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I am submitting herewith a thesis written by Cathy Lynn Annie entitled "The Effect of Childbirth Stress on Salivary Ig-A Secretion in Prepared and Unprepared Primagravidas: A Pilot Study." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science in Nursing.

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THE EFFECT OF CHILDBIRTH STRESS ON SALIVARY IG-A SECRETION IN PREPARED AND UNPREPARED PRIMAGRAVIDAS: A PILOT STUDY

A Thesis

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ABSTRACT

This study addressed the effect of childbirth stress on a particular parameter of immune function, and examined the effects of childbirth preparation on this parameter. The possibility of relationships between perceived stress and anxiety, maternal and neonatal morbidity, and immune status was posited. These relationships were investigated during a 15 month study, carried out between summer, 1986 and fall, 1987. Data were collected on 40 primagravidas beginning their last trimester of pregnancy. Twenty primagravidas who had chosen to enroll in a 6-week prepared childbirth education program comprised the treatment group. The control group consisted of twenty primagravidas opting not to participate in the education program. As a parameter of immunocompetence, salivary samples for immunoglobulin A assay were collected twice, at 2-week intervals, between 30 and 34 weeks gestation (presumably a lower stress period) for baseline determination, and again immediately following delivery (presumably a higher stress period) for all subjects. Treatment subjects completed a 6-week prepared childbirth education program in the interim between baseline and final sampling. Perceived stress, due to life changes, and anxiety were measured at baseline and final sampling periods uttilizing the Holmes and Rahe Social Readjustment Rating Scale and the State-Trait Anxiety

Inventory respectively. Data on maternal and neonatal morbidity were obtained from each subject's and infant's medical and hospital record.

The results showed that subjects who failed to participate in the 6-week prepared childbirth education program (control group) experienced a significant decrease in salivary immunoglobulin A concentration immediately after childbirth, while subjects who had attended the education program and practiced the various techniques regularly (treatment group) failed to evidence a significant decline. This finding supports previous similar studies dealing with stress and immunity and suggests than stress-reduction strategies (such as childbirth education) promote immunocompetence.

Unprepared study subjects were noted to have higher state anxiety scores than their prepared counterparts, indicating heightened worry, nervousness, tenseness and strain during the last trimester of pregnancy and at the time of labor onset. However, the prepared subjects surprisingly experienced a significant increase in state anxiety with the onset of early labor. In spite of promoting immunocompetence, the study results indicated that childbirth preparation may have inadvertently increased state anxiety in treatment subjects as labor began.

The limited data from this study failed to support a relationship between high stress (secondary to life change),

anxiety, and salivary immunoglobulin A concentration. This finding was in contrast to previous similar studies on stress and immunocompetence. Such studies have suggested that high stress levels cause immunosuppression and frequently precede illness.

Fifty percent of the postpartum maternal complications were found to occur in parturients with non-detectable immunoglobulin A concentrations immediately following childbirth, however the small sample size and low incidence of maternal complications precluded drawing any valid conclusions from the data.

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CHAPTER I

INTRODUCTION

Not long ago, researchers were reluctant to relate psychological factors with disease occurrence, as physiological and psychological connections were not well researched. Today, a considerable amount of scientific evidence supports the notion that stress is associated with changes in immunocompetence, particularly immunosuppression, with resultant diminished resistance to infectious diseases, and increased risk of cancer. Many recent studies of complex chronic and acute psychological stressors such as major examinations, bereavement, and sleep deprivation have confirmed that high levels of stress lower immune response and frequently precede illness. (Bartrop, Luckhurst, Lazarus, & Penny, 1977; Dilman, 1977; Dorian, Keystone, Garfinkel, & Brown, 1981; Fischer et al., 1972; Glaser, Kiecolt-Glaser, George, Speicher, & Holliday, 1985; Jemmott et al., 1983; Kasl, Evans, & Niederman, 1979; Kiecolt-Glaser et al., 1986; Kiecolt-Glaser, Stephens, Lipetz, Speicher, & Glaser, 1985; Kubitz, Peavey, & Moore, 1986; Laudenslager, Ryan, Drugan, Hyson, & Maier, 1983; McClelland, Ross, & Patel, 1985; Palmblad, Petrini, Wasserman, & Akerstedt, 1979).

