia (Bansil et al., 2010) because moderate to severe depression has been related to a three-fold increased risk for developing preeclampsia (Qiu, Sanchez, Lam, Garcia, & Williams, 2007)

Emotional Lability and Pregnancy Outcomes

Pregnant women also experience other psychosocial stressors that can exert a physiological impact. Approximately one-half of pregnant women tend to report insomnia, and others may present mood lability, anxiety, or depression during the third trimester (Dorheim, Bjorvatn, & Eberhard-Gran, 2012; Marques et al., 2011). According

to Tam and Chung (2007), emotional lability can be present during the postpartum blues, presenting as mood irritability, anxiety, headaches, and sleep disturbances, but it should also be differentiated from depression if the symptoms persist (Tam & Chung, 2007). Emotional lability should be identified in pregnant women because pregnant women tend to report mood lability throughout the gestational period (Clark, Skouteris, Wertheim, Paxton, & Milgrom, 2009). According to McDonald (1968), women with labor difficulties tend to be more sensitive and apprehensive; those women who develop preterm labor tend to have more negative attitudes toward pregnancy and emotional immaturity; and women with preeclampsia tend to be unhappy and under stress (McDonald, 1968). Patients with affective disorders and schizophrenia should also be monitored during the gestational period because they have a higher risk of fetal and neonatal complications as well (Jablensky, Morgan, Zubrick, Bower, & Yellachich, 2005).

Maternal Emotional Factors Associated With Changes in the Offspring

Stress and anxiety during pregnancy not only affect pregnancy outcomes; animal models have shown that stress during pregnancy has programming effects on the development of the offspring and, in humans, it is related to increased infant illnesses during the first year of life (Beijers, Jansen, Riksen-Walraven, & de Weerth, 2010). For example, children exposed prenatally to stress have a 25% increased risk of being hospitalized due to a severe infectious disease and a 30% increased risk of presenting a less severe infectious disease in childhood (Nielsen, Hansen, Simonsen, & Hviid, 2011).

While stress during the first trimester has a relevant effect on the length of pregnancy (Hobel et al., 2003), chronic maternal stress during the third trimester and the postpartum period increases maternal basal salivary cortisol and affects stress-related behavior and growth in the male offspring and HPA axis functioning in female and male offsprings (Emack, Kostaki, Walker, & Matthews, 2008). Male offsprings of prenatally stressed-rats display increased anxiety behavior, and female and male offsprings of stresses rats also display an increased production of CRH that may be related to altered glucocorticoid negative feedback mechanisms in the limbic system (Brunton & Russell, 2010).

The fetal exposure to the neuroendocrine changes during maternal stress can also result in intrauterine programming that leads to early onset of certain adult disorders like an increased risk of coronary artery disease, diabetes, and stroke (Hobel et al., 2003). Furthermore, maternal psychological stress during pregnancy has been related to immune system changes in the offspring and promotes a higher incidence of allergic processes in the offspring such as asthma, eczema, urticaria, and so on. (Entringer et al., 2008).

As previously mentioned, emotional factors may play a role in the development of pregnancy complications and on newborn outcomes. This is why the identification of possible stress mediating or buffering factors is relevant. According to Häusser (2012), social support and social identity may have a stress-buffering effect (Häusser, Kattenstroth, van Dick, & Mojzisch, 2012) and may decrease the incidence and prevalence of stress-related diseases (Thoits, 2011). The buffering effect of social

support is also relevant in pregnant women, on whom social support may decrease the effects of stressful situations on pregnancy outcomes (Dunkel Schetter, 2010)

The Importance of Social Support During Pregnancy

Social support has been defined as the availability of people on whom a certain individual can rely on, and the existence of people that let the patient know that they are valued and cared about (Kim, Sherman, & Taylor, 2008; Vangelisti, 2009). The relationship between stressful events and the development of disease is stronger among subjects who report lower levels of social support compared to those with high levels of support. This may be due to the fact that social support acts as a moderator of the stress response (Sarason & Sarason, 2009)

The presence of maternal stress can increase the incidence of preterm birth. However, not all women who experience stress during pregnancy deliver preterm. This is why vulnerability to stress should also be considered, and the behavioral mechanisms that mediate the effects of stress during pregnancy should be evaluated (Hobel & Culhane, 2003).

Pregnancy, by itself, is associated with anxiety and stress because of psychological adjustments that have to take place due to life changes of the pregnant woman and the lack of emotional adjustment may increase the risk of pregnancy and neonatal complications. However, one of the most important risk factors for negative pregnancy outcomes is the absence of social support, because it affects maternal emotional well-being (Elsenbruch et al., 2007). Less social support is also correlated with a higher incidence of depressive symptoms in pregnant women (Spoozak, Gotman,

Smith, Belanger, & Yonkers, 2009) and to increased anxiety symptoms as well (Littleton et al., 2007). According to Rodriguez et al. (1999), the adjustment to pregnancy and the presence of relevant medical symptoms during pregnancy can be affected by the amount of perceived stress and social support (Rodriguez, Bohlin, & Lindmark, 1999).

On the other hand, prenatal social support has been positively correlated with infant birth weight through adequate fetal growth. Therefore, interventions should promote support within the pregnant woman's social network, and psychosocial risk factors that may lead to adverse pregnancy and neonatal outcomes should be identified (Feldman, Dunkel-Schetter, Sandman, & Wadhwa, 2000).

Relationship of This Study to Previous Research

Most researchers who have focused on evaluating the effects of stress on pregnancy complications have developed cohorts and prospective cross-sectional studies in which pregnant women were assessed at the beginning of pregnancy and followed until delivery (Coussons-Read et al., 2005; Nepomnaschy et al., 2006). Others evaluated emotional factors in pregnant women during the second and the third trimesters (Nierop et al., 2006; Rahman, Bunn, Lovel, & Creed, 2007).

This study employed similar statistical methods to those used in other studies that have evaluated the effects of emotional factors on the development of different pregnancy complications. Dayan et al. (2002) conducted a cohort study to evaluate the role of anxiety and depression on the development of preterm labor and they performed a logistic regression analysis to search for associations (Dayan et al., 2002). Other researchers have also performed logistic regression analyses to evaluate the role of stress,

anxiety or depression on spontaneous preterm birth (Holzman et al., 2009; Kramer et al., 2009; Nasreen, Kabir, Forsell, & Edhborg, 2010). Analysis of variance (ANOVA) is useful in evaluating the role of psychosocial factors in pregnancy as well. Elsenbruch et al. (2007) compared three groups of social support with regard to pregnancy outcomes by using ANOVA (Elsenbruch et al., 2007). In this study, factorial ANOVA and multivariate analysis of covariance (MANCOVA) were performed in the analysis of the role of psychosocial variables on the development pregnancy complications.

Summary and Conclusions

Pregnancy has been related to anxiety by itself because of the uncertainty that comes with the prospect of having a new baby. It is also a vulnerable state for women because of the multiple physiological changes that take place so the baby can grow in the mother's womb. The immune system is highly regulated during pregnancy and it is this regulation that permits the mother to tolerate the semiallogenic fetus (Guleria et al., 2007). Due to this delicate regulation and to the intricate connections between the immune and the nervous systems, psychoneuroimmunological theories have proposed that emotional factors may be able to affect immune system homeostasis during pregnancy and lead to pregnancy disorders (Coussons-Read, Okun, & Simms, 2003). The HPA axis also undergoes changes during pregnancy. In normal pregnancies, women usually present an HPA axis hyporesponsiveness promoted by the progesterone metabolite, allopregnanolone (Brunton et al., 2008). This HPA regulation favors the continuing of pregnancy. For example, implantation is related to lower cortisol levels; and later in pregnancy, these mechanisms help decrease the effect of glucocorticoid

exposure in the offspring (Kapoor, Dunn, Kostaki, Andrews, & Matthews, 2006) However, it is believed that severe stressful events or chronic stress during pregnancy may annul pregnancy's HPA axis regulatory mechanisms and lead to pregnancy complications through the activation of the immune system (Coussons-Read et al., 2005). Furthermore, high fetal exposure to maternal cortisol has been related to neuroendocrine changes in the newborn (Emack et al., 2008).

Low social support has also been linked to pregnancy complications and this may due to increased stress levels in these women (Zachariah, 2009). There are still research gaps regarding the mechanisms that lead to changes in HPA axis hyporesponsiveness (Douglas, Brunton, Bosch, Russell, & Neumann, 2003), the pathways that mediate an immune system shift towards Th1 responses, and to increased vulnerability to the effects of emotional factors during pregnancy.

The following chapter explains the nature of this study, in which the participation of stress, emotional lability, and depression were evaluated in the development of pregnancy complications.

Chapter 3: Research Method

Introduction

This chapter includes a description of the study design, where it took place, and the type of population that was evaluated. It includes a rationale for why this particular design was selected to answer the research questions. The sample characteristics, the power analysis that was performed, and the required sample size will also be presented. In this chapter, the instrumentation, the data collection process, the analysis, and the ethical considerations will be described as well.

The objective of this study was to evaluate the effect of stress, anxiety, and depression during pregnancy on the development of preeclampsia, abruptio placentae, and preterm delivery, as well as on newborn birthweight. The relationship was controlled for the effect of age, number of previous pregnancies, and socio-economic status (Creswell, 2009). I also evaluated whether perceived social support may have an effect on stress/anxiety, depression, and emotional lability scores during pregnancy.

Research Design and Rationale

A prospective, cross-sectional, quasiexperimental design was performed in which individuals were not randomly assigned because a convenience sample was studied (Creswell, 2009). Prospective studies are appropriate for evaluating whether certain conditions may participate as risk factors for specific outcomes. A cross-sectional approach was used because variables were looked at during a particular point in time. The sample included only women who were attended at the National Institute of Perinatology, and this delimitation is why the study was considered quasi experimental.

Researchers who have evaluated the effects of emotional factors on pregnancy complications have also performed prospective cross-sectional studies (Feldman et al., 2000; Kramer et al., 2009) or used similar approaches (Khashan et al., 2009).

Three research questions were explored that included different variables. For the first research question, logistic regression analyses were performed in which the dependent categorical variables were preeclampsia, preterm labor, abruptio placentae, and low birthweight for gestational age. The independent, numerical variables were stress, depression, emotional lability, and social support scores. The moderating or intervening variable was the Social Support Questionnaire score. The control variables were age at pregnancy and number of previous pregnancies. For the second research question, a multivariate analysis of covariance (MANCOVA) was performed in which stress/anxiety scores, emotional lability, and depression were the quantitative dependent variables, and the Social Support Questionnaire score was coded as a categorical independent variable that was coded as high, medium, or low. The covariates were mother's age at pregnancy and the number of previous pregnancies. For the third research question, a factorial ANOVA was performed in which the dependent quantitative variable was newborn birthweight and the mother's stress/anxiety scores (coded as high or low) and emotional liability scores (coded as high or low) were the independent categorical variables. More information about data analysis and hypotheses will be covered later in this chapter.

In this prospective study, data were collected at different points. The first data collection was performed at any point during pregnancy and consisted of the application

of the Millon Behavioral Medicine Diagnostic Test and the Social Support Questionnaire, as well as the gathering of demographic information. The trimester in which the participant was evaluated was registered for control purposes. The second data collection took place at delivery or pregnancy termination. The information that was collected at this last point included the socioeconomic status of the mother, type of delivery, time of delivery (number of gestational weeks), development of pregnancy complications, newborn Apgar score, and birthweight. Delivery and newborn information was obtained from medical records, with required authorization.

Setting and Population

The setting of the study was the National Institute of Perinatology located in Mexico City, Mexico, which is a government-owned research hospital. This hospital attends a high volume of patients per day who require perinatal healthcare. The participants were pregnant women ranging from 18 to 40 years old who were attended at this hospital. Women who were included in this study were those who were in the first trimester, second trimester, and third trimester of pregnancy.

Sample and Sampling Procedure

Due to difficulties in transportation in Mexico City and to the large sample required for the realization of this study, all participants were recruited from a perinatology hospital that provides health care to a large number of patients per day. A convenience sample was used for this study because all patients were recruited nonrandomly at the same hospital.

Inclusion, Noninclusion, and Exclusion Criteria

In order to meet the study's inclusion criteria, participants needed to be pregnant women in the first, second, or third trimester of pregnancy and between the ages of 18 and 40 years. Women of all socioeconomic statuses were included in this study. The noninclusion criteria, which were the criteria by which pregnant women were not asked to participate in the study, were as follows: being pregnant with a history of gestational hypertension in previous pregnancies. Exclusion criteria, which were the criteria by which participants would have their study participation suspended, were as follows: (a) voluntarily requesting to leave the study, (b) not continuing pregnancy assessment at the National Perinatology Institute and not being reachable to evaluate pregnancy outcome, and (c) having pregnancy loss before the 20^{th} week of gestation. Criterion-based sampling was used because participants were selected from a group of pregnant women attended at a public hospital. All women were evaluated at the National Perinatology Institute in Mexico City.

Power Analysis and Sample Size

A search for effect sizes between stress, anxiety or depression, and pregnancy complications and effect sizes between stress and newborn outcomes was performed using medical and psychological databases. The effect size for anxiety and medical disorders during pregnancy is $d = 0.808$, and the effect size for depression and medical disorders during pregnancy is $d = 0.725$ (King et al., 2010). The effect size for stress and preterm labor is $d = 0.840$ and $r = 0.387$, respectively (Lobel et al., 2008). The effect size for previous life stress and pregnancy complications is $R^2 = 0.146$, $r = 0.382$ (Norbeck &

Tilden, 1983). The effect size for low social support and pregnancy complications is R^2 = 0.082, r = 0.286 (Elsenbruch et al., 2007). The effect size for stress and low birthweight is R^2 = 0.67, r = 0.818 (Rondo et al., 2003). The correlation between negative life events, low social support, and illness development is r = 0.48 (Sarason, Sarason, Potter, & Antoni, 1985).

A power analysis was performed considering an accepted value for power at 0.80 and an alpha level at 0.05. Considering that depression and anxiety have a prevalence during pregnancy of approximately 18% (Karmaliani et al., 2009) and an effect size of r = 0.382 for pregnancy complications, a total of 265-275 women were required to be in the study.

Procedures for Recruitment, Participation, and Data Collection

Recruitment Procedures

Women were asked to participate while they were in the waiting room for any pregnancy appointment. I was the only person administering the tests and questionnaires to the participants. Information regarding the objectives of the study and participation in it was provided. If women agreed to participate, they read and signed an informed consent letter (Appendix A), acknowledging that they had received appropriate information and were eager to freely participate in the study. The approximate total time that participants took to finish the MBMD test and the SSQ was 35 minutes. If they were interrupted by being called for an appointment, they finished after consultation. Women were given a telephone number where they could reach me in case they did not deliver at the Perinatology Institute. An email address and a cell phone were registered for all

participants so that I could contact them if they delivered elsewhere. Women were informed that the second phase of data collection would be done by obtaining information from their medical records. They were informed that they could contact me at any time throughout the study, and that if they wished to know their scores from the MBMD Test or the Social Support Questionnaire, I could contact them after delivery. All participants received the telephone number and the e-mail address with which they could contact me.

Demographics

The demographic data collected at study enrollment during the first trimester of pregnancy included age at current pregnancy, number of previous pregnancies, and the gestational week at which the evaluation was taking place.

Data Collection

The data collection tools that were used in this study were a short demographics questionnaire, the Millon Behavioral Medicine Diagnostic Test, and the short version of the Social Support Questionnaire. Medical records were essential for the second phase of the data collection process, in which pregnancy outcomes were recorded.

Because this is was a prospective cross-sectional study, data were collected at two points. The first data collection effort was performed during the first, second, or third trimester of pregnancy. Data that were obtained at this point were demographic information such as age at current pregnancy, the number of the current pregnancy, gestational week at which the evaluation took place, social status, and economic status. The data that were obtained with the MBMD test were stress/anxiety scores, depression

scores, and emotional lability scores. With the SSQR, perceived social support scores were acquired. Because the hospital where the study took place has a high volume of patients, the approximate calculated time for the first data collection effort was 4 months. Two hundred and seventy-five patients were supposed to be included. After the initial data acquisition, the numerical and categorical variables were entered into an SPSS database, and women were followed until pregnancy termination. After delivery, the development of preeclampsia, preterm labor, or abruptio placentae was confirmed in the medical record of the mother. The gestational week in which delivery occurred and the presence of maternal infections during pregnancy were obtained as well. Apgar scores and birthweight were collected from the newborn's medical record.

The tests were completed in paper format. All the written tests and demographic questionnaires were kept in a locked filing cabinet. The written tests and questionnaires were kept in a locked filing cabinet at my home, and the SPSS file with all the results was saved in my laptop computer's hard disk and Time Capsule.

During the first data collection process, the MBMD test, the SSQ, and the demographic questionnaire were kept in a privacy envelope for each participant. The MBMD test only showed the assigned study number for each participant and her birthdate. The envelope showed the participant's birth date and the assigned participant number as well. However, this information was not easy to associate with the participant. For example, if the participant's birth date was June 5, 1965 and her assigned number was 57, the number that appeared on her envelope was 57-050665. Every envelope was kept in a filing cabinet until all participants were gathered. After completing the sample, I

took out the MBMD test from each participant and scored the test by using Pearson's Q local software. I entered the test's answers manually. Pearson's Q local software required that the test's answers be entered twice in order to eliminate typing errors. The MBMD test scores were only linked to the participant by the number formed by the assigned number and the participant's birthdate. Nobody at Pearson Assessments was able to identify the participants because they only had their assigned study numbers and birthdates. The results obtained from Pearson Assessments were saved in a .pdf file for each participant; the files were saved in my computer, and each file had the participant's birthdate and the study number that was assigned to each participant. All files were password protected. The test results were uploaded into an SPSS password-protected file. The SPSS files that contained the databases with the test results were locked and saved in my computer's hard disk and Time Capsule. I kept the information regarding the participant's name, medical record number, birthdate, phone number or email, and assigned study number in a password-protected file in my computer.

The second data collection process involved the use of medical records. I filled in the required information on a sheet of paper that had the participant's assigned study number; the information was then uploaded to the SPSS database. This sheet of paper was kept in the participant's envelope and locked in a filing cabinet as well.