A new field, termed "psychoneuroimmunology," examines mechanisms by which psychological states and responses interact with the immunological system to affect either health or disease. Former and ongoing research in this subspecialty has enabled both the public and medical community to understand better the interrelationships of states of mind, biological function, and health. Findings of the current research has major implications for both health management and illness prevention modalities (Maier & Laudenslager, 1985; Solomon, Amkraut & Kasper, 1974).

The human immunologic system is a protective mechanism consisting of three levels of defense response. Local barriers, including the skin, mucous membranes, and normal flora (such as that lining the gastrointestinal tract) serve as a first line of defense by protecting body surfaces. The second level of defense is the inflammatory response which functions through phagocytic cells of the blood, reticuloendothelial, and lymphatic systems to ingest and digest foreign materials that have transcended local defense barriers. The immune response, or third level of defense is a physiologic reaction of the body to any substance considered foreign or threatening (Fischbach, 1984).

An antigen is a foreign protein capable of evoking an immune response. Typical antigens are viruses, bacteria, fungi, and cancer cells. Two types of immune response help

protect the individual from invading foreign substances. The cell-mediated response is produced locally by activated lymphocytes present at the time and location of the invading antigen, while the humoral immune response involves the production of protein molecules called antibodies which enter and are widely distributed throughout the body fluids (Fischbach, 1984; Groer, 1983).

The humoral immune response of importance to this study involves the production of antibodies from specialized plasma lymphocytes called B-cells. These specialized cells originate from stem cells in the embryonic bone marrow, migrate to an unidentified area believed to be Peyer's Patches (lymphoid tissue lining the gastrointestinal tract) and mature. This maturation mechanism has been shown to occur as early as 9 weeks in embryonic life (Groer, 1983).

When a mature B-cell encounters an antigen, the cell divides and differentiates into a plasma cell, which initiates the production and secretion of antibodies (immunoglobulins). All B-cells have receptor-specific immunoglobulin molecules on their membrane surfaces that correlate specifically with the antibody class being produced. Antibodies are specific, reacting only with the antigen responsible for antibody production. Derangement in B-cell function leads to inadequate production of antibody (immunoincompetence), and manifests clinically as increased susceptibility to infections and enhanced pathogenicity from

drugs and toxins (Fischbach, 1984; Groer, 1983; Stewart & Gershwin, 1981).

Immunoglobulins (Igs) are all structurally similar, possessing four polypeptide chains, two heavy chains and two light chains, linked together by disulfide bonds. Immunoglobulin classification is determined according to the type of heavy chain present. Immunoglobulin-A (Ig-A) consists of two heavy and two light chains and comprises 5-15% of the total body immunoglobulin (Schweitzer, 1985; Widmann, 1983).

Two types of Ig-A exist, secretory and serum. Secretory Ig-A is the fraction found in high concentrations in exocrine secretions such as tears, saliva, intestinal juices, colostrum and milk. Secretory Ig-A is produced after terminal differentiation of plasma cells contained within the lamina propria (close to the mucosal surfaces) and seems to play a major role in preventing pathogens from invading the mucosal surfaces of the respiratory, digestive, bronchial, and genital tracts. Ig-A does not affect the pathogen directly, but exerts its effect by attaching to the surface of the microorganism (agglutination), preventing bacterial and viral adherence to the mucosal surface and thus preventing absorption (epithelial penetration). Secretory Ig-A has a configuration slightly different than serum Ig-A as the result of a secretory component that attaches to the surface cells, permitting secretory Ig-A to

survive the hostile environments where it is usually found. As an additional protective feature, Ig-A can also bind to neutrophils and activate an alternative defense system known as the complement system. Receptors for Ig-A can be found on lymphocytes, polymorphonuclear leukocytes, and monocytes (Andrews & Capra, 1980; Bernier, 1985; Groer, 1983; Riddick, 1981; Schweitzer, 1985; Widmann, 1983).

Ig-A does not cross the placenta and is not appreciable in infants for several months after birth. Adult levels are reached at approximately 5 years of age. The mean serum Ig-A value for adults in the 17 to 49 year age group is 79 mg/dL $\pm$ 0.161 mg/dL, while salivary Ig-A concentration is approximately one-third that of serum. Ig-A has a half-life of 5.8 to 7 days and is extremely concentrated (600 mg%) in breast milk. In colostrum, Ig-A acts locally within the newborn's intestinal tract against potential pathogens (Bernier,1985; Groer, 1983; Stewart & Gershwin, 1981).

B-cell function in humans can be quantitated by evaluating the major immunoglobulin classes, including Ig-A. The most widely used and reliable method for Ig quantitation is the radial immunodiffusion assay technique. The procedure involves addition of antibody to wells containing a specific antigen. The antigen diffuses radially, forming a ring of precipitate which continues to enlarge until the antigen completely reacts. Once the ring stops enlarging, a quantitative relationship exists between the ring diameter

and the concentration of the antigen, the ring diameter being directly proportional to the concentration of the test sample. Reference sera are analyzed, then plotted, and unknown sample concentrations are determined from the reference plot. This radial immunodiffusion assay technique was utilized for salivary Ig-A quantitation in this study (Stewart & Gershwin, 1981).

The immune system is an open system, affected by a great number of internal and external variables, each with the capacity to alter immunocompetence and lead to pathophysiological disruptions. Unprepared childbirth can be seen as both an internal and external variable (stressor) with the potential for altering immunocompetence, including B-cell function and subsequent immunoglobulin production. Reduced Ig-A concentration can be expected to diminish local resistance (first line defense) by increasing vulnerability to exogenous microorganisms (Andrews & Capra, 1980; Groer, 1983).

Childbirth, experienced by most women during young middle adulthood, is frequently wrought with fear, uncertitude, ambivalence, and anxiety, leading to varying degrees of disequilibrium and stress. Of paramount importance is the individual's ability to cope with the stressful situation. For decades, prepared childbirth education has been successfully utilized as a method of

stress reduction (coping strategy) during childbirth. Concentration, relaxation, and breathing techniques serve to shift attention from pain toward another focus, thereby making pain consciousness more peripheral, while body-building exercises help tone muscles to be utilized during labor and delivery. Intensive classroom instruction focusing on important aspects of the birth process helps break the fear-tension-pain cycle, contributing to stress reduction through education (Bergstrom-Walan, 1963; Cogan, 1973; Cogan, Henneborn, & Klopfer, 1976; Davenport-Slack & Boylan, 1974; Huttel, Mitchell, Fischer, & Meyer, 1972; Mulcahy & Janz, 1973; Scott & Rose, 1976; Stone, Demchik-Stone, & Horan, 1977; Yahia & Ulin, 1965; Zacharias, 1981).

The theoretical framework for this study was based on Sister Callista Roy's adaptation model. Roy's model (1976) contains three major elements- man, adaptation, and the nursing process. Man is seen as a biopsychosocial and holistic being whose whole is different from and greater than the sum of his parts. Man is an integrated system with interrlated parts. Basic to Roy's model is a belief that man is an open living system who continuously interacts with and exchanges energy, matter, and information with his

environment. Man's constant interaction with his internal and external environment necessitates both internal and external change. This change is referred to as adaptation.

Adaptive mechanisms, both genetically determined and learned, permit man to cope with environmental change. Man has a great, although limited capacity to adapt. The adaptation process occurs when an individual positively responds to internal or external change. Two factors, the extent of environmental change and the individual's coping ability, are significant in determining whether an individual will be capable of adapting to change.

Adaptation level is the state of an individual's coping, which will determine whether a positive response to internal or external environmental change will occur. Individual adaptation level is determined by focal, contextual, and residual stimuli. A focal stimulus consists of any environmental influence necessitating change. Contextual stimuli consist of internal and external influences that are measurable and reported by the individual. Residual stimuli, which may be difficult to quantify objectively, are the very unique, individual characteristics that exist and are relevant to the situation. When the sum of the stimuli falls within the individual's zone of adaptation, a positive reponse to change (adaptation) has occurred. Maladaptation results

when the total stimuli fall outside the individual's zone of adaptation.