Instrumentation

Millon Behavioral Medicine Diagnostic

The MBMD is based on the Millon Behavioral Health Inventory (MBHI), which is one of the most frequently used health inventories in the United States. It is distributed

in the United States by Pearson Assessments, and I have been authorized by this company as a test administrator. The estimated administration time is 20-25 minutes.

The MBMD is composed of 165 items and 29 clinical scales, and it is useful in the evaluation of psychological factors that may influence the clinical course or the treatment of medically ill adult patients. The phenomena evaluated by the MBMD are response patterns (disclosure, desirability, and debasement), negative health habits (alcohol, drugs, eating, caffeine, inactivity, and smoking), psychiatric indications (anxiety-tension, depression, cognitive dysfunction, emotional liability, and guardedness), coping styles (introversive, inhibited, dejected, cooperative, sociable, confident, nonconforming, forceful, respectful, oppositional, and denigrating), stress moderators (spiritual absence, illness apprehension, functional deficits, pain sensitivity, social isolation, and future pessimism), treatment prognostics (interventional fragility, medication abuse, information discomfort, utilization excess, and problematic compliance), and management guides (adjustment difficulties and psychiatric/ psychosocial referral (Millon et al., 2006).

The reliability of the MBMD test, estimated by internal consistency and test-retest analyses, showed an internal consistency of *rtt*,=.79 and a median test-retest coefficient of *rtt* = .83. Regarding the validity of the MBMD test, the MBMD scales were correlated with other measures such as BDI and the BSI depression scales (Millon, 2012). The test-retest reliability was estimated with a sample of *N* = 41, and the results obtained were as follows: psychiatric indications (*rtt* = .79 to .88); coping style (*rtt* = .71 to .90); stress moderators (*rtt* =. 78 to .92); treatment prognostics (*rtt* = 72 to .88); and management

guide (*rtt* = .78 to .81). The median for all scales is *rtt* = .83 (Millon, 2012). Reviewers of the MBMD scales have reported variable to good internal consistency and indicated that the scales addressing psychosocial features showed alpha coefficients close to or superior to 0.8 (Strack, 2008).

The scales included in the MBMD were validated by an item-sorting procedure in which various medical professionals placed the items into scales for which they were initially written. The items that were sorted correctly by most of the medical professionals were maintained on the test. Afterward, the items were correlated with many other measures that evaluated similar phenomena to each of the scales. For example, the MBMD depression scale was correlated with the BDI (.87) and with the BSI depression scale (.58) (Millon, 2012).

The convergent correlations between MBMD scales and other measurement divides with well established validity were moderate to high, with the exception of two aspects: problematic compliance and utilization excess. The test authors refer that these may be due to complex and variable patient behavior (Millon et al., 2006).

The various scales of the MBMD may be relevant to different clinicians. For example, psychometricians are interested in the results of all scales, but clinicians (physicians, surgeons, etc.) are mostly interested in psychiatric indicators and stress moderators because these refer to patient characteristics that are directly influencing clinical decisions (Strack, 2008). The Spanish Q local MBMD answer sheets will be used to administer the test, and the scores for the MBMD test will be obtained by using Pearson Assessment's Q local software.

Social Support Questionnaire

The Social Support Questionnaire (SSQ) evaluates two aspects of social support: the amount of perceived social support and the degree to which this social support is satisfying. The SSQ has an alpha coefficient of internal reliability of 0.97, which is a high reliability; criterion validity tests demonstrated a negative correlation between the SSQ and a depression scale (Sarason et al., 1983). For this study, the short form of the Sarason Social Support Questionnaire will be used, which is also known as the SSQSR. The short form of the SSQ has high internal reliability and a high correlation with the SSQ. It consists of 12 items that have scores that range from 1 (*very dissatisfied*) to 6 (*very satisfied*). The SSQSR odd-numbered items assess the participants' social support network, and the even-numbered items assess the extent to which they are satisfied with the level of support received. Satisfaction items are rated on 6-point scales in which 1 = *very dissatisfied* and 6 = *very satisfied*. The maximum score for the social support network items is 54, and the maximum score for the items that evaluate satisfaction with social support is 36. The scores that reflect the number of individuals in the patient's network as well as the satisfaction with support are obtained by summing across items. The total social support score will be calculated by adding the score from the social support network and the score from the satisfaction with social support items. The maximum score will be 90. This questionnaire takes less than 5 minutes to administer (Sarason, Sarason, Shearin, & Pierce, 1987), and it will be hand scored by a research assistant to decrease the risk of potential researcher bias.

Medical Records

The data that was collected from mothers' and newborns' medical records during the first week after delivery was the number of infections during the first, second, and third trimesters; the development of pregnancy complications such as preeclampsia, abruptio placentae, and preterm labor; the gestational week in which delivery occurred; neonatal Apgar scores; and the newborn's birthweight. The newborn's weight was also considered as low, adequate, or high for gestational age by using weight-for gestational-age curves. The socioeconomical status was also obtained from the social worker's evaluation in the medical record.

Measures of Social Support and Emotional Factors

Social Support Network Scores

These scores were obtained using the short version of the Sarason's Social Support Questionnaire that consists of 12 items. The six odd number items assess the participants' social support network. The maximum score for the social support network items is 54 (Sarason et al., 1987).

Satisfaction With Social Support Scores

These scores were obtained using the short version of the Sarason's Social Support Questionnaire (SSQ) that consists of 12 items. The six even-numbered items assess the extent to which they are satisfied with the level of support received. Satisfaction items are rated on 6-point scales where 1 = very dissatisfied and 6 = very satisfied. The maximum score for the items that evaluate satisfaction with social support is 36 (Sarason et al., 1987).

Overall Social Support Score

The total social support score was calculated by adding the score from the social support network items and the score from the satisfaction with social support items. The maximum score was 90.

High social support score. High social support was defined as having an overall social support score that ranged from 68-90 in the SSQ.

Medium-high social support score. Medium social support was defined as having an overall social support score between 46-67 in the SSQ.

Medium-low social support score. Medium social support was defined as having an overall social support score between 23-45 in the SSQ.

Low social support score. Medium social support was defined as having an overall social support score between 0-22 in the SSQ.

Stress/Anxiety Scores

These scores were calculated by using the MBMD Test's Anxiety-Tension Scale AA. The maximum score was 100. It is believed that high scores on this scale may suffer from numerous somatic disorders (Millon et al., 2006).

Low stress score. Low stress score was defined as having a stress/anxiety score between 0-50 in the MBMD.

High stress score. High stress score was defined as having a stress/anxiety score between 51-100 in the MBMD.

Depression Scores

These scores were calculated by using the MBMD Test's Depression Scale BB. The maximum score was 100. High scores on this scale are likely to intensify the discomfort of their psychological and physical problems (Millon et al., 2006).

Emotional Lability Scores

These scores were calculated by using the MBMD Test's Emotional Lability Scale DD. The maximum score was 100. High scorers on this scale tend to experience endogenous mood changes, apathy and dejection (Millon et al., 2006).

Low emotional lability score. Low emotional lability was defined as having a stress/anxiety score between 0-50 in the MDMB.

High emotional lability score. High emotional lability was defined as having a stress/anxiety score between 51-100 in the MBMD.

Nature of the Scale for Each Variable

Age at current pregnancy. This variable was considered as a numerical variable.

Number of previous pregnancies. This variable was considered as a numerical continuous variable

Gestational week at which the evaluation is taking place. This variable was considered as a numerical variable.

Current social status. This variable was considered as a nominal categorical variable and it will be coded as married, single, divorced, widowed.

Economical status. This variable was considered as a ordinal variable and it was coded as high-income, medium-income, low-income.

Number of maternal infections during pregnancy. This variable was considered as a numerical interval value.

Development of preeclampsia. This variable was considered as nominal categorical variables and was coded as yes/no.

Development of abruptio placentae. This variable was considered as nominal categorical variables and was coded as yes/no.

Development of preterm labor. This variable was considered as nominal categorical variables and was coded as yes/no.

Depression score. This variable was considered as a numerical interval variable.

Anxiety/stress score. This variable was considered as a numerical interval variable.

Emotional lability score. This variable was considered as a numerical interval variable.

Social support score. This variable was considered as an interval variable for logistic regression and as ordinal (coded as low, medium, high) for the multivariate analysis of covariance.

Newborn's weight. This variable was recorded as numerical interval variable.

Newborn's weight for gestational age. It was considered as an ordinal variable depending on its relationship with gestational age. It was coded as low, normal or high for gestational age.

Newborn's Apgar scores at the first minute and after five minutes. This variable was considered as a numerical interval variable.

Data Analysis Plan

The IBM SPSS Statistics 20.0 Premium software was used for data analysis. A data file was created which will contain the variable names, their type, and their values (George & Paul, 2010). A study number was assigned to each participant. The study number will consist in the participant's birthdate and an assigned study number. For example if the participants birth date was June 5th, 1965 and her assigned number was 57, the number that was assigned to her was 57-050665. All the participant's data was assigned to this number and this ensured confidentiality of the information because only the researcher was able to associate the data with each participant. The first data was entered to the data file as soon as the first data collection phase ends. The rest of the data was entered for each participant after pregnancy termination.

Before performing the analysis, data cleaning procedures were performed. The preanalysis data screening assured the accuracy of the data and consisted on examination of the data by performing descriptive statistics and frequency distribution. I verified that all cases had values within possible range and that all cases had values that corresponded to the coded values for each variable.

A research assistant from the National Institute of Perinatology controlled the quality of the data that was analyzed. Additionally, a search for missing data was done. The missing data was handled by replacing missing data with the mean values. The preanalysis data cleaning also included the assessment of outliers (extreme values) because these could create problems in multivariate analyses, such as those

that were performed in this study. Outliers were identified using Mahalanobis distance and the researcher decided which outliers should be dropped from further analysis (Mertler & Vannatta, 2010).

Finally, data was tested for normality, linearity, and homoscedasticity because these are three assumptions for multivariate statistical analyses. Univariate normality was tested by using the normal probability plot (normal Q-Q plot), skewness and kurtosis, and the Kolmogorov-Smirnov statistic. If data were substantially deviated from normal, I evaluated if data transformations using a square root transformation or a log transformation were required. After transformation of the data, normality was reevaluated. Linearity is important in multivariate analyses because many techniques are based on linear relations. Linearity was be evaluated with residual plots. Homoscedasticity was evaluated by using the Levene's test to assess the homogeneity of variances (Mertler et al., 2010).

Before performing the analyses for the three research questions, an analysis of the demographical variables was performed, which consisted in frequency distribution and central tendency measures (mean, mode, median).

Research Questions

Research Question 1

Is there a significant relationship between the presence of stress/anxiety, depression and/or emotional lability with the development of preeclampsia, abruptio placentae, preterm labor and/or the delivery of low birthweight for gestational age babies?

Null hypothesis (H_0). There is no significant relationship between stress/anxiety, depression, emotional lability, and the development of preeclampsia, abruptio placentae, preterm labor and low birthweight for gestational age.

Alternative hypothesis (H_1). There is a significant relationship between stress/anxiety, emotional lability and depression and the development of preeclampsia, abruptio placentae, preterm labor, and low birthweight for gestational age.

Logistic regression analyses were performed to evaluate the degree in which preeclampsia, abruptio placentae, preterm birth and low birth weight-for gestational age (coded as present or not present) were predicted by anxiety/stress, emotional liability and depression (independent quantitative variables). Logistic regression aims to classify participants into groups. It may be considered as an extension of multiple regression, but in logistic regression the dependent variable is categorical (Mertler et al., 2010).
Four sets of logistic regressions were performed, one for preeclampsia, one for abruptio placentae, one for preterm labor, and one for low birth weight for gestational age, as dependent variables. The independent variables were stress/anxiety scores, emotional lability scores and depression scores. Moderating or intervening variables for regression analysis were the total social support score. The control variables were age at pregnancy, family income, and social status.

Considering that depression and anxiety have a prevalence during pregnancy of approximately 18% (Karmaliani et al., 2009), and an effect size of r=0.382 for pregnancy complications, for the regression analysis, a total of 265-275 women should have been included in order to have a power of .80

The main output components that helped interpret the results from logistic regression were goodness of fit indices, the-2 log likelihood, Cox &Snell R Square and Nagelkerke R square. R^2 indicates the proportion of variability in the dependent variable that may be accounted for by predictor variables. The last component of the output was the Wald statistic, in which R was the partial correlation coefficient between the independent variables and the dependent variable (Mertler et al., 2010).

Research Question 2

Does the availability or unavailability of social support during pregnancy have a relationship with the presence of stress/anxiety, emotional lability and or depression?

Null hypothesis (H_0). The availability of social support does not have a significant relationship with the presence of stress/anxiety, emotional lability and/or depression during pregnancy.

Alternative hypothesis (H_1). The availability of social support has a significant relationship with the presence of stress/anxiety, emotional lability and/or depression during pregnancy.

A multivariate analysis of covariance (MANCOVA) was performed to evaluate the relationship between stress/anxiety scores, emotional lability and depression, as quantitative dependent variables; and the social support score (coded as high, medium-high, medium-low, low) as a categorical independent variable. The covariates were mother's age at pregnancy and the number of previous pregnancies.

MANCOVA searches for statistically significant mean differences between groups after adjusting a newly created dependent variable for differences on covariates. It

is useful when researchers want to control de effects of concomitant variables (Mertler et al., 2010).

MANCOVA's results initially showed homogeneity of variance-covariance with Box' test. If the Box's test was significant, then Pillai's Trace was used for multivariate test statistic. However, if equal variances were assumed with Box's test, then a Wilk's Lambda statistics was used when interpreting the homogeneity of regression slopes. The results of homogeneity of regression slopes were examined using the F ratio and the p value and effect size for each factor's main effect (Mertler et al., 2010).

Research Question 3

Is there a difference between the birthweight of the offsprings of women who experience high levels of anxiety, depression or emotional lability during pregnancy, and those who do not?

Null hypothesis (H_0). There is no difference in newborn birthweight between pregnant women who experience high levels of stress/anxiety, depression or high emotional lability scores during pregnancy, compared to those who do not.

Alternative hypothesis (H_1). There is a difference in newborn birthweight between pregnant women who experience high levels of stress/anxiety, depression or high emotional lability scores during pregnancy, compared to those who do not.

A factorial design experiment was done because two independent variables were analyzed regarding their independent or simultaneous effects on the dependent variables (Creswell, 2009).

When research designs include more than one factor, they are called factorial designs. Factorial analysis of variance (ANOVA) tests the mean differences with respect to some dependent variables. It also allows the researcher to test group differences and to test for interaction effects between various levels of the independent variables (Mertler et al., 2010).

Three Factorial ANOVAs (Two-Factor Design) were performed. The first one evaluated if there were significant differences in newborn birthweight for gestational age between the mother‘s stress/anxiety scores (coded as high and low), and emotional lability scores (coded as high and low). The dependent quantitative variable was newborn birthweight; the independent categorical variables was stress/anxiety and emotional lability. The second one evaluated if there were significant differences in newborn birthweight for gestational age between the mother‘s stress/anxiety scores (coded as high and low), and depression scores (coded as high and low). The dependent quantitative variable was newborn birthweight; the independent categorical variables were stress/anxiety and depression. The third one evaluated if there were significant differences in newborn birthweight for gestational age between the mother‘s depression scores (coded as high and low), and emotional lability scores (coded as high and low). The dependent quantitative variable was newborn birthweight; the independent categorical variables were depression and emotional lability.

For the 2 x 2 factorial analysis, in which 4 groups were included, considering an effect size of $r = 0.818$, the required size was at least 9 participants in each group, for a total of

36 participants. Considering a 10% of attrition, and additional 4 participants were added so that each group had at least 10 participants, and a total of 40 participants.

For the factorial ANOVA results, a line plot displayed factor interactions. If lines crisscrossed or overlapped, then an interaction was present. In order to evaluate if the interaction was statistically significant, the F ratio and the p level from the factorial ANOVA test was evaluated.

Threats to Validity

A possible threat to external validity in this study was the inclusion of mostly medium and low-income women because these are the patients attended at the Perinatology Institute. High-income women in Mexico tend to receive medical care at private hospitals and this is why the study results may not be generalized to patients from all economical status. On the other hand, there is a known interaction between low birthweight for gestational age and preeclampsia, which may be independent from emotional factors which may pose a threat to internal validity; the interaction between infections and preterm birth may also be independent from emotional factors, thus may have affected internal validity of the study as well.

Ethical Procedures

Approval to perform this study was obtained from the Ethics and Research Committees at the National Institute of Perinatology in Mexico City, and Walden University's Institutional Review Board (IRB) approval was also required.

This study did not pose any potential physical or psychological harm for the participants. The participation of each woman in the initial data collection lasted

approximately 35 minutes. Pregnant women received information regarding the nature of the study and the measurements characteristics. Participants were informed that their decision whether or not to participate in this study in no way affected their treatment at the Perinatology Institute, nor they would have had benefits for participating in the study. Each woman that agreed to participate signed an informed consent letter that guaranteed her confidentiality. The informed consent stated that all records will remain confidential and only the researcher will have access to them. In order to maintain the confidentiality of the participants, all participants were assigned a study number and the names of the participants were only accessible to the main researcher. The participants' names were not disclosed to others. A copy of informed consent can be found in Appendix A.

The MBMD and SSRQ results were available to all participants who wished to know their results, after pregnancy termination. Participants let the researcher know this upon study enrollment and contacted the researcher after delivery.

Summary

This was a prospective cross-sectional study that took place at the National Institute of Perinatology in Mexico City which included pregnant women from ages 18 to 40 years old in any of the three trimesters of pregnancy. Participants were assessed at study enrollment and were followed until delivery. The study aimed to explore causal effects between emotional factors, specifically stress/anxiety, depression, and emotional lability, and pregnancy complications; and the effects of social support on emotional factors of pregnant women. At study enrollment, women answered a demographical questionnaire, the MBMD test and the Sarason Social Support Questionnaire. After

delivery, a second data collection took place in which the researcher searched for pregnancy outcome information in the participant's medical records.

Three research questions were evaluated. The first one evaluated the relationship between stress/anxiety, depression, and emotional lability with the development of preeclampsia, abruptio placentae, preterm birth, or low birthweight for gestational age. A logistic regression was performed for each dependent variable; controlling for the age of mother, the number of previous pregnancies, and the number of infections during pregnancy. The second research question was explored by performing a MANCOVA in which the relationship between social support and stress, depression, and social lability was evaluated. A factorial ANOVA was used to answer the third research question that considered if there were differences between birthweight of the offsprings of mothers who experienced high levels of anxiety or emotional lability, compared to those who not.