Roy depicts four adaptation modes by which man responds to change. She has termed these physiological, self-concept, role function and interdependence modes. Recognition of deficits or excesses by the individual activates the modes and stimulates coping behavior. The individual strives to attain and maintain biopsychosocial integrity, physiological integrity through physiological adaptive mechanisms (endocrine system), self-concept integrity through psychological modes (goal attainment), role function integrity by social interaction modes (role performance), and interdependence integrity through interdependence modes (self-fulfillment). Adaptation occurs and integrity is maintained by positive responses to need deficits or excesses. Maladaptation results when responses to deficits or excesses are deficient (Galbreath, 1980; Haan, 1982; Rawlings, 1984; Robinson, Bridgewater, Molla, & Wathen, 1982; Roy, 1976).

Pregnancy and birth is a period of transition, of moving from the known or certain to the unknown, uncertain, and untested. Stress and anxiety are inevitable components of this period. Environmental influences (focal stimuli) such as change in financial status or work pattern; internal and external factors (contextual stimuli) including genitourinary, musculoskeletal, endocrine, body image, and

nutritional changes, as well as individual characteristics (residual stimuli) such as educational level and previous experience will all play a role in the degree of stress and anxiety experienced. Each of these factors will necessitate some degree of adaptation.

Adaptation occurs when the pregnant individual recognizes personal deficits (lack of knowledge regarding the birth process) and excesses (weight gain) which threaten integrity, and initiates change. The pregnant individual experiencing fear regarding impending labor and delivery adapts positively (copes) by seeking information, making informed choices, establishing close interpersonal relationships with other expectant individuals, learning cognitive and relaxation strategies, and developing parenting skills. As a result of these activities, fear, anxiety, and stress are reduced, illness prevented, and integrity maintained. By contrast, the expectant individual experiencing stress and anxiety as a result of pregnancy complications may manifest maladaptation by neglecting nutritional needs and by failing to take vital medications or heed medical advice. The result of maladaptation is disruption of biopsychosocial integrity which may adversely affect both mother and fetus and potentiate illness.

Pregnancy and parturition are also periods of great internal change. Alteration in organ systems, body processes and structure required for meeting both maternal and fetal pregnancy and birth needs demands tremendous

physical and physiological adaptation (including immunocompetence) if integrity is to be maintained. Perceived coping ability will play a major role in the degree of stress and anxiety experienced during this period. By decreasing stress and anxiety associated with birth, childbirth education facilitates positive adaptation and promotes health.

Nominal definitions for this study include:

Immunoglobulin - A (Ig-A)	a protein of B lymphocyte origin providing local, first-line defense against pathogens; secreted by the external secretory organs and found in saliva and in high concentrations in colostrum.
Immunosuppression	diminished immune response.
Colostrum	early breast milk.
Primagravida	woman bearing her first child.
Morbidity	illness or disease.

Stress	the result of any demand made upon an individual with the potential for producing disequilibrium (disrupting biopsychosocial integrity) if coping responses are inadequate.
Life change unit	significant life event changes pertaining to marriage, education, work, family and peer relationships, finances, religion, recreation, and health (including pregnancy) with the potential for producing stress and necessitating adaptation.
Stressor	childbirth (labor and delivery) was utilized in this study as a stimulus or situation capable of initiating a stress reaction in the study subjects.
Anxiety	a sense of apprehension associated with feelings of uncertainty and helplessness, resulting from a threat to an

individual's being, self-esteem, or identity; subjectively experienced, having both behavioral and physiological components.

Neonate — newly born infant from birth to 4 weeks.

Review of related literature has generated the following hypotheses for this study:

1) There will be no significant difference in salivary Ig-A concentration in treatment (prepared) and control (unprepared) groups at initial (baseline) sampling.
2) There will be a significant decrease in salivary Ig-A concentration from baseline to final determinations in both treatment and control groups.
3) The decline in Ig-A concentration will be greater in the control group than in the treatment group.
4) Subjects with high scores on the Holmes & Rahe Social Readjustment Rating Scale and State-Trait Anxiety Inventory will have lower Ig-A concentrations than subjects with low scores on the same scales.
5) Subjects with the lowest Ig-A levels at the time of

delivery (final sampling) will have a higher incidence of postpartum morbidity than subjects with higher Ig-A levels.