All participants signed an informed consent letter and were assigned a number upon study enrolment so all their information remained confident and the I was the only one who had access to it.

The following chapter includes the results of this study. It explains the data collection process, the descriptive statistics and the results from the statistical analyses that were performed in order to answer the three research questions of this study.

Chapter 4: Results

Introduction

The purpose of this study was to evaluate the effects of stress/anxiety, depression, and emotional lability on the development of pregnancy complications. For this matter, three research questions and hypotheses were proposed. The first hypothesis indicated that there is a significant relationship between stress/anxiety, emotional lability, and depression and the development of preeclampsia, abruptio placentae, preterm labor, and low birthweight for gestational age; the second hypothesis stated that the availability of social support has a significant relationship with the presence of stress/anxiety, emotional lability, and/or depression during pregnancy; the third hypothesis stated that there is a difference in newborn birthweight between pregnant women who experience high levels of stress/anxiety, depression, or high emotional lability scores during pregnancy and those who do not.

In this chapter, the results of the study are presented. The first part of the chapter describes the data collection process; it explains how many participants were included and the number of participants who were eliminated from the study due to incomplete data or the inability to evaluate their pregnancy outcomes. The second part of the chapter describes the demographic characteristics of the participants and includes their marital status, social income status, age at current pregnancy, gestational week at which the evaluation took place, and body mass index at the beginning of pregnancy. The third part of the chapter includes the descriptive statistics of the variables evaluated in this study, such as stress/anxiety scores; depression scores; emotional lability scores; number of

participants who developed preeclampsia, abruptio placentae, or preterm birth; and newborn's weight, size, and Apgar scores. The last three parts of the chapter describe the data screening procedures that were performed before the analysis and the results of the statistical analyses performed. For Hypothesis 1, logistic regression analyses were performed; for Hypothesis 2, a MANCOVA was executed; for Hypothesis 3, three sets of factorial ANOVA were computed.

Data Collection

All participants were women attended at the National Institute of Perinatology in Mexico City. Two hundred eighty-one women were invited to participate; 11 women refused to participate, and 270 agreed to do so. From the 270 who participated, 16 did not complete the MBMD test appropriately and had to be eliminated. The remaining 254 participants were followed until pregnancy termination, and the information regarding pregnancy outcomes was obtained from their medical records. Seven women did not deliver at the National Institutes of Perinatology and had to be located by phone or email to obtain information regarding pregnancy termination and newborn variables. Three of the seven women who did not deliver at the National Institute of Perinatology could not be found. From the 251 participants whose information was gathered at pregnancy termination, nine participants had to be eliminated because of missing data for some variables. The total number of participants who had a complete evaluation at study enrollment and complete pregnancy outcome information was 242. The first stage of the data collection process, which was the recruitment and evaluation of participants, lasted 2 months. The second phase of the data collection process, when several variables related

to pregnancy outcomes and newborn conditions were obtained from the medical records, lasted 3.5 months.

Demographics Results

The study included 242 pregnant women ranging in age from 18 to 43, with a mean age of 29.59 and a standard deviation of 6.85. The mean evaluation week was 31.54, with a standard deviation of 5.10. The mean number of pregnancies for participants was 2.42 (1.39). The body mass index mean prior to current pregnancy was 25.91 (5.17). The mean height for participants was 1.58 meters, with a standard deviation of 0.06 (see Table 1).

Table 1

Maternal Descriptive Statistics

	Maternal Age	Evaluation Week	Number of pregnancies	BMI Before Pregnancy	Height
Mean	29.59	31.54	2.42	25.9126	1.5800
Median	29.50	32.00	2,00	24.9000	1.5800
SD	6.86	5.103	1.39	5.17279	.06996
Minimum	18	21	1	17.10	1.30
Maximum	43	40	8	51.51	1.81

Regarding the social status of participants, as shown in Table 2, 43.8% of participants were married, 21.5% were single, and 34.7% were in a relationship. Of the 242 participants, 232 had a monthly family income that ranged from 1 to 10,000 Mexican pesos, which is considered low income; and 10 participants had a monthly family income

that ranged between 11,000 and 84,000 Mexican pesos, considered as medium income. No high-income participants were included in this study (see Table 2).

Table 2

Social Status and Monthly Family Income

		Frequency	Percent
Social status	Married	106	43.8
	Single	52	21.5
	In a relationship	84	34.7
	Total	242	100.0
Family income	0-10,000 Mexican pesos	232	95.9
	11,000-84,000 Mexican pesos	10	4.1
	Total	242	100.0

Descriptive Statistics

Cesarean-section was the most common method of delivery, accounting for 76.9%. The remaining 23.1% had vaginal deliveries. Low-weight for gestational age was present in 15.3% of delivered babies, whereas 4.5% were considered as hypertrophic. The rest of the babies born from participants, 80.2%, had normal weight for gestational age (see Table 3).

Table 3

Newborn Weight for Gestational Age

	Frequency	Percent	Valid Percent	Cumulative Percent
Low Weight	37	15.3	15.3	15.3
Normal Weight	194	80.2	80.2	95.5
High Weight	11	4.5	4.5	100.0
Total	242	100.0	100.0	

As the National Institute of Perinatology is considered a concentration hospital for high-risk pregnancies, many participants had comorbidities. The most common illnesses, as shown in Table 4, were type 2 diabetes in 5.8%, gestational diabetes in 14.9%, hypothyroidism in 10.7%, cardiopathy in 2.5%, epilepsy in 2.9%, asthma in 2.5%, and drug use in 2.5% of participants. Of the 242 women evaluated, fifteen women developed preeclampsia, 37 women delivered preterm, and four women had premature abruption of the placenta. Results are presented in Table 5.

Table 4

Maternal Illness

	Frequency	Percent
None	106	43.8
Diabetes mellitus 1	2	0.8
Diabetes mellitus 2	14	5.8
Gestational diabetes	36	14.9
Hyperthyroidism	4	1.7
Hypothyroidism	26	10.7
Arthritis	1	0.4
Lupus	2	0.8

(table continues)

	Frequency	Percent
Cardiopathy	6	2.5
Fibromyalgia	1	0.4
Asthma	6	2.5
Psychopathology	4	1.7
Drug consumer	6	2.5
Deep venous thrombosis	1	0.4
Epilepsy	7	2.9
Placental acretism	3	1.2
Bulimia	1	0.4
Thrombocytopenia	1	0.4
Cancer history	1	0.4
Autoimmune thrombocytopenic purpura	2	0.8
Myasthenia gravis	1	0.4
Uterine myomatosis	2	0.8
Scleroderma	1	0.4
Coagulation disorder	1	0.4
Congenital adrenal hyperplasia	1	0.4
Vitiligo	1	0.4
Bone dysplasia	1	0.4
Atopic dermatitis	1	0.4
McCune Albright	1	0.4
Erythema nodoso	1	0.4
Hepatopathy	1	0.4
Total	242	100.0

Table 5

Pregnancy Complications

	Frequency	Percent
Preeclampsia	15	6.2
Preterm birth	37	15.3
Abruptio placentae	4	1.7
None of the above	186	76.8
Total	242	100.0

Psychosocial Factors

Total social support scores for participants had a mean of 15.88, with 54 being the maximum score possible in the SSQ. The mean for social support satisfaction scores was 32.32, 36 being the maximum score possible. The mean of the overall total social support score obtained through the SSQ from participants was 48.20, with 90 being the maximum achievable score. Total social support scores were divided into four categories, as shown in Table 6. Two percent of participants had low social support, 40.9% had medium-low social support, 50% had medium-high social support, and 6.6% of participants had high social support.

The mean score for stress/anxiety was 66.36, the mean depression score was 54.70, and the mean score for emotional lability was 59.71. The maximum possible score for these three variables was 100 (see Table 7). According to the MBMD manual (Millon et al., 2006), scores between 60 and 74 are suggestive but not sufficiently indicative of symptom pathology; scores of 75 to 84 suggest the presence of the disorder; and scores of 85 and above strongly support the prominence of the pathological symptom (Millon et al., 2006)

Table 6

Categories of Total Social Support

	Frequency	Percent
Low social support	6	2.5
Medium-low social support	99	40.9
Medium-high social support	121	50.0
High social support	16	6.6
Total	242	100.0

Table 7

Stress/Anxiety, Depression, and Emotional Lability Scores

	Stress/Anxiety Score	Depression Score	Emotional Lability Score
Mean	66,36	54.70	59.71
Median	71,50	64.00	62.00
SD	23,97	28.84	16.21
Minimum	5	5	10
Maximum	105	105	95

Preanalysis Data Screening

Before performing multivariate analysis, I screened the data for outliers. Normality, linearity, and homoscedasticity were evaluated. Univariate screening for outliers of grouped data with stem and leaf plots was performed, but no outliers were eliminated. Multivariate screening for ungrouped data was performed for 14 numerical variables using Mahalanobis distance. Considering that the critical value for X^2 at $p < 0.001$ with 14 degrees of freedom is 36.123, I eliminated cases with a Mahalanobis

distance greater than 36.123 from further analysis. Eight cases were eliminated in this process. Thus, for multivariate analyses, 234 cases were included.

To evaluate univariate normality, histograms, Q-Q plots, skewness, kurtosis, and Kolmogorov-Smirnov tests of normality were performed for numerical variables. Levene's test for equality of variances showed homogeneity of variances because no values were significant. Lastly, homogeneity of variance-covariance matrices was evaluated within MANOVA by calculating Box's test of equality of variance. As Box's test was not significant, equality of covariance was concluded.

Hypothesis 1 Results

Logistic Regression Analysis for Preeclampsia

An Enter logistic regression was conducted to evaluate which independent variables (maternal age, social status, family income, total social support, stress/anxiety, depression, and emotional lability) were predictors of preeclampsia. A 95% confidence interval was used. Data screening led to the elimination of eight outliers. Logistic regression results showed that the overall model fit of eight predictors was moderate (-2log Likelihood = 105.075), but the model was not statistically reliable to distinguish between preeclampsia and nonpreeclampsia ($X^2(8) = 6.360$, $p = 0.07$). The model correctly classified 93.6% of the cases. Wald statistic showed that being single significantly predicts preeclampsia in this model. Regression coefficients are presented in Table 8. The odds ratio for the significant variables indicates increased likelihood of preeclampsia development.

Table 8

Regression Coefficients for Preeclampsia

	B	Wald	*df*	*p*	OR
Maternal age	0.019	0.198	1	0.657	1.020
Married	0.462	0.385	1	0.535	1.587
Single	1.504	3.906	1	0.048	4.498
Family income	-0.691	0.363	1	0.547	0.501
Stress/anxiety	-0.003	0.043	1	0.837	0.997
Depression	0.014	1.341	1	0.247	1.014
Emotional lability	0.001	0.001	1	0.979	1.001
Social support	0.025	1.014	1	0.314	1.025
Constant	-5.076	3.643	1	0.056	0.006

Note. OR = odds ratio; *df* = degrees of freedom; CI = confidence interval.

Logistic Regression Analysis for Preterm Birth

A logistic regression was conducted to evaluate which independent variables (maternal age, social status, family income, total social support, stress/anxiety, depression, and emotional lability) were predictors of preterm birth. Data screening led to the elimination of eight outliers. Logistic regression results showed that the overall model fit of eight predictors was fair (-2log Likelihood = 189.511), but the model was not statistically reliable to distinguish between preterm birth and nonpreterm birth (X^2 (8) = 14.789, p = 0.063). The model correctly classified only 84.2% of the cases. Wald statistic showed that the variables single and social support significantly predict preterm birth in this model. Regression coefficients are presented in Table 9. The odds ratio for the variable single indicates increased likelihood of preterm birth development. However, the odds ratio for social support indicates little change in the likelihood of preterm birth development.

Table 9

Regression Coefficients for Preterm Birth

	B	Wald	*df*	*p*	OR
Maternal age	0.021	0.516	1	0.473	1.021
Married	0.316	0.596	1	0.440	1.371
Single	1.396	4.340	1	0.037	4.041
Family income	0.602	0.470	1	0.493	1.826
Stress/anxiety	-0.019	2.673	1	0.102	0.981
Depression	-0.003	0.155	1	0.694	0.997
Emotional lability	0.017	1.160	1	0.282	1.017
Social support	-0.043	5.517	1	0.019	.957
Constant	2.761	2.120	1	0.145	15.816

Note. OR = odds ratio; *df* = degrees of freedom; CI = confidence interval.

Logistic Regression Analysis for Abruptio Placentae

A logistic regression was conducted to evaluate which independent variables (maternal age, social status, family income, total social support, stress/anxiety, depression, and emotional lability) were predictors of abruptio placentae. Data screening led to the elimination of eight outliers. Logistic regression results showed that the overall model fit of 8 predictors was good (-2log Likelihood = 28.657) but the model was not statistically reliable to distinguish between abruptio placentae and non-abruptio placentae (X^2 (8) = 11.826, p = 0.159). The model correctly classified 98.3% of the cases. Wald statistic showed that the family income significantly predicts abruptio placentae in this model. Regression coefficients are presented in Table 10. Odds ratio for the variable family income shows increased likelihood of abruptio placentae development.

Table 10

Regression Coefficients for Abruptio Placentae

	B	Wald	*df*	*p*	OR
Maternal Age	-0.027	0.089	1	0.766	0.973
Married	-16.580	0.000	1	0.997	0.000
Single	-17.999	0.000	1	0.996	0.000
Family income	3.260	4.071	1	0.044	26.044
Stress/Anxiety	-0.112	2.824	1	0.093	0.894
Depression	0.009	0.120	1	0.729	1.010
Emotional Lability	0.073	1.521	1	0.217	1.075
Social Support	0.016	0.088	1	0.767	1.017
Constant	21.585	0.000	1	0.996	2367358568.87

Note. OR = odds ratio; *df* = degrees of freedom; CI = confidence interval.

Logistic Regression Analysis for Low Weight for Gestational Age

A logistic regression was conducted to evaluate which independent variables (maternal age, social status, family income, total social support, stress/anxiety, depression, and emotional lability) were predictors of low-weight for gestational age. Data screening led to the elimination of eight outliers. Logistic regression results showed that the overall model fit of 8 predictors was poor (-2log Likelihood = 192.570) and the model was not statistically reliable to distinguish between low-weight for gestational age and non-low-weight for gestational age ($X^2(8) = 4.910$, $p = 0.767$). The model correctly classified 85% of the cases. Wald statistic showed that the variables entered in the model do not significantly predict low-weight for gestational age. Regression coefficients are presented in Table 11.

Table 11

Regression Coefficients for Low Weight for Gestational Age

	B	Wald	*df*	*p*	OR
Maternal Age	-0.001	0.001	1	00.95	.999
Married	0.649	2.055	1	0.152	1.914
Single	0.327	0.344	1	0.558	1.387
Family Income	0.236	0.045	1	0.832	1.266
Stress/Anxiety	0.013	1.383	1	0.240	1.013
Depression	-0.006	0.698	1	0.403	0.994
Emotional Lability	-0.017	1.246	1	0.264	0.983
Social Support	0.007	0.146	1	0.702	1.007
Constant	-2.194	1.198	1	0.274	0.111

Note. OR = odds ratio; *df* = degrees of freedom; CI = confidence interval.

Hypothesis 2 Results

MANCOVA Results

Multivariate analysis of covariance (MANCOVA) was performed to determine the effect of social support category on stress/anxiety, depression, and emotional lability scores while controlling for maternal age at time of pregnancy and number of pregnancies. Prior to the test, outliers were eliminated. MANCOVA results revealed a significant difference among the social support categories on the combined dependent variables, Pillai's Trace = 0.018, F (9,684) = 3.125, p = 0.001, multivariate n^2 = 0.39. The covariates (maternal age and number of pregnancies) did not significantly influence the combined dependent variables. Analysis of covariance (ANCOVA) was conducted on each dependent variable as a follow-up test to MANCOVA. Results are shown in Table 12. Although Pillai's Trace was not significant for influences of number of pregnancies

on the combined dependent variables, the ANCOVA reported significant differences between number of pregnancies and stress scores [F (3,228) = 5.893 , p = 0.016, partial n^2= 0.025].

Table 12

ANCOVA Summary Table for Social Support on Stress/Anxiety, Depression, and Emotional Lability

Source	DV	*SS*	*df*	*MS*	*F*	*p*	n^2
Social Support	Stress/Anxiety	5876.63	3	1958.88	3.762	0.012	0.047
	Depression	20075.75	3	6691.92	9.050	0.000	0.106
	EL	677.03	3	225.67	0.842	0.472	0.011
Maternal Age	Stress/Anxiety	1282.01	1	1282.01	2.462	0.118	0.011
	Depression	451.22	1	451.22	0.610	0.436	0.003
	EL	301.34	1	301.34	1.124	0.290	0.005
No. pregnancies	Stress/Anxiety	3068.47	1	3068.47	5.893	0.016	0.025
	Depression	1850.76	1	1850.76	2.503	0.115	0.011
	EL	237.52	1	237.52	.886	0.348	0.004
Within	Stress/Anxiety	118710.63	228	520.66			
Treatments	Depression	168596.57	228	739.46			
	EL	61113.78	228	268.04			
Total	Stress/Anxiety	1152572.00	234				
	Depression	896691.00	234				
	EL	891525.00	234				
Corrected Total	Stress/Anxiety	130097.54	233				
	Depression	193782.35	233				
	EL	62392.35	233				

Note. DV = dependent variable; *df* = degrees of freedom; *SS* = sum of squares; *MS* = mean of squares; EL = emotional lability.

A comparison of adjusted means show that there is a difference of 19.51 points in stress/anxiety scores between medium-low social support and high social support and a difference of 31.76 points in depression scores between medium-low social support and

high social support . Table 13 presents adjusted and unadjusted means for stress/anxiety, depression and emotional lability by social support category.

Table 13

Adjusted and Unadjusted Means for Stress/Anxiety, Depression, and Emotional Lability

Dependent Variable	Total Social Support	Adjusted Mean	*SD*
Stress/Anxiety	Low	68.137[a]	9.318
	Medium-low	71.125[a]	2.349
	Medium-high	63.632[a]	2.107
	High	51.607[a]	6.158
Depression	Low	62.645[a]	11.105
	Medium-low	64.835[a]	2.799
	Medium-high	48.830[a]	2.511
	High	33.075[a]	7.338
Emotional Lability	Low	59.289[a]	6.686
	Medium-low	61.282[a]	1.685
	Medium-high	58.678[a]	1.512
	High	54.728[a]	4.418

Note. Covariates appearing in the model are evaluated at the following values: Maternal Age = 29.53, No. Pregnancies = 2.42.

Hypothesis 3 Results

Three sets of factorial ANOVA were performed to evaluate the effects of stress/anxiety, depression and emotional lability on newborn weight, and the possible interaction effects among them.

Factorial ANOVA Stress/Anxiety, Emotional Lability, and Birthweight

Data were screened to ensure that assumptions of factorial ANOVA were met. Univariate and multivariate outliers were evaluated and eight outliers were eliminated.

Table 14

Descriptive Statistics on Interactions Between Stress and Emotional Lability With Newborn Weight as Dependent Variable

Stress	Emotional Lability	Mean	*SD*	N
	Low	3013.19	536.504	31
Low	High	2982.78	565.585	27
	Total	2999.03	545.564	58
	Low	2903.50	559.677	22
High	High	2865.38	448.847	154
	Total	2870.15	462.477	176
	Low	2967.66	543.634	53
Total	High	2882.90	468.197	181
	Total	2902.09	486.381	234

In order to identify interaction effects between factors, line plots of the cell means were performed. Line plots of Stress/Anxiety and Emotional Lability variables show no interaction between factors. Lines show that higher levels of stress are related lower newborn weight (See Figure 1 and Figure 2).

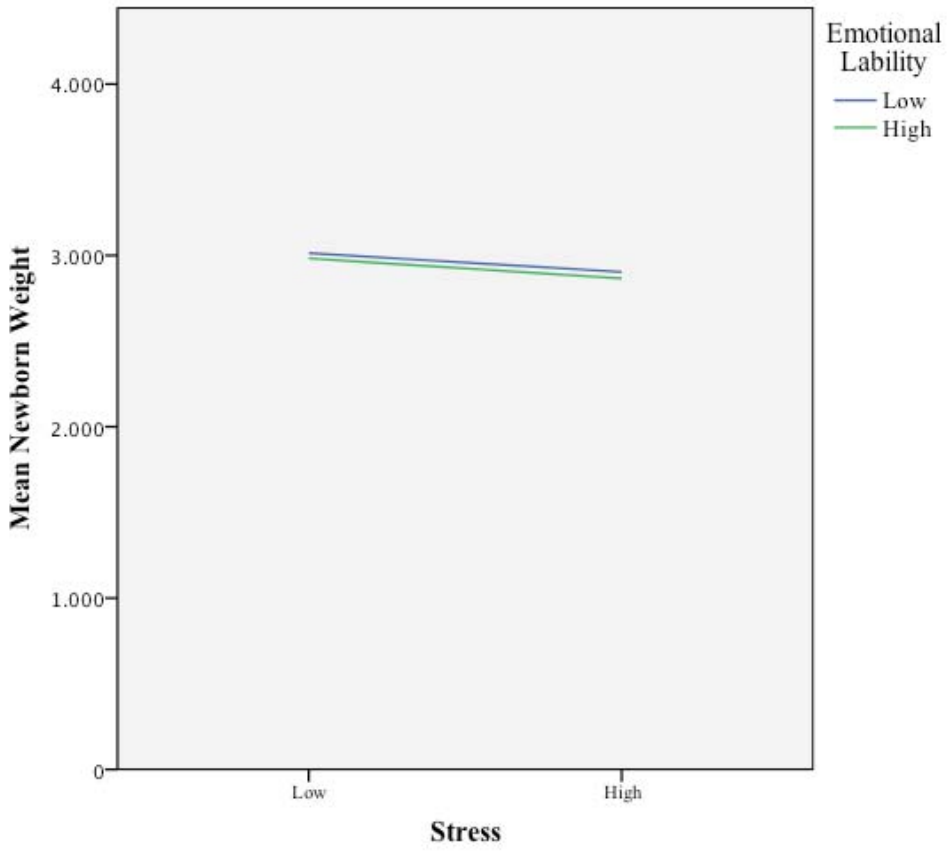

Figure 1. Interaction of stress/anxiety and emotional lability on newborn weight.

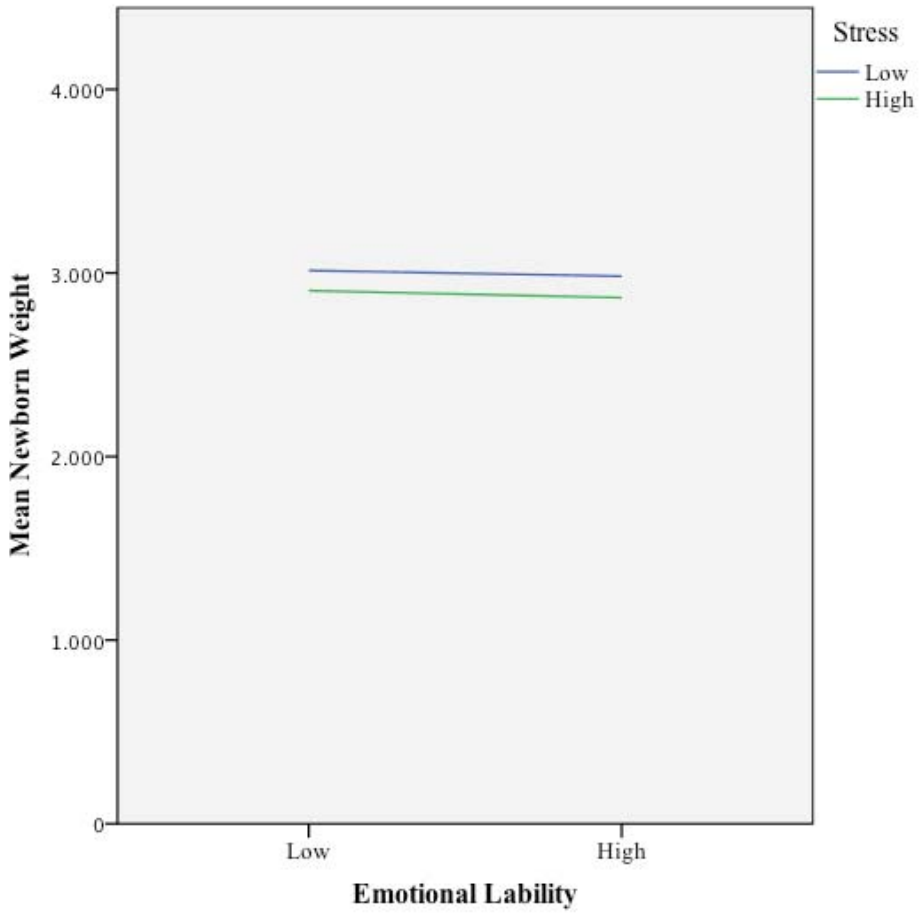

Figure 2. Interaction of emotional lability and stress/anxiety on newborn weight.

A 2X2 factorial analysis of variance was performed to investigate newborn birthweight differences in stress and depression category among pregnant women. Test's results in Table 15 show that newborn weight is not significantly different in women with low and high levels of stress and low and high levels of emotional lability.

Table 15

ANOVA Summary Table for Stress/Anxiety and Depression on Newborn Weight

Source	*SS*	*df*	*MS*	*F*	*p*	n^2
Between treatments	765990.53[a]	3	255330.18	1.080	00.38	0.014
Stress	425335.81	1	425335.81	1.800	0.181	0.008
Emotional Lability	38738.06	1	38738.06	0.164	00.66	0.001
Stress x EL	489.16	1	489.160	0.002	00.964	0.000
Within treatments	54354023.40	230	236321.84			
Total	2025903040.00	234				

Note. df = degrees of freedom; *SS* = sum of squares : *MS* = mean of squares: EL = emotional lability

Factorial ANOVA Stress/Anxiety, Depression, and Birthweight

Data were screened to ensure that assumptions of factorial ANOVA were met. Univariate and multivariate outliers were evaluated and eight outliers were eliminated. Means and standard deviations were calculated for all variables before checking interactions (see Table 16).

Table 16

Descriptive Statistics on Interactions Between Stress and Depression With Newborn Weight as Dependent Variable

Stress	Depression	Mean	*SD*	N
	Low	2929.41	541.824	44
Low	High	3217.86	515.764	14
	Total	2999.03	545.564	58
	Low	2801.50	498.600	42
High	High	2891.66	450.373	134
	Total	2870.15	462.477	176
	Low	2866.94	522.077	86
Total	High	2922.52	464.993	148
	Total	2902.09	486.381	234

In order to identify interaction effects between factors, line plots of the cell means were performed. The line plots of Stress/Anxiety and Depression show interaction between factors. Lines show that high stress scores are related to lower birthweight, but low stress scores combined with high depression scores, are not related to low weight for gestational age (see Figure 3).

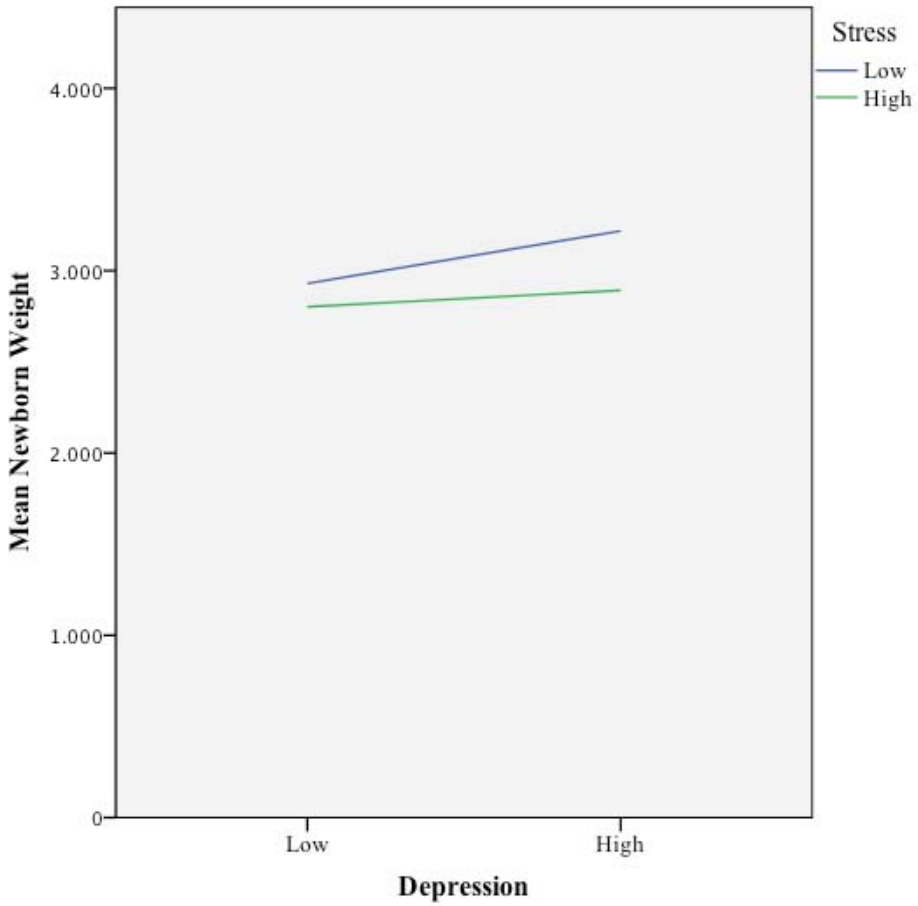

Figure 3. Interaction of depression and stress/anxiety on newborn weight.

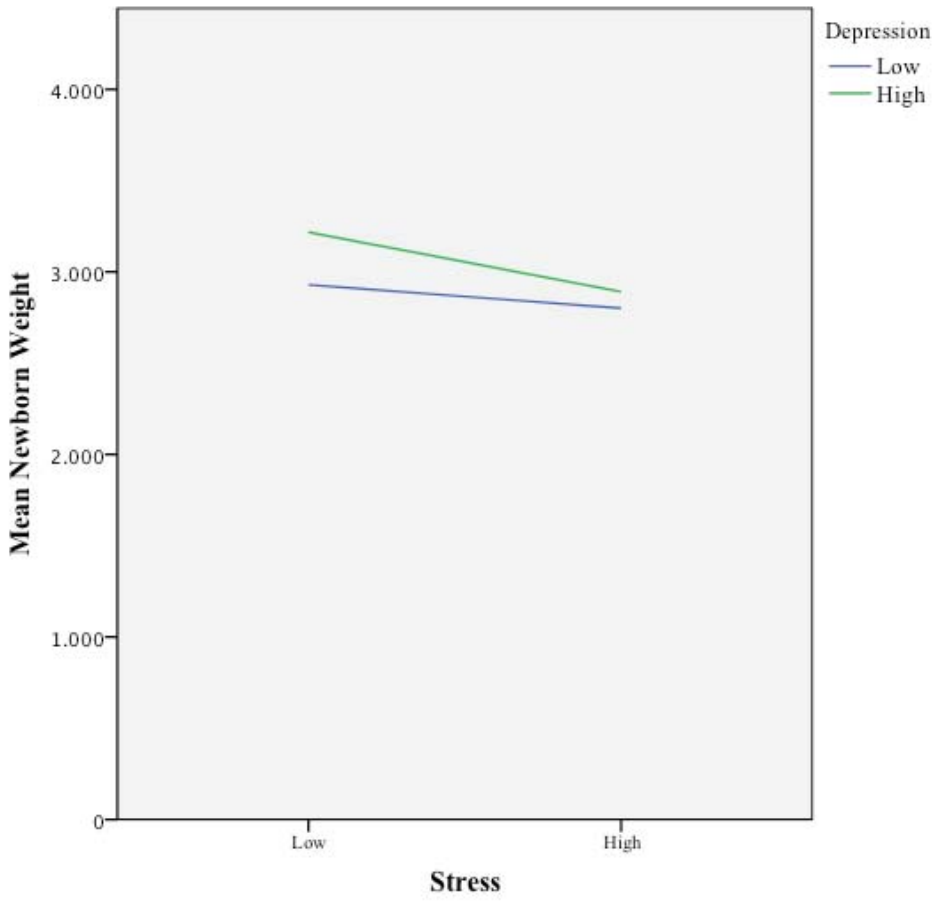

Figure 4. Interaction of stress/anxiety and depression on newborn weight.

A 2X2 factorial analysis of variance was performed to investigate newborn birthweight differences in stress and depression category among pregnant women. ANOVA results, presented in Table 17, show a significant main effect of stress [$F(1,230) = 7.10$, $p = 0.008$, partial $n^2 = 0.030$], and depression [$F(1,230) = 4.94$, $p = 0.027$, partial $n^2 = 0.021$]. Interaction between factors was not significant [$F(1,230) = 1.35$, $p = 0.246$, partial $n^2 = 0.006$].

Table 17

ANOVA Summary Table for Stress/Anxiety and Depression on Newborn Weight

Source	*SS*	*df*	*MS*	*F*	*p*	n^2
Between treatments	1868299.193	3	622766.40	2.690	0.047	0.034
Stress	1644039.50	1	1644039.50	7.101	0.008	0.030
Depression	1142864.11	1	1142864.11	4.936	0.027	0.021
Stress x Depression	313458.53	1	313458.53	1.354	0.246	0.006
Within treatments	53251714.739	230	231529.195			
Total	2025903040.00	234				

Note. df = degrees of freedom; *SS* = sum of squares : *MS* = mean of squares; EL = emotional lability

Factorial ANOVA Depression, Emotional Lability, and Birthweight

Data were screened to ensure that assumptions of factorial ANOVA were met. Univariate and multivariate outliers were evaluated and eight outliers were eliminated. Means and standard deviations were calculated for all variables before checking interactions (see Table 18).

Table 18

Descriptive Statistics on Interactions Between Depression and Emotional Lability With Newborn Weight as Dependent Variable

Depression	Emotional Lability	Mean	*SD*	N
Low	Low	2865.83	552.14	35
	High	2867.71	506.01	51
	Total	2866.94	522.08	86
High	Low	3165.67	481.05	18
	High	2888.85	454.42	130
	Total	2922.52	464.99	148
Total	Low	2967.66	543.63	53
	High	2882.90	468.20	181
	Total	2902.09	486.38	234

In order to identify interaction effects between factors, line plots of the cell means were performed. Intersection of lines shows interaction between depression and emotional lability. Lines show that higher levels of depression combined with high levels of emotional lability are related to lower newborn weight (See Figure 5 and Figure 6).

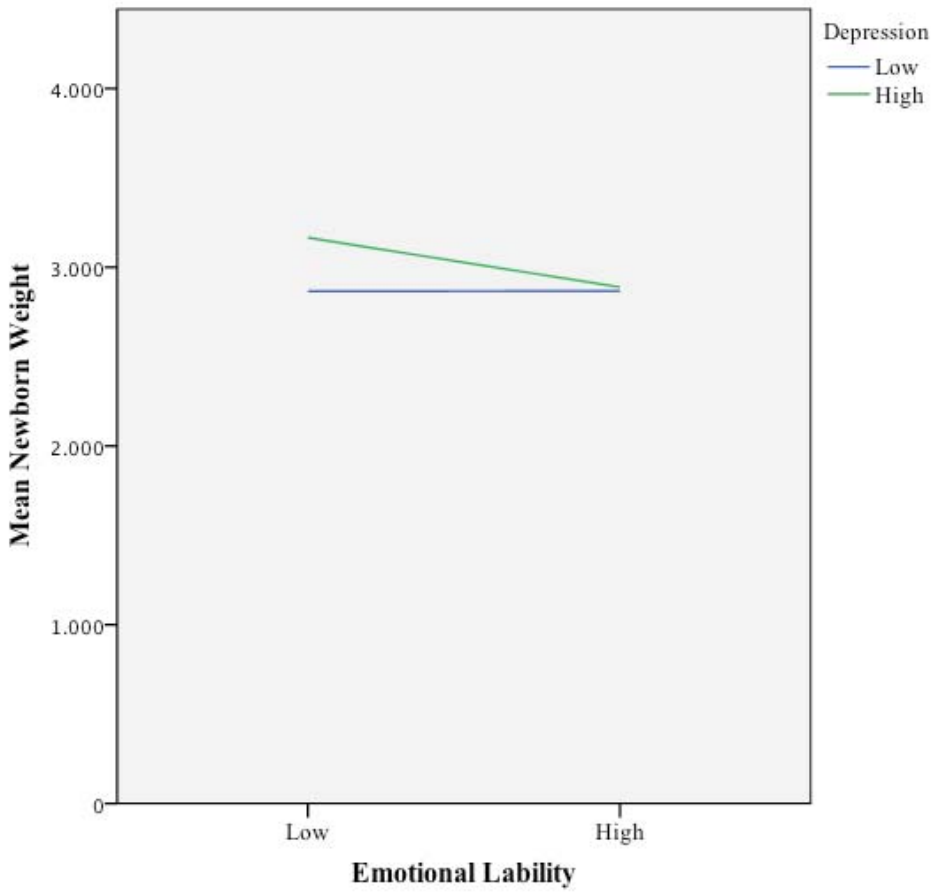

Figure 5. Interaction of emotional lability and depression on newborn weight.