Childbirth can be viewed as a stressful transition period requiring biopsychosocial adaptation if integrity is to be maintained and health promoted. Physiological integrity includes immunocompetence. Childbirth education facilitates positive coping through education and training in relaxation and cognitive strategies, strengthens psychosocial integrity, and promotes adaptation.

The purpose of this pilot study was to probe the link between stress, coping, and immunity, utilizing prepared and unprepared childbirth as potential stressors, prepared childbirth education as a coping strategy, and Ig-A as a marker parameter of immunocompetence. It was felt that significant findings in this study would have major implications for postpartum maternal morbidity and espouse the need for childbirth preparation in the antenatal period. Additionally, the study was intended to extend stress and immunological phenomena to include the childbearing individual. Review of the literature revealed few studies exploring childbirth as a potential stressor, and no studies were located examining specifically the effect of childbirth stress on immunocompetence.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

Chapter II contains an overview of topics pertinent to the study. The literature review will focus on the stress concept including psychosocial correlates and support of childbirth education as a coping strategy (stress reduction technique). Recent studies examining the effects of various stressors on immunocompetence parameters are included and serve as a basis for this study.

The Stress Concept

Hans Selye (1982) defined stress as the "nonspecific result of any demand upon the body" (p. 7). Many different situations (stressors) are capable of producing stress and disrupting homeostasis. Both psychological and physical stressors exist. Examples include pain, fatigue, fear, trauma, loss, shame, and bacteria to mention a few. In an effort to deal with the stress, the body employs adaptive responses, or defense mechanisms that permit the individual to cope with the stressor.

Stress can be seen as a necessary component of normal life, with low levels helping to mobilize or motivate the

individual and promote growth. On the other hand, extreme and/or continual stress will deplete energy reserves and adversely affect the individual's physical and emotional functioning (Robinson et al., 1982).

At a more physiologic level, one sees a strikingly similar systemic response irregardless of the type or location of the stressor. Selye (1982) in his earlier works, has named this restorative process the "General Adaptation Syndrome" (GAS). In spite of considerable progress in analysis of the stress reaction, the precise manner in which the alarm reaction is mediated has yet to be identified. The first mediator, through an unknown mechanism, excites the hypothalamus. Stimulation of nerve cells in the median eminence of the hypothalamus causes release of cortiocotrophic hormone releasing factor, which relays messages to the pituitary gland. As a result of pituitary stimulation, adrenocorticotrophic hormone (ACTH) is released, causing the adrenals to secrete corticoids, primarily glucocorticoids, to increase serum glucose (gluconeogenesis) which serves as a source of energy in meeting bodily needs.

This outpouring of corticoids (primarily cortisol) into the blood and body fluids minimizes stressor effects, permitting the individual to adapt to the stressor through the syntoxic, anti-inflammatory, and anti-immune activity of cortisol. Corticoids have also been demonstrated to stimulate the development of connective tissue for protection against

further intrusion, and to exert syntoxic effects which promote adaptation to stressors (Groer, 1983).

An additional result of corticoid stimulation is reduction in the number of circulating eosinophils and lymphocytes, including T-lymphocytes (T-cells). Proper T-cell function is necessary to protect the individual from invasion by microorganisms (bacteria, viruses, and parasites), and for rejection of malignant cells. A decrease in T-cell number would also result in a reduction of circulating lymphokines, T-cell derived chemical substances which assist the inflammatory response. Lymphokines consist of: (a) chemotactic factors, which attract lymphocytes, neutrophils, and macrophages to the inflammatory site, (b) mitogenic factors, which stimulate leukocyte division, increasing leukocyte number, and (c) macrophage-inhibiting factors, which prevent movement of macrophages from the inflammatory site, thus prolonging macrophage action (Groer, 1983).