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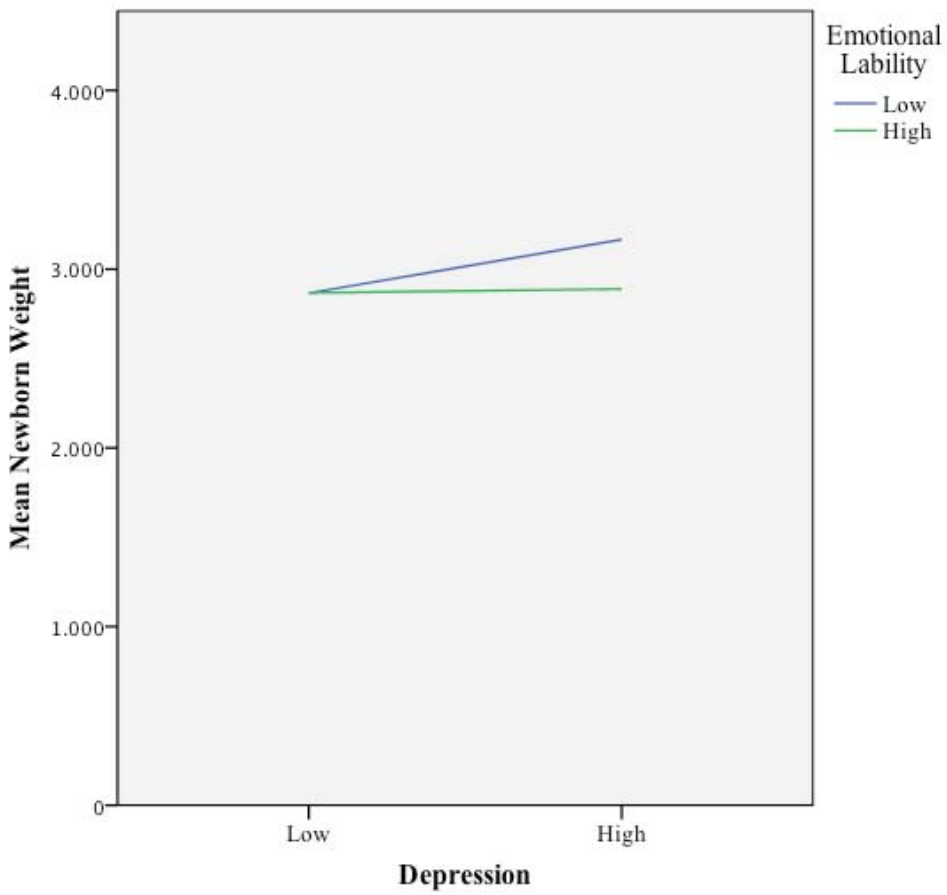

Figure 6. Interaction of depression and emotional lability on newborn weight.

A 2X2 factorial analysis of variance was performed to investigate newborn birthweight differences in stress and depression category among pregnant women. ANOVA results, presented in Table 19, show a significant main effect of depression on newborn weight [$F(1,230) = 3.96$, $p = 0.048$, partial $n^2 = 0.017$] but not for emotional lability [$F(1,230) = 2.90$, $p = 0.090$, partial $n^2 = 0.012$]. Estimates of effect size revealed low strength in associations. No post hoc tests were performed because the variables depression and stress/anxiety only have 2 categories. Results show that newborn weight is significantly different in women with low and high levels of

depression.

Table 19

ANOVA Summary Table for Emotional Lability and Depression on Newborn Weight

Source	*SS*	*df*	*MS*	*F*	*p*	n^2
Between treatments	1379600.15	3	459866.72	1.968	0.120	0.025
Depression	924658.524	1	924658.52	3.957	0.048	0.017
Emotional Lability	678376.362	1	678376.36	2.903	0.090	0.012
Depression x EL	697031.198	1	697031.20	2.983	0.085	0.013
Within treatments	53740413.783	230	233653.97			
Total	2025903040.00	234				

Note. df = degrees of freedom; *SS* = sum of squares : *MS* = mean of squares; EL = emotional lability

Summary

The results of this study were obtained by performing statistical analyses to a database that was made through the evaluation of patients from the National Institute of Perinatology in Mexico City. This study included a population constituted mostly by low-income pregnant women. Different statistical tests were used to explore the hypotheses and research questions of the study.

The logistic regression models for Hypothesis 1 were not statistically reliable to distinguish between the two categories of dependent variables that were evaluated. However, some statistically significant differences were found in some models. The alternative Hypothesis 2 was supported by this research because the amount of social support was found to interact with the levels of stress and depression in pregnant women.

The results for Hypothesis 3 show that stress and depression have significant effects on newborn weight, and high stress scores are related to lower newborn weight.

In chapter 5, an overview of the research study and the results is presented. The findings are discussed in this chapter, as well as the implications for social change of this study. This manuscript concludes with the researcher's point of view of the findings of the effects of stress, depression and emotional lability on the development of pregnancy complications.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This study was performed to evaluate the effects of psychosocial factors on the development of pregnancy complications or poor pregnancy outcomes, such as preeclampsia, preterm birth, abruptio placentae, and low weight for gestational age. In this study, I also sought to determine if the amount of social support may influence stress/anxiety or depression levels in pregnant women. Additionally, I aimed to determine whether there is a relationship between stress, depression, and emotional lability and newborn weight.

Given that the current study involved obtaining information from a cohort of pregnant women who were followed until delivery, the participants included in this study were women in the second or third trimester of pregnancy. Although the inclusion of women in the first trimester of pregnancy would have been appropriate, these women were not invited to participate because this would have prolonged the time for study completion by 3 months.

This prospective study was done thanks to the participation of patients from the National Institute of Perinatology, who kindly spent approximately 35 minutes of their time answering the demographic questionnaire, the MBMD test, and the SSQ.

Previous research has focused on the effects of stress and depression on the development of pregnancy complications, mainly preterm birth and small-for-gestational-age newborns. However, there is little information regarding the consequences of

emotional lability in pregnancy. Moreover, there are no reported studies regarding stress, depression, and emotional lability on pregnancy outcomes in the Mexican population.

Overview

Women in the second and third trimesters of pregnancy were evaluated and followed until delivery. All participants were patients from the National Institute of Perinatology. This is the biggest public perinatology hospital in Mexico City, where more than 100 pregnant women are attended every day. Two hundred eighty one women were invited to participate, and only 11 women refused to do so. Thus, the study initially had 270 participants. The first stage of the data collection process, which was the recruitment and evaluation of participants, lasted 2 months. After this time, all women were followed until delivery. Following pregnancy termination, several variables related to pregnancy outcomes and newborn conditions were obtained from the medical records. This was the second phase of the data collection process, which lasted 3.5 months. After eliminating those participants who did not complete correctly the MBMD test and those who did not deliver at the National Institute of Perinatology and were not able to be reached by me, I had a total of 242 participants with complete information for analysis. As the required sample to have a power of 0.80 was not achieved, the power of this study with 242 participants was 0.74, considering an alpha level of 0.05.

Demographics of the Study Population

The patients who receive healthcare at the National Institute of Perinatology come from different parts of the country, but most of the study participants were women living in Mexico City and the surrounding urban areas. The mean age of the women during

evaluation was 29.59 +-6.85 years. The mean number of pregnancies for participants was 2.42+-1.39. The mean of the body mass index before pregnancy in evaluated patients was 25.91(5.17). The results of this study show that we may also have a problem of increased weight in the childbearing population, as 49.6% of the women evaluated were overweight or obese. Although the relationship between BMI and depression or stress scores was not directly evaluated in this study, it would be an interesting association to search for in future studies. It has been reported that high BMI may increase obstetrical risks (Chu et al., 2008).

This study mainly evaluated low-income women because 95.9% of participants were of low socioeconomic status and the remaining 4.1% of women were from medium socioeconomic status. No women from high-income families participated in this study. Low socioeconomic status families in Mexico earn from 0 to 10,000 Mexican pesos per month, which is a monthly income below 850 US Dollars.

Almost half of the participants (43.8%) were married, 34.7% were in a relationship and living with the father of the baby, and the remaining 21.5% were single and had no relation with the father of the baby at the moment of evaluation.

Mean gestational age at delivery was 38.19 weeks. The statistical analysis for the present study did not evaluate correlations between stress and depression scores and gestational age at delivery, but this will be done in a future study. The mean newborn height was 48.70 cm (1.54), and the mean weight of newborns was 2904 grams (488.67). Babies born in Mexico City tend to be smaller than those born in lower altitude zones in Mexico or in rural areas. Mexican weight for gestational age indexes were used to

classify the newborn's weight into low, normal, or high weight for gestational age (Flores Huerta & Martínez Salgado, 2012). According to these indexes, 15.3% of newborns had low weight for gestational age because their weight was below the 10th percentile, while 80.2% had normal weight and 4.5% had high weight for gestational age, with a weight above the 90th percentile.

From the 242 participants in this study, 136 participants had associated pathologies and 106 were healthy. The most common pathologies present in these women were type 2 diabetes, gestational diabetes, hypothyroidism, asthma, epilepsy, and cardiopathy. No correlations were evaluated in this study between these pathologies and pregnancy outcomes, nor were they included as covariates.

Three types of social support scores were obtained with the SSQ: the social support network score, social support satisfaction score, and overall social support score. The social support network scores obtained by participants in the SSQ had a mean of 15.88 (9.08). Given that the maximum score for social support network in Sarason's questionnaire is 54, the social support network that many of these pregnant women could count on was quite small. Regarding social support satisfaction, the mean score was 32.32 (6.59). As the maximum score possible for satisfaction in the SSQ is 36, results show that although some participants might not have had big social support networks, many were satisfied with the social support received. The overall social support scores for participants had a mean of 48.20 (12.07), with 90 being the maximum achievable score. This shows that the overall social support mean for the study group was not high, as it was barely above 45.

Total social support scores were divided into four categories for further analysis. Low social support was present in 2.5% of participants and medium-low social support was found in 40.9%, whereas medium-high social support was present in 50% of participants and high social support was present in 6.6%. Medium social support was present in more than 80% of participants.

Stress/anxiety scores had a mean of 66.36 (23.97), and the mean for depression scores was 54.70 (28.84). Emotional lability scores had a mean of 59.71 (16.20). Stress/anxiety scores were the highest among the three variables. Between these three variables, stress was the variable with the highest mean. Women in this study had higher stress/anxiety and depression scores than those obtained with the MBMD in patients with severe and moderate asthma (Lavoie et al., 2010) and had higher stress/anxiety and emotional lability scores than those found in HIV-positive men and women (Cruess, Minor, Antoni, & Millon, 2007).

Frequency of Pregnancy Complications

The incidence of preeclampsia in this study was 6.2%, which is within the reported frequency for preeclampsia in the general population. As preeclampsia has an incidence that ranges from to 2-6% (Chappell et al., 2008), the population studied did not have increased prevalence of this syndrome.

Of the 15 women who developed preeclampsia, seven delivered preterm, being considered as early onset preeclampsia, and eight delivered after week 37, considered as late onset preeclampsia. No statistical analyses to differentiate between early onset and late onset preeclampsia were made for this study.

Preterm birth was the most common pregnancy complication found in this study, accounting for 15.3%, with 37 cases. As the reported prevalence for preterm birth in the general population is 5-10% (Dayan et al., 2006), an increased incidence of preterm birth was found in the population studied. This may have been due to the type of population studied, as the National Institute of Perinatology attends women who have comorbities during pregnancy.

The less common pregnancy complication that was evaluated in this study was abruptio placentae. Only four women had premature abruption of the placenta, representing 1.7% of cases.

Interpretation of Hypothesis 1 Findings

Factors increasing risk for preeclampsia. A logistic regression was performed to evaluate factors predicting the development of preeclampsia. The overall model fit was moderate. However, in the analysis, the Wald statistic indicated that being a single mother significantly predicts preeclampsia with an OR = 4.49 (CI 1.01-19.98). Stress and depression scores were not significant as predictors for preeclampsia in this model. Thus, the first alternative hypothesis, which stated that stress, depression, or emotional lability influence the development of preeclampsia, was not supported by this study. However, the finding that being single can increase the risk of developing preeclampsia is relevant because single marital status has been reported as a risk factor, mostly for preterm birth (Shah, Zao, & Ali, 2011), but not for preeclampsia. Perhaps being single affects the development of preeclampsia through pathways different from those of stress and depression evaluated in this study, or by increasing allostatic load biomarkers, which

were not measured in this study. On the other hand, low socioeconomic status has been considered a risk factor for preeclampsia (Silva et al., 2008), but in this study, family income was not significant for the development of preeclampsia. The fact that the majority of participants in this study were from low-income families may have influenced the results on this matter because there was not a high income population for comparison.

Factors increasing risk for preterm birth. A logistic regression was performed in order to evaluate predictor variables for preeclampsia. The overall model fit was fair, and the Wald statistic showed that two variables were significant for preterm birth in this model: being single, OR = 4.04, 95% CI [1.08, 15.03], and social support, OR = 0.95, 95% CI [0.92, 0.99]. For social support, the OR is below 1. Thus, social support reduces by 5% the risk for preterm birth. In contrast, stress and depression scores were not significant as predictors for preterm birth in this model; this result is similar to those of other studies that did not find an association between stress and depression and preterm birth (Berle et al., 2005).

The results from this analysis regarding social status and social support are similar to those of other studies. Maternal unmarried social status was associated in a meta-analysis with increased risk of preterm birth (Shah et al., 2011), and Ancel et al. (1999) also found increased risk for preterm birth in unmarried cohabiting and unmarried noncohabiting women (Ancel, Saurel-Cubizolles, Renzo, Papiernik, & Bréart, 1999).

Finding a small but protective effect of social support on the development of preterm birth in this study is relevant because social support has been reported to improve pregnancy outcomes (Hoffman & Hatch, 1996), and lack of social support may be

considered an important risk factor for preterm birth (Elsenbruch et al., 2007). However, according to the results in this study, the association between social support and lower risk for preterm birth may not be through the stress-buffering effects of social support in these patients, as stress and depression were not significant predictors of preterm birth in this study. On the other hand, it may be that higher levels of social support decrease stress scores in such a way that stress no longer acts as a predictor variable for preterm birth. Further studies are needed in order to clarify these concepts and explain the pathways by which the presence or the lack of social support may affect pregnancy outcomes .

Lastly, it must be noted that eight patients who developed preeclampsia also delivered preterm. Even though patients with early onset preeclampsia are at higher risk of delivering preterm because preeclampsia develops before week 34 of gestation, it is relevant that single maternal status was related to both preeclampsia and preterm birth as a predicting factor. These findings may have important implications not only for social workers, but also for clinicians, and they may help gain a broader perspective on the importance of being accompanied and cared for during the gestational period.

Factors increasing risk for abruptio placentae. A logistic regression was performed to evaluate factors predicting the development of abruptio placentae. The overall model fit was moderate, and the model was not statistically reliable to distinguish between abruptio placentae and non-abruptio placentae. However, one significant variable was found in the model that included seven independent variables. Family income was significant as a predictor for abruptio placentae, OR= 26.04, 95% CI [1.09, 617.78].

Although low family income may increase the risk of low weight for gestational age babies and preterm birth (Parker, Schoendorf, & Kiely, 1994), it is not a common risk factor reported for abruptio placentae. Known risk factors for abruptio placentae are multigravidity and folic acid deficiency (Hibbard & Hibbard, 1963).

The finding that low income may act as a predictor for abruptio placentae could have been promoted by the high prevalence of low-income families evaluated in this study, which may also explain the high variability in the confidence interval for this variable. Further studies that include a higher number of cases with abruptio placentae may be needed.

Factors increasing risk for newborns with low weight for gestational age. A logistic regression was performed to evaluate factors predicting the delivery of low weight for gestational age newborns (SGA). The overall model fit was poor, and no variables were found to be statistically significant as predictors of low weight for gestational age in this model. This may have been due to low sample size or to a poor model fit, because other studies have found increased risk for SGA and low family income (Parker et al., 1994), for maternal unmarried status (Shah et al., 2011), and for maternal depression (Stewart, 2007). Although no statistical differences were found in this regression model, it is believed that fetal growth and newborn weight can be predicted by the amount of maternal social support (Feldman et al., 2000).

Interpretation of Hypothesis 2 Findings

Impact of Social Support on Stress and Depression. A MANCOVA was performed to evaluate the effects of different social support levels on maternal scores for

stress/anxiety, depression and emotional lability, controlling for maternal age and number of pregnancies. Results showed that stress/anxiety scores and depression scores are significantly influenced by social support levels, being the effect size of depression higher (partial $n^2 = 0.106$) than that of stress/anxiety (partial $n^2 = 0.047$). The small number of participants in the low social support group (n = 6) may explain the lack of statistical differences for this group. Results indicate that higher levels of social support are associated with lower levels of depression and lower levels of stress/anxiety in pregnant women.

Social support is believed to affect well-being by potentially protecting the adverse effects of stress (Cohen & Wills, 1985). Hoffman et al (1996) emphasize the importance of social support on improving pregnancy outcomes because it may have direct buffering effects on stressors (Hoffman et al., 1996). In this study, social support does appear to have buffering effects on stress levels, and, more importantly, on depression scores. The finding that social support can have direct implications on depression scores in pregnant women is interesting because social support has mainly been attributed a stress-buffering effect but not a depression-buffering effect. The second alternative hypothesis, which stated that availability of social support has a significant relationship with the presence of stress/anxiety and/or depression during pregnancy was supported by this study.