Corticoid stimulation as a result of stress has both protective and potentially disruptive features. Although cortisol has been shown to promote syntoxic, anti-inflammatory, and anti-immune activity, promoting adaptation, the decrease in lymphocyte number (including T-cells and lymphokines) brought about by corticoid stimulation may result in adverse inflammatory and immune

effects and increased host vulnerability to potential pathogens.

Also involved in the stress reaction are the mineralocorticoids (such as aldosterone) which enhance the renal tubular reabsorption of sodium and chloride. Somatotrophin, or growth hormone, is also involved in the defense reaction. All of these processes are controlled by way of feedback loops to the hypothalamic-hypophyseal-adrenocortical axis (Selye, 1982; Guzzetta & Forsyth, 1979).

In addition to the above reactions, another pathway facilitates the alarm phase of the stress response. Stimulation of the sympathetic nervous system causes release of large amounts of catecholamines with resultant increases in heart rate and contractility, vasoconstriction, blood pressure, serum glucose, and alertness. The blood coagulation process is also stimulated by epinephrine (a catecholamine), serving as a protective mechanism in the event of excessive bleeding (Guzzetta & Forsyth, 1979).

Researchers have discovered morphine-like substances, called endorphins, produced in the brain, which may shed light on the first mediating response in the stress reaction. Endorphins have been found to possess properties similar to those of ACTH. Not only do endorphins serve as pain killers, but their relatively high concentrations in pituitary tissue

lead researchers to believe that they may play a critical role in transmission of the alarm signal (Selye, 1982).

More current views of stress take into consideration the individual's ability to act on both his internal and external environment, and to appraise and select among responses. Each person's perception of both demand and coping is unique and based on learning. It is the individual who perceives the demand, chooses a coping response, and finally determines how satisfactory that response is. Stress arises from a perceived mismatch between demands made on the individual and coping ability, and must be viewed within the context of the individual's life (Clark, 1984; Lazarus and DeLongis, 1983).

An inability to classify the demand and/or associate an appropriate coping response will result in inefficient or ineffective coping and increased stress. The timing and strength of the demand are also critical in the individual's appraisal of coping ability: coping ability will be impaired during high demand periods. Similarly, when an individual perceives his coping ability as greater than demand, a sense of control and enhanced self-esteem will result. On the other hand, perceived lack of control under circumstances in which coping is important may be associated with loss of self-esteem. Consistent lack of control leads to feelings of helplessness and depression (Clark, 1984).

Physiological stressors such as trauma, infection, or hemorrhage, disrupt homeostasis directly, bringing about

local adaptation such as clot formation or an inflammatory response. Also associated is activation of the GAS. Demands capable of invoking stress responses act through the hypothalamus to increase sympathetic and endocrine responses and promote physiological adaptation (Clark, 1984).

When confronted with situations necessitating change (adaptation), individuals prefer to assume "active" rather than "passive" roles, and effect change when possible. When change is impossible (impending labor), cognitive coping strategies assist adaptation by altering the meaning of the situation for the individual (Lazarus & DeLongis, 1982). Lack of social and emotional support have been demonstrated to exacerbate the stress reaction, serving as important psychosocial variables in adaptation (Brown, 1985; Haan, 1982).

Findings of an interesting study by Billings and Moos (1981) indicated that active attempts to deal with stressors and less avoidance behavior by individuals were associated with diminished stress, while passivity and more avoidance behavior were found to contribute to stress. Additionally, it was discovered that "active" copers tended to be those with more education and income, indicating that socioeconomic status may be yet another variable in the coping process.

Stress and Immune Function

Attempts to understand the underlying pathophysiology of

the immune response to stress focused on many parameters. Stressors examined have varied from space flight, sleep deprivation, noise, life change, and bereavement to academic stress and major examinations. Immune responses have been measured by indicators such as white blood cell counts, lymphoblast transformation, immunoglobulin levels, natural killer cell concentration, cortisol levels, even viral infections such as mononucleosis or herpes simplex reactivation. (Bartrop et al., 1977; Dorian, 1981; Fischer et al., 1972; Glaser et al., 1985; Jemmott et al.,1983; Kasl et al., 1979; Kiecolt-Glaser, Glaser et al., 1986; Kiecolt-Glaser, Stephens et al., 1985; Laudenslager et al., 1983; Palmblad et al., 1979; Solomon et al., 1974).

In a 1984 study of 34 first year medical students, researchers found a significant reduction in the percentage of helper/inducer T-lymphocytes, decreased helper/inducer-suppressor/cytotoxic-cell ratio, and natural killer cell activity associated with examination stress. Students assigned to a relaxation group showed a significantly higher percentage of helper/inducer cells (indicating less immunosuppression) than students not participating in relaxation (Kiecolt-Glaser et al., 1986).

A similar study conducted with 76 first year medical students in 1985 revealed significantly higher antibody titers to three herpes virus variants, namely Epstein-Barr virus, Herpes simplex virus, and Cytomegalovirus associated

with examination stress and loneliness. High titers found in these subjects suggest depression of the cellular immune response with resultant diminished control over the virus. Findings of this study indicated that stress related immunosuppression can significantly alter herpes virus latency (Glaser et al., 1985).

In a 1977 study of 33 bereaved spouses, Bartrop et al. discovered depressed lymphoblast transformation (no difference in T or B-cell number, but depressed T-cell function) in comparison to non-bereaved controls. Findings of this study also suggested a positive association between the length of bereavement and degree of immunosuppression.

Another interesting study (Jemmott et al., 1983) examined the relationship of power motivation, academic stress, and immune function. This study utilized 64 first year dental students as subjects, and measured secretion of salivary Ig-A during three high stress and two low stress periods. Results of this study indicated that differential personality characteristics may affect Ig-A secretion rates. Subjects reporting a great need to establish and maintain warm personal relationships secreted more Ig-A, while those with a high inhibited need for power (desiring prestige, but unable to express this motive) had lower secretory rates. An aggregate decline in Ig-A secretion related to major examinations was also noted in both personality types. Results of this study support the belief that stress can inhibit immune response.

Fischer et al. (1972) carried out a study utilizing 21 crewmen from Apollo missions 7 through 13 as subjects. The purpose was to assess the effects of space flight environment on cellular division, utilizing lymphocyte counts. The results indicated a somewhat delayed increase in lymphocyte number (on the first day post-flight), while RNA and DNA synthesis (lymphoblast transformation) remained stable during both pre and post flight periods.

In a 1983 study of rats exposed to shock, controllability of the stressor (shock) was noted to be a critical factor in lymphocyte proliferation. Findings of this study suggested that complex psychological factors such an organism's loss of control over events may affect immune response (Laudenslager et al., 1983).

In a study of twelve young male subjects, the effect of 48 hours of sleep deprivation on in vitro DNA synthesis of blood lymphocytes was measured. Findings suggested a reduction in DNA synthesis of lymphocytes following sleep deprivation, with return to pre-exposure levels five days after the stressor. Sleep deprivation, with concomitant increase in energy production at the expense of other body systems may be the mechanism involved in this study. This expense may include defense against infectious organisms (Palmblad et al., 1979).

Risk factors in the development of infectious mononucleosis were studied in 1400 West Point cadets in a

prospective 4-year study. Of the subjects, two-thirds were found to be immune to Epstein-Barr virus (antibody present) at initiation of the study, and one-third were susceptible (lacking Epstein-Barr virus antibody). Epstein- Barr virus (EBV) is the organism responsible for infectious mononucleosis. Within the susceptible group, 20% per year became seroconverters (developed the antibody). Twenty-five percent of the seroconverters developed clinically apparent infectious mononucleosis. Psychosocial risk factors among seroconverters that increased the risk of EBV infection included: (a) having fathers who were "overachievers," (b) having a strong commitment to a military career, (c) highly valuing certain aspects of training and military career, (d) poor academic performance, and (e) high motivation with poor academic performance. The combination of high motivation and poor academic performance was the best predictor for the development of infectious mononucleosis (Kasl et al., 1979).