According to the results, not only social support scores may influences stress scores, the number of pregnancies significantly influence stress scores during pregnancy.

This finding may help healthcare providers comprehend how emotional factors may affect women during first time pregnancy.

Interpretation of Hypothesis 3 Findings

Impact of Stress/Anxiety, Depression and Emotional Lability on Newborn Weight. Three sets of factorial ANOVA were performed to evaluate the impact of stress/anxiety, depression and emotional lability on newborn weight.

Results of the 2X2 factorial analysis of variance to evaluate the effect of stress and emotional lability showed that newborn weight is not significantly different in women with low and high levels of stress and low and high levels of emotional lability. Line plots of the variables stress/anxiety and emotional lability show no interaction either. Although the effect of these variables on newborn weight it is not statistically significant, lines show that higher levels of stress and emotional lability are related to lower newborn weight than low stress and low emotional lability.

Results of the 2X2 factorial analysis of variance to evaluate the effect of stress and depression showed that newborn weight is significantly different in women with low and high levels of stress and low and high levels of depression. Although factorial analysis did not show a statistically significant combined effect of stress and depression on newborn weight, line plots of the variables stress/anxiety and depression show interaction between factors. High stress scores combined with high depression scores are related to lower newborn weight.

These results support the concept that stress and depression can affect newborn weight and are similar to those found in other studies, which reported that maternal stress

and severe life events can be associated to low birthweight (Khashan et al., 2008; Rondo et al., 2003). However, other researchers have not found an association between stress and depression with low birth weight (Berle et al., 2005; Brooke, Anderson, Bland, Peacock, & Stewart, 1989). The finding that stress and depression scores can affect newborn weight has relevant implications because it is highly probable that this may due to the participation of neuroendocrine pathways that are affecting either fetal nutrient availability or affecting fetal endocrine mechanisms. Unfortunately, no biomarkers were measured in this study to be able to correlate them with stress, depression scores and newborn weight. According to the line plots, the presence of high stress scores and low depression scores may be related to lower newborn weight than high depression, and low stress scores. This implies that high stress scores are the ones related to lower newborn weight.

Results of the 2X2 factorial analysis of variance to evaluate the effect of emotional lability and depression showed that newborn weight is significantly different in women with low and high levels of depression.

Although the combined effect of emotional lability and depression on newborn weight was not statistically significant in factorial analysis, line plots of the variables emotional lability and depression show interaction among variables. High levels of depression scores combined with high levels of emotional lability are related to lower newborn weight. Low levels of depression combined with low levels of emotional lability do not affect newborn weight according to line plots.

The results supported the finding that increased maternal depression can be related to low-weight for gestational age because it can affect infant growth (Nasreen et al., 2010; Stewart, 2007). Stress and low social support have been related to emotional lability in pregnancy (Norbeck et al., 1983), but the effects of emotional lability on pregnancy outcomes has not been fully studied. This study did not find an association between emotional lability and newborn weight.

Implications for Social Change and Recommendations for Action

As being a single mother may increase the probability of developing preterm birth and preeclampsia in low-income Mexican women, social workers from the National Institute of Perinatology should take special care of those single women being attended at this hospital. Even though the study was not able to indicate by what mechanisms being single could increase the probabilities of developing preterm birth or preeclampsia, it could be related to decreased amount of social support in these women and, perhaps, higher levels of stress or allostatic load. The creation of social support groups at this perinatology hospital would be relevant for these patients.

The results show that the amount of social support perceived by pregnant women can affect stress and depression scores. Thus, by focusing in the detection of those women with low levels of social support within the population attended at the hospital, we may be able to identify those women with higher vulnerability for experiencing higher levels of stress or depression during pregnancy.

While being evaluated, many women commented to me their need to learn stress management techniques and several participants referred their eagerness to participate in

stress management activities. The establishment of a stress management program for pregnant women at the National Institute of Perinatology would be highly appropriate and, along with social support groups, may have an impact on pregnancy outcomes.

The results of this study can be useful in promoting social change for those pregnant women in vulnerable psychosocial situations because they show the importance of psychosocial well being during pregnancy and the possible impact of some emotional aspects on pregnancy outcomes, by affecting allostatic load. Pregnancy is a delicate time for the mother and the fetus. It is a time where neuroendocrine changes promoted by chronic stress or depression have shown to affect immune system regulation (Wadhwa et al., 2001) that may lead to pregnancy complications (Coussons-Read, Okun, & Nettles, 2007) or the metabolic programming of the fetus (Beijers et al., 2010; Brunton et al., 2010). This is why the uses of education resources promoting healthy lifestyle patterns, the establishment of stress management programs during pregnancy, and the promotion of social support groups, especially for those single pregnant women and those in scarce support conditions, could promote a positive impact in our society.

Limitations and Future Recommendations

Limitations

As many participants did not complete the MBMD test correctly, many were not able to be located by the researcher after delivery, and many others had missing data, the required sample to have a power of 0.80 was not achieved and may represent a limitation of this study. With a sample of 242 participants, the power of this study was 0.74, considering an alpha level of 0.05. Due to small effect sizes of stress and depression on

the development of pregnancy complications, studies on this matter require a large sample size, especially for multivariate statistical analyses like logistic regression, in which many factors are evaluated at the same time. Perhaps, the sample size of this study was not big enough to find statistical differences in the logistic regression analyses. Furthermore, poor model fit for logistic regression analyses may not have affected results regarding variable interactions, which may also be a limitation of this study.

Another limitation of this study was that it included mostly women from low-income families. Women from low socio-economical status could be exposed to different stressors or situations that may affect their emotional well being during pregnancy, compared to those from medium or high-income families. This may render these results less generalizable.

Additionally, this study did not include the measurement of allostatic load biomarkers or the evaluation of immune system components. Since it is thought that stress and depression may influence pregnancy outcomes through changes in cortisol, pregnancy hormones, and cytokine regulation, a relevant part of the pathophysiological mechanisms involved were not evaluated by this study. Lastly, the interaction between pathologies present in 136 of participants with pregnancy outcomes was not evaluated in the current study, which may also represent a limitation of the study.

Future Recommendations

Future research projects regarding the effects of stress and depression on the development of pregnancy complications should include the evaluation of allostatic load biomarkers, as well as immunological parameters, in order to know more in depth which

biological pathways are involved in increasing risk for preterm birth, low-weight for gestational age or other poor perinatal outcomes. Also, the relationship between stress and depression with gestational hypertension and gestational diabetes could be evaluated in follow-up studies. Future recommendations for research would also include a bigger sample size for logistic regression in order to have adequate statistical power.

The finding that depression may be associated with higher newborn weight is interesting and it would be appropriate to do further research on this matter to explore if this could be related to increased cortisol levels or to a higher incidence of gestational diabetes in depressed women. However, this finding may also be a statistical artifact, given its counterintuitive nature.

While collecting the data, the researcher noticed many potential research gaps that could be explored in future studies, such as the relationship between psychosocial factors and the development of gestational hypertension and gestational diabetes.

Conclusion

Overall, the findings lend partial support to the notion that psychosocial factors can increase the risk for pregnancy complications. Even though the mechanisms by which emotional factors can affect pregnancy outcomes are not fully known, several studies indicate possible contributors to neuroendocrine changes that may affect the delicate immunorregulatory processes involved during pregnancy. Further studies are needed in order to identify changes in biomarkers associated with these psychosocial variables.

The results of this study indicate that single maternal socioeconomical status, low levels of social support, low family income, the number of pregnancies, high stress scores, and high depression scores are elements contributing, directly or indirectly, to the development of pregnancy complications or poor pregnancy outcomes.

Importantly, many of these factors are potentially modifiable. This means that we could have an impact on some psychosocial factors that may be contributing to pregnancy morbidity by creating social support groups for women in low social support environments, and stress management programs for those women with high levels of stress. Unfortunately, many psychosocial factors that may contribute to poor pregnancy outcomes are also related to low socioeconomical status, which is a difficult factor to modify in the short term. This study's results aim to promote awareness regarding the psychosocial conditions of the Mexican pregnant woman that may be contributing to poor gestational outcomes.

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Appendix A: Informed Consent

Informed Consent for the Effects of Stress/Anxiety, Depression and Emotional Lability on the Development of Pregnancy Complications Study (English)

CONSENT FORM

You are invited to take part in a research study that will evaluate the effects of stress/anxiety, depression and emotional lability on the development of pregnancy complications. The researcher is inviting pregnant women who are 18 to 42 years old, in any trimester of pregnancy, who don't have chronic hypertension, and who will be receiving prenatal consultations at the National Institute of Perinatology to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Dr. Estibalitz Laresgoiti, MD, who is a PhD student at Walden University.

Background information

The purpose of this study is to evaluate if stress, depression and/or emotional lability during pregnancy can be associated to the development of preeclampsia, abruptio placentae, preterm birth and low birthweight for gestational age babies. This study will also appraise if the amount of perceived social support may influence the levels of stress, anxiety, depression and emotional lability. This study will also assess if women with higher levels of stress or emotional lability deliver babies with lower birthweight.

Approximately 300 pregnant women will be included in this study. All pregnant women

who receive prenatal healthcare at the National Institute of Perinatology, who accept to participate by signing the Statement of Consent will be included in the study.

Procedures

If you agree to be in this study, you will be asked to: complete the administration of two written tests. The first one will evaluate the level of stress, anxiety or depression that you may be experiencing during pregnancy. The second test will help the researcher know the amount of perceived social support that you have during this pregnancy. Information regarding your age, your socioeconomical status and your social status will also be needed. The participants will dedicate approximately 35 minutes of their time to answer the written tests. You will then be followed until pregnancy termination when the researcher will record if you developed pregnancy complications and your pre pregnancy and post-delivery weight in your medical record. The researcher will not contact you at this time because the follow up data will be retrieved from the medical record. Your baby´s birthweight and Apgar will also be obtained as well from medical records.

This study will not evaluate any treatments. In this study, measurements of stress, anxiety, depression, and emotional lability will be performed during pregnancy. After delivery, the development of pregnancy complications and birth conditions of your baby will be recorded. Afterwards, the researcher will evaluate if the levels of stress, anxiety depression or emotional lability can be correlated with the development of pregnancy complications.

Voluntary Nature of the Study

This study is voluntary. Everyone will respect your decision of whether or not you

choose to be in the study. No one at the National Institute of Perinatology will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

If you agree to participate in this research study, you will be asked to sign the Statement of Consent located below this Informed Consent Form. By accepting to participate, you agree to answer the Millon Behavioral Medicine Diagnostic Test, which will help us measure the parameters previously mentioned, and the Social Support Questionnaire that will evaluate the level of perceived social support by the participant during pregnancy. The participant will commit to stay in touch with the researchers so they can follow her pregnancy until delivery, which may take place at the National Institute of Perinatology, or, if not possible, at another hospital.

Risks and Benefits of Being in the Study:

Being in this type of study may involve some risk of the minor discomforts that can be encountered in daily life, such as becoming upset due to test administration. However, there are no known risks for the tests that will be used in this study. Being in this study would not pose risk to your safety or wellbeing.

If you decide to participate in this study, the benefits for you and your baby will not be directly reflected in the short term. The information that will be obtained in this study may allow us to implement new parameters in health care attention for the pregnant woman, and establish outlines for the prevention of pregnancy complications. In this study, we pretend to evaluate the psychosocial factors that can be modified in order to improve maternal and newborn outcomes.

Payment

The participation in this study will have no monetary cost for any participant. Neither the participant will receive any type of compensation for her participation in this study. Your participation in the study is voluntary and you are free to withdraw at any time. Your decision to participate in this study will not affect your relationship with the National Institute of Perinatology neither the quality of the health care services that you receive as a patient of this Institute.

You may ask the researchers for a report of the results from the Millon Behavioral Medicine diagnostic test and the Social Support Questionnaire after you deliver your baby, and this will have no cost for you.

Privacy

The records of this study will be kept confidential. The demographic, psychosocial and health related information will be kept private and will only be revised by the researcher. During data analysis, your information will not be identified by your name; you data will be linked to your medical record number at the National Institute of Perinatology. Only the researcher participating in this project will be able to link the tests results with you. Research records and databases will be saved in password-protected files. In any sort of report that might be published, I will not include any information that will make it possible to identify a participant. The data will only be used for research matters and will not be used other persons not related to this study. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions

You may ask any questions you have now. Or if you have questions later, you may contact the researcher. If you have any doubts regarding the informed consent process or your rights as a research study participant please contact de Human Research Studies Committee of the National Institute of Perinatology. Walden University's approval number for this study is _____and it expires on _____

This project has been approved and is supervised by the Bioethics and Research Committee of this the National Institute of Perinatology. This Committee is formed by a group of experts that revises meticulously the research projects and the possible risks for the participants of the study

The researcher will give you a copy of this form to keep

Statement of Consent

I have read the above information and I feel I understand the study well enough to make a decision about my involvement.

By signing below I confirm that I have read the informed consent form for the participation in this study, which has been given to me. My participation in this project is entirely voluntary and I know am free to refuse to participate or finish my participation at any moment, without this affecting the health care services I receive now, or will receive in the future. I consent to participate in this study because I have had the opportunity to discuss my doubts, worries and expectatives regarding this study. I have been given

enough information regarding my participation in this research study. I understand that I am agreeing to the terms described above.

Printed Name of Participant _____

Date of Consent _____

Participant's Signature _____

Researcher's Signature _____

Informed Consent for the Effects of Stress/Anxiety, Depression and Emotional Lability on the Development of Pregnancy Complications Study (Spanish)

FORMA DE CONSENTIMIENTO INFORMADO

Se le invita a formar parte de un estudio de investigación que evaluará los efectos del estrés/ansiedad, depresión y labilidad emocional en el desarrollo de complicaciones del embarazo. El investigador esta invitando a las mujeres embarazadas, de 18 a 42 años de edad, en cualquier trimestre del embarazo, que no tengan hipertensión crónica previa al embarazo y que reciban atención perinatal en el Instituto Nacional de Perinatología. Esta forma es parte del proceso llamado "consentimiento informado" que permitirá a usted entender este estudio antes de decidir si quiere participar.

Este estudio será dirigido por la investigadora llamada Dra. Estibalitz Laresgoiti, quien es una estudiante de doctorado en Walden University.

Antecedentes e Información General

El objetivo de este estudio es saber si el estrés, la labilidad emocional y la depresión durante la gestación pueden estar asociados al desarrollo de preeclampsia, desprendimiento prematuro de placenta normo inserta, parto pretérmino y con el estado de su bebé al nacer. El estudio también evaluará si el apoyo social percibido por la paciente durante el embarazo puede afectar los niveles de estrés, ansiedad o depresión de la madre. Este estudio evaluará también si los pacientes con mayores de niveles de estrés o labilidad emocional tienen bebés con menor peso al nacimiento.

Procedimientos

Si acepta participar en este estudio, se le pedirá que realice dos pruebas escritas. La

primera prueba nos ayudará a evaluar el nivel de estrés, ansiedad o depresión que pudiera usted estar presentando durante su embarazo. La otra prueba será un cuestionario que nos ayudará a conocer el apoyo social con el que usted cuenta durante su embarazo. También se solicitará a usted información sobre la edad que tiene durante este embarazo y su estado civil. Las participantes dedicarán aproximadamente 35 minutos de su tiempo para responder las pruebas escritas. Será usted posteriormente monitoreada por los investigadores hasta el fin de su embarazo para evaluar si usted presentó alguna complicación durante el mismo y cual fue el Apgar de su bebé al nacimiento. Se registrará también el peso de su bebé al nacimiento y el peso de usted al iniciar y terminar su embarazo. El investigador no lo contactará al final de su embarazo porque el resto de los datos necesarios para el estudio se obtendrán de su expediente clínico.
El estudio no propone evaluar ningún tipo de tratamiento,. Lo que se hará será medir los niveles de estrés, ansiedad y depresión durante el embarazo y se seguirá a la mujer hasta el final del embarazo. Después del nacimiento de su bebe se revisara en su expediente clínico si usted desarrollo alguna complicaciones del embarazo y se registrarán las condiciones de nacimiento de su bebé. Posteriormente se evaluará si los niveles de estrés, ansiedad o depresión en el embarazo se pueden estar relacionados con el desarrollo de ciertas complicaciones del embarazo.

Naturaleza Voluntaria de este Estudio

Este estudio es voluntario. Todos respetaran su decisión sobre si participar o no en el estudio. Nadie en el Instituto Nacional de Perinatología la tratará de manera diferente si

decide no participar en este estudio. Si decide ser arte del estudio ahora, puede cambiar de opinión posteriormente. Puede acabar su participación en cualquier momento.

Si está de acuerdo en participar en este estudio de investigación se le pedirá que firme la declaración de consentimiento informado localizada al final de esta carta. Al aceptar participar en el estudio, usted acepta contestar la prueba Millon de Diagnóstico de Comportamiento para el Campo Médico, que nos ayudará a medir los parámetros antes mencionados, y el Cuestionario de Apoyo Social de Sarason, que busca evaluar el nivel de apoyo social percibido por la paciente durante el embarazo. La paciente se comprometerá a mantenerse en contacto con los investigadores para que estos puedan seguir su embarazo hasta su final, ya sea en el INPer, o en otro hospital, en caso de que el nacimiento no haya sido en esta Institución.

Riesgos y Beneficios de Participar en este Estudio

El participar en este estudio puede involucrar algún riesgo de incomodidades menores encontradas en el su vida diaria, como por ejemplo, estar incomoda con la administración de las pruebas.. Sin embargo, no hay riesgos conocidos para las pruebas que se usarán en este estudio. El participar en este estudio no pone en riesgo su seguridad y bienestar. Las pacientes solo tendrán que dedicar aproximadamente 25 minutos para contestar las pruebas escritas.

Si usted decide ingresar al estudio, el beneficio para usted y su hijo(a) no será directo. La información que se obtenga podría permitir en un futuro implementar nuevas medidas de atención y nuevos esquemas de prevención de complicaciones del embarazo. En este estudio se pretende evaluar los factores psicosociales que podríamos modificar para

mejorar el pronóstico materno-neonatal.

Pagos o Remuneraciones

No hay ningún costo para usted por participar en este estudio. Tampoco los participantes de este estudio recibirán algún tipo de compensación económica o de otro tipo por participar en el estudio. Su participación en este estudio es totalmente voluntaria y es usted libre de terminar su participación en cualquier momento. Su dedicación de participar en este estudio no afectará su relación con el Instituto Nacional de Perinatología ni la calidad de los servicio de salud que recibe como paciente en este Instituto.

Usted podrá solicitar un reporte de los estudios de los resultados de la prueba Millon y del Cuestionario de Apoyo Social de Sarason a los investigadores al término de su embarazo, sin generarse ningún costo por ello.

Privacidad y Confidencialidad

La información médica obtenida durante este proyecto se mantendrá como confidencial. La información demográfica, psicosocial y relacionada a la salud será siempre confidencial y únicamente será revisada por el investigador de este estudio. Durante el análisis de los datos, su información no será identificada con su nombre; sus datos estarán ligados a su número de expediente clínico del Instituto Nacional de Perinatología y solo el investigador principal del estudio podrá relacionar sus resultados con usted. Las bases de datos que contienen la información de las participantes se mantendrá en archivos protegidos con contraseña. Cualquier tipo de reporte que sea publicado sobre este estudio no contendrá información con la cual sea posible identificar a alguna participante. Los

datos que se obtengan de este estudio serán utilizados con fines de investigación y no serán usados por personas ajenas a este estudio.

Contactos y Preguntas

Podrá hacer preguntas en cualquier momento acerca de este estudio. En caso de alguna duda o si requiere de mayor información se debe comunicar con la encargada del estudio.

Si tiene cualquier duda sobre el proceso de consentimiento informado o sus derechos como un sujeto en investigación deberá ponerse en contacto con el Comité de Investigación para estudios en Humanos en el Instituto Nacional de Perinatología. El número de aprobación de Walden para este estudio es _____y expira el _____.

La realización de este estudio ha sido aprobada y supervisada por el Comité de Investigación y de Bioética de este hospital, quienes son un grupo de expertos que revisan detalladamente los protocolos de estudio y el riesgo para los sujetos de estudio.

El investigador le entregará una copia de esta forma para que usted la conserve.

Declaración de Consentimiento

He leído la hoja de consentimiento informado que se me ha entregado y entiendo el proyecto lo suficiente como para tomar una decisión sobre mi participación.

Al firmar abajo confirmo que he leído la forma de consentimiento que se me ha otorgado para la participación en este estudio. Mi participación en el proyecto es enteramente voluntaria y soy libre de rehusar a tomar parte o a abandonar en cualquier momento, sin afectar ni poner en peligro mi atención médica futura.

Consiento en participar en este proyecto, he tenido la oportunidad de plantear mis dudas, temores, expectativas respecto al estudio. Se me ha proporcionado información suficiente acerca de todo lo referente al estudio, han respondido todas mis preguntas. Entiendo que estoy de acuerdo con los términos descritos anteriormente.

Nombre de la Participante _____

Fecha de Consentimiento _____

Firma de la Participante _____

Firma del Investigador _____

Appendix B: Authorization to Use or Disclose PHI for Research

Authorization to Use or Disclose PHI for Research Purposes (English)

The top portion of this form (above the dotted line) should be completed by the researcher. A copy of the form should be given to the research participant for his/her personal records.

Research Participant Name: _____

Phone:_____

Address: _____

Discloser of Information: National Institute of Perinatology Health Records

Recipient of Information: Estibalitz Laresgoiti Servitje

Means of disclosing information (i.e., verbal, written, etc.): Information will be uploaded to a database for statistical analysis. Only the researcher will be able to link the information obtained from medical records with the participant. The participant's identity will be concealed.

Information to be disclosed:

Medical data

Reason for the Release: This information is being released/obtained for the purpose of evaluating the role of stress,/anxiety, depression, and emotional lability on the development of pregnancy complications. The data that will be obtained from medical records will be: pregnancy outcomes (development of preeclampsia, perterm labor and abruptio placentae), development of infections during pregnancy, newborn's Apgar and

birthweight.

Authorization Provided by Research Participant:

I understand that this authorization permits the release of information between the two parties named above.

I understand that I have the right to refuse to sign this release form.

I understand that upon release, this information will be kept confidential; my identity will be concealed and data will not be re-disclosed outside of the specified individuals or agencies.

I understand a photocopy of this release will be as effective as the original.

I understand this authorization will be in effect for 12 months from the date signed unless cancelled by me in writing. Upon receipt of the written cancellation, this release will be void.

_____

Signature Date

_____

Witness Date

Authorization to Use or Disclose PHI for Research Purposes (Spanish)

Autorización para Liberar/Usar Información Privada

del Expediente Clínico con Fines de Investigación

La porción superior de esta forma (por arriba de la línea punteada) deberá ser llenada por el investigador. Una copia de esta forma deberá ser entregada a la participante.

Nombre de la participante del proyecto: _____

Teléfono:_____

Dirección: _____

Persona que libera la información: Expediente Clínico del Instituto Nacional de Perinatología

Persona que recibe la información: Estibalitz Laresgoiti Servitje

Manera de liberar la información: La información obtenida del expediente clínico y de las pruebas SSQ y MBMD se incorporará a una base de datos para hacer análisis estadístico. Sólo la investigadora podrá enlazar la información obtenida del expediente clínico y las pruebas con los datos de la participante.

Información que será obtenida: Información médica

Razón para liberación de información: Esta información será liberada/obtenida con el fin de evaluar el efecto del estrés/ansiedad, depresión y labilidad emocional en el desarrollo de complicaciones del embarazo. La información que será obtenida del expediente clínico será la siguiente: desarrollo de complicaciones del embarazo (preeclampsia, parto pretérmino, desprendimiento prematuro de placenta normo inserta),

el desarrollo de infecciones durante el embarazo, el Apgar del recién nacido y el peso del bebe al nacimiento.

Autorización Dada por la Participante del Estudio de Investigación:

Entiendo que esta autorización permite la liberación de la información entre las dos personas anteriormente mencionadas.

Entiendo que tengo el derecho de negarme a firmar esta carta de liberación.

Entiendo que al liberarse esta información, esta será mantenida como confidencial y mi identidad se mantendrá oculta y mis datos no serán revelados a nadie fuera de este proyecto de investigación.

Entiendo que una copia de esta carta de liberación será igual de efectiva que la original.

Entiendo que esta autorización tendrá efecto durante los doce meses siguientes a partir de la fecha abajo mencionada a menos de que sea cancelada por mi a través de una petición escrita. En cuanto se reciba una cancelación escrita, esta carta de liberación se invalidará.

_____

Firma Fecha

_____

Testigo Fecha

Appendix C: Permission to Conduct Study

Instituto Nacional de Perinatología
Isidro Espinosa de los Reyes

Ref. 1000.2012. Dirección General
México, D.F. 18 de octubre de 2012

DR. FRANCISCO MORALES CARMONA
Jefe del Departamento de Psicología

Me es grato informar a usted, y a su grupo de colaboradores, que las Comisiones de Investigación y Ética en Investigación han revisado y emitido el dictamen correspondiente a su proyecto:

Evaluación del efecto del estrés/ansiedad, la labilidad emocional y la depresión en el desarrollo de complicaciones del embarazo

ACEPTADO

Registro: 212250-48651

En cuanto al monto económico solicitado por usted para desarrollar el proyecto mencionado, la asignación dependerá estrictamente de la disponibilidad de los recursos federales correspondientes y, en su caso, de la disponibilidad de los recursos entregados por agencias financiadoras externas.

Me permito hacer de su conocimiento que al término del desarrollo de este proyecto usted deberá entregar un **informe técnico final**, (según el formato institucional) disponible en www.inper.mx/investigacion.html, para la presentación de productos de investigación, acompañado de los documentos probatorios del mismo.

Le felicito por su desempeño y compromiso institucional y me es grato enviarle un saludo cordial.

Atentamente,

DR. PEDRO GUTIÉRREZ CASTRELLÓN
DIRECTOR DE INVESTIGACIÓN

JMR/PGC/*phg

Recibí 18/oct/12

Montes Urales 800, Lomas Virreyes, México, DF 11000; Tel. (55) 5520 8565, Fax (55) 55201593; dirgral@inper.mx

Appendix D: Demographic Questionnaire

Demographic Questionnaire (English)

The completion of this demographic questionnaire is relevant for determining the influence of several of factors on the results of this study. All of these records will remain confidential.

Age: _____

Trimester at which the evaluation is taking place:

First: _____

Second: _____

Third: _____

Gestational week at which evaluation is taking place: _____

Social status:

Married ____

Single _____

Partner_____

Divorced____

Widowed_____

Woman's weight before pregnancy: _____

Height _____

Demographic Questionnaire (Spanish)

El llenado de este cuestionario es muy importante para determinar la influencia de varios factores sobre los resultados del estudio. Todos los datos serán confidenciales.

Edad _____

Trimestre en el que se esta evaluando a la paciente: (Marque con una cruz)

Primero_____

Segundo_____

Tercero_____

Edad gestacional en la que se esta evaluando: _____

Estado civil:

Casada: ____

Soltera: _____

Unión libre:_____

Divorciada _____

Viuda:_____

Peso antes del embarazo: _____

Talla _____

Appendix E: Permission to Use Social Support Questionnaire

The Sarason Questionnaires are in the public domain and may be obtained from the University of Washington, Department of Psychology web site: http://www.psych.uw.edu/psych.php#p=161

The Sarason Social Support Questionnaire and the Social Support Questionnaire (short form) have been developed by Irwin and Barbara Sarason and their associates. They are in PDF format (Adobe Reader required) and include the original articles that describe them.

Permission is granted to researchers to use these instruments. However, Dr. Sarason would appreciate information about the findings of studies in which they are used. Anyhow, I asked Dr. Sarason for permission to use the SSQ6. Below is his response:

From: Irwin Sarason

Subject: Re: Permission to use the short version of the Social Support Questionnaire

Date: 31 de mayo de 2012 14:48:14 PDT

To: Estibalitz Laresgoiti

Respond to: Irwin Sarason

You have my permission. There is some useful information at

http://web.psych.washington.edu/research/sarason/

Irwin Sarason

Department of Psychology
University of Washington

On May 11, 2012, at 8:35 PM, Estibalitz Laresgoiti wrote:

Dear Dr. Sarason,

My name is Estibalitz Laresgoiti and I am a PhD student in health psychology at Walden University. I have a medical doctorate degree, a master's in science degree in immunology, and a master's degree in neurosciences. My background is in pregnancy immunology and in psychoneuroimmunology. I am interested in pursuing my dissertation in the area of stress and the development of pregnancy complications. I have been searching for an instrument that would explore perception of social support in pregnant women. I was fascinated when I found the short version of your Social Support Questionnaire in the journal of Social and Personal Relationships. This journal does have a copy of the short version of the Social Support Questionnaire, but I am not sure if the questionnaire is available for public use. I want to ask for your permission to use it in my dissertation study. I would truly appreciate your assistance on this matter, and any direction you might offer.

Please feel free to contact me

Thank you in advance for your help

Sincerely,

Estibalitz Laresgoiti Servitje
PhD Graduate Student, Health Psychology Program
Walden University

Appendix F: Short Version of the Social Support Questionnaire

Sarason, I.G., Sarason, B.R.., Shearin, E.N., & Pierce, G.R. (1987). A brief measure of social support: Practical and Theoretical implications. *Journal of Social and Personal Relationships, 4*, 497-510.

Social Support Questionnaire 6 (SSQ6) (English)

Instructions:

The following questions ask about people in your life who provide you with help or support. Each question has two parts. For the first part, list all the people you know, excluding yourself, whom you can count on for help or support in the manner described. Give the person's initials and their relationship to you (see example). Do not list more than one person next to each of the numbers beneath the question.

For the second part, circle how satisfied you are with the overall support you have.

If you have no support for a question, check the words "No one," but still rate your level of satisfaction. Do not list more than nine persons per question.

Please answer all questions as best you can. All your answers will be kept confidential.

Example:

Who do you know whom you can trust with information that could get you in trouble?

No one	1) T.N. (brother)	4) T.N. (father)	7)
	2) L.M. (friend)	5) L.M. (employer)	8)
	3) R.S. (friend)	6)	9)

How satisfied?

6) very	5) fairly	4) a little	3) a little	2) fairly	1) very

satisfied satisfied satisfied dissatisfied dissatisfied dissatisfied

1. Whom can you really count on to be dependable when you need help?

No one 1) 4) 7)
2) 5) 8)
3) 6) 9)

2. How satisfied?

6) very satisfied 5) fairly satisfied 4) a little satisfied 3) a little dissatisfied 2) fairly dissatisfied 1) very dissatisfied

3. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

No one 1) 4) 7)
2) 5) 8)
3) 6) 9)

4. How satisfied?

6) very satisfied 5) fairly satisfied 4) a little satisfied 3) a little dissatisfied 2) fairly dissatisfied 1) very dissatisfied

5. Who accepts you totally, including both your worst and your best points?

No one 1) 4) 7)
2) 5) 8)
3) 6) 9)

6. How satisfied?

6) very satisfied 5) fairly satisfied 4) a little satisfied 3) a little dissatisfied 2) fairly dissatisfied 1) very dissatisfied

7. Who can you really count on to care about you, regardless of what is happening to you?

No one 1) 4) 7)
2) 5) 8)
3) 6) 9)

8. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied

9. Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

10. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied

11. Who can you count on to console you when you are very upset?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

12. How satisfied?

6) very satisfied	5) fairly satisfied	4) a little satisfied	3) a little dissatisfied	2) fairly dissatisfied	1) very dissatisfied

To score SSQ6:

1. Add total number of people for all 6 odd-numbered items. (Max. is 54). Divide by 6 for per item score. This gives you SSQ Number Score, or SSQN.
2. Add total satisfaction scores for all 6 even-numbered items. (Maximum is 36). Divide by 6 for per item score. This gives you SSQ Satisfaction score or SSQS.
3. You can add up the SSQN score and the SSQS score to obtain the total social support score. The maximum score will be 90.

Cuestionario de Apoyo Social 6 (SSQ6) (Español)

Instrucciones:

Las siguientes preguntas evalúan las personas en su vida que le dan a usted ayuda o apoyo. Cada pregunta tiene dos partes. Para la primera parte, enliste todas las personas que conoce, excluyéndose a usted, en las que usted puede contar para ayuda o apoyo en la manera descrita. Escriba las iniciales de esta persona y la relación con usted (vea el ejemplo). No enliste más de una persona junto a los números debajo de la pregunta y no enliste más de nueve personas por pregunta. Para la segunda parte, circule que tan satisfecha se siente con el apoyo que tiene.. Si no tiene apoyo en alguna de las preguntas, marque la palabra “Nadie”, pero de todas formas marque su nivel de satisfacción.
Por favor, conteste todas las preguntas lo mejor que pueda. Todas sus respuestas serán confidenciales.

Ejemplo:

¿A quien conoce usted que pueda confiar con información que podría ponerla en problemas?

Nadie	1) T.N. (hermano)	4) T.N. (padre)	7)
	2) L.M. (amigo)	5) L.M. (jefe)	8)
	3) R.S. (amiga)	6)	9)

¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

1. **Con quién puede usted realmente contar para apoyarla cuando necesita ayuda?**

Nadie	1)	4)	7)
	2)	5)	8)

	3)	6)	9)

2. ¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

3. Con quién puede usted realmente contar para sentirse más relajada cuando está bajo presión o está tensa?

Nadie	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

4. ¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

5. ¿Quién la acepta totalmente como es, incluyendo sus mejores y sus peores puntos?

Nadie	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

6. ¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

7. ¿En quién puede usted realmente contar para cuidar de usted, sin importar lo que le esté pasando a usted?

Nadie	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

8. ¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

9. ¿Con quién puede usted realmente contar para ayudarla a sentir mejor cuando se siente deprimido y abatido?

Nadie	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

10. ¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

11. ¿Con quién puede usted contar para consolarla cuando se sienta molesto o perturbado?

Nadie	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

12. ¿Qué tan satisfecha está usted con este apoyo?

6) muy satisfecha	5) algo satisfecha	4) poco satisfecha	3) poco insatisfecha	2) algo insatisfecha	1) muy insatisfecha

Para calificar el SSQ6:

1. Sumar el número total de las personas por las 6 preguntas nones que valoran la red de apoyo social. El máximo es 54. Dividir entre 6 para obtener la calificación la red de apoyo social.
2. Sumar la calificación de las preguntas pares, que valoran el grado con el cual la persona está satisfecha con el grado de apoyo social recibido. El máximo es 36. Dividir entre 6 para obtener la calificación de la satisfacción de apoyo social recibido.

3. Sumar la calificación de la red de apoyo social, más la calificación de la satisfacción de apoyo social para obtener la calificación total de apoyo social. La calificación máxima es 90.

Appendix G: Permission to Use MBMD

The Millon Behavioral Medicine Diagnostic (MBMD) Test is distributed by Pearson Assessments. I am an authorized administrator of the MBMD test. The Spanish Q Local / MBMD Answer Sheets will be bought through Pearson's web site, and the tests will be scored using Pearson Assessment's Q local software.

Appendix H: IRB Materials Approval

Walden’s Univeristy Institutional Review Board (IRB) approved application for the study entitled, "Effect of Stress/Anxiety, Depression and Emotional Lability on the Development of Pregnancy Complications."

The approval # was 12-11-12-0180653 and it will expire on December 10, 2013.

Appendix I: Tables and Additional Information

As shown in Table I1, single pregnancies were the most common, accounting for 95.5% of pregnancies. Eleven participants were pregnant with twins and only one participant had triplets.

Table I1

Number of Babies in Uterus

	Frequency	Percent
1	231	95.5
2	10	4.1
3	1	0.4
Total	242	100.0

One baby died *in uterus* before pregnancy termination due to unknown causes. No placental or maternal causes were identified. The remaining 99.5% were born alive (see Table I2).

Table I2

Alive or Deceased Newborns

	Frequency	Percent
Alive	241	99.5
Deceased	1	0.5
Total	242	100.0

Mean gestational age at delivery was 38.19 weeks. The mean newborn height was 48.7 cm and the mean weight of newborns was 2904 grams (see Table I3).

Table I3

Newborn Weight at Delivery

		Gestational Age at Delivery	Newborn weight
N	Valid	242	242
	Missing	0	0
Mean		38.19	2904.44
Median		38.30	2904.50
Mode		38.3	2790[a]
SD		1.58	488.67
Minimum		31.5	1564
Maximum		41.6	4236

a. Multiple modes exist. The smallest value is shown

Of the 242 participants, 254 babies were born. 56.2% of babies were female and 43.8% were male. One baby had dysmorphic external genitalia and was categorized as female after genetic evaluation.

Table I4

Newborn's Sex

	Frequency	Percent
Female	143	56.2
Male	111	43.8
Total	254	100.0

Most babies (93.8%) were born healthy. However, ten had minor malformations, one was born with Down Syndrome, one had gastroschisis, one had cystic hygroma, one baby was microcephalic and one had cleft palate and lip, as shown in Table I5.

Table I5

Newborn Illness

	Frequency	Percent
None	227	93.8
Minor malformations	10	4.1
Trisomy 21	1	0.4
Gastroschisis	1	0.4
Cystic Hygroma	1	0.4
Microcephaly	1	0.4
Cleft lip and palate	1	0.4
Total	242	100.0

Mean gestational age at delivery was 38.19 weeks. The mean newborn height was 48.7 cm and the mean weight of newborns was 2904 grams. The mean Apgar score at minute 1 was 7.93 and the mean Apgar score ar 5 minutes was 8.92. Mean Silverman Anderson scoring for babies was 1.6 (see Table I6).

Table I6

Newborn Conditions at Delivery

		Gestational Age at Delivery	Newborn height	Newborn weight	Apgar 1 min	Apgar 5 min	Silverman Anderson
N	Valid	242	242	242	242	242	242
	Missing	0	0	0	0	0	0
Mean		38.19	48.70	2904.44	7.93	8.92	1.60
Median		38.30	49.00	2904.50	8.00	9.00	2.00
Mode		38.3	50.0	2790[a]	8	9	2
SD		1.58	2.64	488.67	0.92	0.67	.64
Minimum		31.5	36.0	1564	0	0	0
Maximum		41.6	54.0	4236	9	10	5

a. Multiple modes exist. The smallest value is shown

The mean number of maternal infections during pregnancy was 0.91. Statistics are shown in Table I7. Urinary tract infections, respiratory airway infections, gastrointestinal infections and cervicovaginitis were considered.

Table I7

Number of Maternal Infections During Pregnancy

		Number of Maternal Infections
N	Valid	242
	Missing	0
Mean		0.91
Median		1.00
Mode		1
SD		0.74
Minimum		1
Maximum		3

Table I8

Social Support Scores

	Social Support Network	Social Support Satisfaction	Social Support Total Score
Mean	15,88	32.32	48.20
Median	14,00	35.00	48.00
SD	9,08	6.595	12.07
Minimum	0	6	13
Maximum	54	56	89

Curriculum Vitae

Estibalitz Laresgoiti Servitje
Curriculum Vitae

Date of birth: 26 de Septiembre de 1972
Place of birth Distrito Federal, Mexico
Profession and specialty: Physician with postgraduate studies in the psychoneuroimmunology field.

ACADEMIC EXPERIENCE

Candidate for Doctor of Philosophy 2009 - Present
Walden University, Minneapolis, Minnesota.
GPA 3.8
Dissertation: The Effects of Stress, Depression and Emotional Lability on the Development of Pregnancy Complications.

Master in Neurosciences 2004-2005
Universitat Oberta de Catalunya,
Neurosciences and Mental Health Institute.
Barcelona, Spain.
Thesis: Psychoneuroimmunology. Multidirectional Communication.

Master of Sciences in Immunology 1997-2000
National School of Biological Sciences.
Instituto Politécnico Nacional.
Distrito Federal, Mexico
Mean score: 9.7
Thesis: Analysis of the Cytokine Pattern and other Proteins Secreted by J-774 Cells Infected with Bacteria of the Tuberculosis Complex.

Medical Doctorate 1991-1996
Anáhuac University, School of Medicine.
Huixquilucan, State of Mexico
Universidad Nacional Autónoma de Mexico (UNAM)
Mean score: 9.74

Primary, Secondary and High School Studies 1977-1985
Instituto Mexicano Regina 1986-1991
Distrito Federal, Mexico

First year of Secondary Studies 1985-1986
Pensionnat International de La Chassotte
Fribourg, Switzerland..

LICENSURE AND CERTIFICATIONS

- Medical Doctorate Professional License: DGP, SEP 2619183. Mexico.
- Master of Sciences in Immunology Professional License: DGP, SEP: 5296108. Mexico
- National Council of General Practitioners Certification (CONAMEGE), 2011-2016 Registry 11/01/09-1437-10912. Mexico.
- Stress Management Technique Instructor Certification, 2011. American Holistic Nurses Association (AHNA), American Nurses Association. USA.

PROFESSIONAL EXPERIENCE

Clinical Practice in Immunology 2011 – Present
American British Cowdray Medical Center. Mexico.

Professor of Physiopathology and Propaedeutic 2011 – Present
School of Medicine. Panamerican University.
Distrito Federal, Mexico.

Molecular bases and triggers of autoimmunity. Physiopathology of small, medium and large vessel vasculitis. Physiopathology of dermatomyositis, polymyositis, antiphospholipid syndrome, scleroderma, systemic lupus erythematosus, spondyloarthropaties, Sjögren syndrome and rheumatoid arthritis.

Professor of Immunology 2010-2011
School of Medicine. Panamerican University.
Distrito Federal, Mexico

Components of innate and adaptive immunity. Major histocompatibility complex molecules. Antigen processing and presenting in MHC molecules. Immune response induction. Lymphocyte intracellular signaling. Immune system regulation. Hypersensitivity mechanisms. Molecular and genetic basis and triggers of autoimmunity. Immune responses to bacteria, virus, parasites, fungi and prions. Primary and secondary immunodeficiencies.

Professor of Clinical Immunology 2003 – 2009
School of Medicine. Anáhuac University.
Huixquilucan, Estado de Mexico

Active immunization, vaccines and adjuvants. Reproductive immunology. Blood groups and ABO incompatibility reactions. Rh Isoimmunization. Hypersensitivity mechanisms. Molecular and genetic basis and triggers of autoimmunity. Immune

responses to bacteria, virus, parasites, fungi and prions. Primary and secondary immunodeficiencies. Solid organ transplant immunology.

Professor of Basic Immunology 2002-2010
School of Medicine. Anáhuac University.
Huixquilucan, Estado de Mexico

Immune system ontogeny. Primary and secondary lymphoid organs. Components of innate and adaptive immune system. Cytokines. Major histocompatibility complex molecules. Dendritic cells. Antigen processing and presentation T and B lymphocytes' activation. Immune system regulation. Hypersensitivity mechanisms. Autoimmunity.

Chemistry Teacher 2001-2002
School of Medicine. Anáhuac University.
Huixquilucan, Estado de Mexico

Inorganic chemistry. Atom. Electron. Electronegativity. Types of bonds, Water and solubility. Acids and bases. Dissociation coefficients. pH and buffers. Acid/base disequilibrium. Solutions and colloids. Mole, molarity, molality and normality. Equivalent. Osmosis. Osmotic pressure. Colloid osmotic pressure. Alkanes, alkenes, alkynes, alcohols, esters, ether, ketones and amines

Biochemistry Teacher 1998-1999
School of Medicine. Anáhuac University.
Huixquilucan, Estado de Mexico

pH and acid/base disequilibrium. Proteins. Primary, secondary, tertiary and quaternary structure of proteins. Enzymes. Carbohydrates. Carbohydrate metabolism. Glycogenesis. Glycogenolysis. Glycolysis. Krebs cycle. Oxidative phosphorylation. Lipids and beta-oxidation. Ions.

COLLABORATIONS

Collaboration in projects with the Psychoneuroimmunology Group…….2012-Present
at the National Institute of Perinatology

Collaboration as a writer for the website www.infogen.org.mx 2011 - Present
Web site dedicated to the diffusion of pregnancy knowledge and birth defects prevention information.

Collaboration in projects with Dr. David Olson's group. 2010 – Present
Dr. Olson is the Director of the Center for Perinatal Research.
University of Alberta. Edmonton, Canada.

Collaboration in the project: 1995-1996
"Epidemiological, microbiological an molecular analyses

of *S.aureus* and coagulase negative *Staphylococcus* resistance in nosocomial infections in newborn care units" during research social service at the National Institute of Perinatology.

PUBLICATIONS

ARTICLES PUBLISHED IN PEER-REVIEWED JOURNALS

Laresgoiti-Servitje E. A leading role for the immune system in the pathophysiology of preeclampsia. *J Leukoc Biol.* 2013. In press

Gómez-López N, Laresgoiti-Servitje E. T regulatory cells: regulating both therm and preterm labor? Immunol Cell Biol. 2012;90(10):919-920

Laresgoiti-Servitje E, Gomez-Lopez N. (2012). The pathophysiology of preeclampsia involves altered levels of angiogenic factors promoted by hypoxia and autoantibody-mediated mechanisms. *Biol Reprod*. 2012,87(2):36-42

Laresgoiti-Servitje E, Gomez-Lopez N, Olson DM. An immunological insight into the origins of pre-eclampsia. Hum Reprod Update. 2010;16(5):510-24.

Gomez-Lopez N, Laresgoiti-Servitje E, Olson DM, Estrada-Gutierrez G, Vadillo-Ortega F. The role of chemokines in term and premature rupture of the fetal membranes: a review. Biol Reprod. 2010;82(5):809-14. Epub 2010/01/22.

CONGRESS ABSTRACTS PUBLISHED IN PEER-REVIEWED JOURNALS

Laresgoiti-Servitje, E, Méndez-Aragón P, Serafín López J, Estrada Parra S, Estrada-García I. Análisis del patrón de citocinas de células J-774 infectadas con bacterias del complejo tuberculosis. Rev Latinoam Micriobiol. 2000; 42(Supl):397 MX ISSN 0034-9771

ARTICLES PUBLISHED IN WEB SITES

Pregnancy and the Immune System www.infogen.org.mx

The Effects of Stress on Pregnant Women www.infogen.org.mx

The Immune System of the Newborn and the Importance of Breast Milk www.infogen.org.mx

ORAL AND PROFESSIONAL PRESENTATIONS

Preeclampsia Immunology: From its Origins to its Pathophysiology
IV Annual Reunion of the Latin American Chapter of the American Society for Reproductive Immunology.
Iguaçu, Brazil.

Immunodeficiencies and their Association with Cancer, Allergy and Autoimmunity — November, 2012
Medical Association Seminars
American British Cowdray Medical Center, Mexico.

Stress and the Psyhconeuroimmunology of Cancer — July, 2012
Medical Association Seminars
American British Cowdray Medical Center, Mexico.

The Effects of Stress on Your Immune System . — April, 2012
Radio interview with Marthe Debayle.
WRadio 96.9FM. Mexico.

The Effects of Acute and Chronic Stress on the Immune System. — January 2012
Postgraduate Seminars in Immunology.
National School of Biological Sciences.. Instituto Politécnico Nacional

Breast Cancer Immunotherapy — November 2011
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Dynamis of Breast Cell Phsyiology — May 2011
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Cellular Cycle of Mammary Gland Cells. — May 2011
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Development and Involution of the Breast Gland. — May 2011
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Advances in Breast Cancer Therapy — September 2008
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Breast Cancer Immunology — November 2007
Advanced Course in Breast Gland Pathology
Spanish Hospital, College of Gynecologists and Obstetricians.
Mexico.

Breast Cancer Immunology — April 2007
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Mechanisms Involved in Cell Proliferation — April 2007
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico

Breast Cancer Molecular Biology — March 2007
1st Course in Breast Gland Pathology for General Practitioners.
National Association of General Practitioners and Family Physicians.
Mexico.

Newborn Immunology — October 2006
Clinical Session. Pediatrics Pavillion
Mexico City General Hospital.

Breast Cancer Molecular Biology and Pathology — April 2006
International Course on Errors to Avoid in Breast Gland Pathology.
Spanish Hospital, College of Gynecologists and Obstetricians.

Dynamics of Breast Cell Physiology — October 2006
International Diplomate in Breast Gland Pathology
La Salle University. Pachuca, Mexico.

Breast Cancer Immunology — July 2005
International Course on Errors to Avoid in Breast Gland Pathology.
Spanish Hospital, College of Gynecologists and Obstetricians
Erupean Institute of Oncology. Milan, Italy

Active immunization in Clinical Practice — June 2005
2nd Clinical Workshop for Interns
Dalinde Medical Center. Mexico.

The Mollecular Biology of Breast Cancer — April 2004
XXV Annual Reunion of the College of Gynecologists and Obstetricians
Spanish Hospital. Mexico.

CONGRESS PRESENTATIONS

Analysis of the cytokine pattern and other proteins — May 2000
secreted by J-774 cells infected with tuberculosis complex bacteria.
XV Latin-American Congress of Microbiology.
Mérida, Yucatán. Mexico

COURSE ATTENDANCE

Holistic Stress Management Instructor's — September 2011
Certification Workshop
Paramount Wellness Institute. American Holistic Nurses Association
Boulder, Colorado

Advanced Course in Basic And Clinical immunology — February 2010
Federation of Clinical Immunology Societies
Scottsdale, Arizona

Theoretical-Practical Course in Flow Cytometry — December 2007
Uses of Flow Cytometry in Clinical Biomedicine
Clínica Ruiz. Dr. Alejandro Ruiz-Argüelles
Puebla, Puebla. Mexico

Theoretical- Practical Course in Proteomics — October 2007
Postgraduate and Research Department.
Anáhuac University. In collaboration with BioRAD
Huixquilucan, Mexico

Basic Immunology for Clinicians Course: Update 2007 — June 2007
Interventional Immunology, Immunoassessment
and Damage Associated Molecular Pattern Molecules Symposia
Clinical Immunology Society
San Diego, California

Advanced Course in Mucosal Immunology — October 2002
Ruggero Ceppelini Superior School of Immunology
Naples, Italy.

Learning Evaluation Course — September 2002
Center for Teacher Development. Anáhuac University
Huixquilucan, Estado de Mexico

Advanced Trauma Life Support Course — March 1996
American College of Surgeons. Spanish Hospital.

Distrito Federal, Mexico

CONGRESS ATTENDANCES

V SLIMP/ IV Annual Reunion of the Latin American Chapter of the American Society for Reproductive Immunology. Iguaçu, Brazil. — February, 2013

XVII National Congress of Immunology. Mexican Immunology Society. Mexico — May 2006

International Fibromyalgia Symposium. American British Cowdray Medical Center. Mexico — May 2005

XV National Congress of Immunology. Mexican Immunology Society. Mexico — Abril 2002

XIV Annual Reunion of the National Institute of Perinatology. National Institute of Perinatology. Mexico — April 1997

Vaccines and Immunizations in the Pediatric Population. Mexican Pediatrics Society — April 1997

1st World Congress of Pediatric Infectious Diseases. World Society of Pediatric Infectious Diseases — December 1996

1er International Congress of Human Breastfeeding. Mexican Society for the Study and Promotion of Human Lactation .

SCHOLARSHIPS

Mucosal Immunology Course Scholarship. Ruggero Ceppelini Superior School of Immunology. Naples, Italy. — October 2002

Scholarship for Master of Science studies. National Council of Science and Technology (CONACyT). Mexico — 1997

HONORS AND AWARDS

Psi Chi Member. International Honor Society in Psychology — August 2011

Excellence in Teaching Award. Anáhuac University — May 2010

Excellence in Teaching Award. Anáhuac University	May 2009
Excellence in Teaching Award. Anáhuac University	May 2008
Excellence in Teaching Award. Anáhuac University	May 2007
Excellence in Teaching Award. Anáhuac University	May 2006
Excellence in Teaching Award. Anáhuac University	May 2005
Synodal Award . Anáhuac University	April 2005
Synodal Award . Anáhuac University	July 2004
Excellence in Teaching Award. Anáhuac University	May 2005
Synodal Award . Anáhuac University	January2004
Synodal Award . Anáhuac University	July 2003
Excellence in Teaching Award. Anáhuac University	May 2003
Award for having achieved the highest grade in the Intern Graduate Program. Spanish Hospital. Mexico	July 1996
Medical Doctorate Professional Oral Exam of exceptional quality Universidad Nacional Autónoma de Mexico	July 1996
Medical Doctorate Written Professional Exam of excellent quality Anáhuac University	July 1996
Suma cum laude. Medical Doctorate Universidad Anáhuac / UNAM	July 1996
3rd Place in the National Exam of Primary Education. Secretariat of Public Education. Mexico	June 1985

PROFESSIONAL ORGANIZATIONS

Member. Clinical Immunology Society (CIS)	2007 - Present
Member. American Association	2009 - Present

for the Advancement of Science (AAAS)

Member. Health Psychology Division of the American Psychological Association (APA, Division 38). 2009 - Present

Member. Psychoneuroimmunology Research Society 2011 – Present

Member. Federation of Clinical Immunology Societies 2011 – Present

Member. Latin American Society for Immunodeficiencies 2011 - Present

Member. Psi Chi, International Honor Society in Psychology 2011- Present

Member. Society of Leukocyte Biology 2012- Present

LANGUAGES

Certificate of Proficiency in English (CPE) June 1990
Cambridge University. Cambridge. England

First Certificate in English June 1989
Cambridge University. Cambridge, England

Diplôme de la Langue Française. June 1988
Federation des Alliances Françaises
Mexico

French Language Intermediate Level Certificate June 1986
Pensionnat International La Chassotte.
Fribourg, Switzerland

TECHNOLOGY COMPETENCIES

Experience with Windows and Mac operating systems
Experience with Microsoft Office software for Windows and MAC: Word, Excel Power Point.
Experience with iWork software for MAC: Pages, Keynote.
Experience as teacher and student with programs for online education: eCollege, Blackboard, Moodle.
Experience with Refworks, Zotero and End Note reference software, and IBM SPSS predictive analytics software.

COMMUNITY SERVICE

I do community service with the SERTULL Foundation in Mexico, participating in the Health Promotion and the Human Rights Committees.
The Human Rights Committee collaborates with institutions dedicated to combat human trafficking and commercial sexual exploitation in Mexico.