Kiecolt-Glaser et al. (1985) studied differences in DNA repair in lymphocytes among 28 high and low distressed psychiatric inpatients. Study results confirmed significantly poorer DNA repair of lymphocytes in the high distress group in comparison to the low distress group. Because lymphocytes normally respond to bacterial or viral antigens by increasing DNA synthesis and cell replication, impairment of this mechanism could result in compromised immune response.

Psychiatric residents comprised the experimental group in a study designed to measure changes in immune and endocrine function as a result of Oral Fellowship Examination stress. The experimental group displayed significantly reduced mitogen response (indicating diminished T-lymphocyte number) before the exam, compared to controls, with an increase after the stressor. Cortisol levels were significantly lower before and after the exam in the experimental group. Subjects reporting high subjective stress had a significant increase in the percentage of late rosettes (T-lymphocyte markers), also indicating a decrease in T-lymphocyte number, which returned to normal following the exam. Results of this study support significant reduction in cellular immunity (mediated by T-lymphocytes) as a result of psychological stress (Dorian et al., 1981).

A 1986 study by Kubitz, Peavey, and Moore examined the effect of locus of control in 129 high and low stressed individuals on salivary Ig-A levels. The results showed no significant difference between the high and low stressed groups on salivary Ig-A levels. However, a significant negative correlation between internal locus of control and Ig-A secretion was noted, indicating that individuals with a strong internal locus of control secrete less Ig-A. The findings suggested that individuals with a high internal locus may be particularly vulnerable to high stress levels, especially uncontrollable stress. Women participating in the

study were interestingly noted to have lower Ig-A levels during the premenstrual phase (second half) of their menstrual cycles.

Findings of a 1985 study by McClelland, Ross, and Patel of 46 college students indicated that academic examination stress stimulates secretion of norepinephrine (adrenergic activity) and eventually lowers Ig-A secretion. Students whose reported need for power was greater than their need for affiliation secreted more norepinephrine than students reporting a greater need for affiliation than power. The greater increase in norepinephrine secretion in the power group was associated with a greater subsequent drop in salivary Ig-A secretion. Results of this study suggested that intense adrenergic stimulation (evidenced in individuals with high power needs) diminishes immune function.

Experimental findings by Solomon et al. (1974) suggested that the macrophage may be the target link between stress and immunity, playing a significant role in the afferent, central and efferent limbs of the immune system. Any event causing a reduction in macrophage activity, such as stress, may inhibit both cellular (T-lymphocyte) and humoral (B-lymphocyte) immune responses.

Dilman (1977) discussed the role of metabolic changes, namely an increase in free fatty acids, insulin, cholesterol, and triglycerides, in depression of cellular immunity. Metabolic changes such as these occur normally during

pregnancy, periods of rapid growth, stress, and aging. During these high stress periods, glycogen stores are limited, and free fatty acids become an energy-producing substrate. Free fatty acids suppress glucose uptake by muscle and intensify gluconeogenesis, but at the same time, may cause lymphocytolysis with resultant metabolic immunodepression. These metabolic changes also promote cell-division, and as a direct result, increase the possibility of malignant transformation.

Although stress is seen as a necessary motivating force in daily life, extreme and/or continual stress may potentiate illness by disrupting biopsychosocial integrity. Previous studies of various stressors and immune parameters support the belief that chronic and acute stress causes immunosuppression and predisposes to illness. Unique psychosocial variables (such as control, preception, education, and self-esteem) also affect the stress response in very individualistic ways.

The Role of Childbirth Preparation

As early as 1933, Grantly Dick-Read proposed a new method for the management of childbirth, which he called natural childbirth. His method emphasized that labor involves a cycle of fear, which leads to tension, and finally pain. When pain occurs, the fear is confirmed and the cycle perpetuated. This method of preparation for childbirth

focuses on reduction of fear through education and thus reduction of pain. Dick-Read's early work is the forerunner of several childbirth education programs designed to facilitate enhanced birthing experiences for families. The education focus endures as a vital part of modern childbirth preparation.

The Lamaze technique, also termed the psychoprophylactic method, emerged in the 1960's in efforts to incorporate psychological aspects of the birth process into childbirth preparation. The Lamaze technique, utilized in this study, focuses on: (a) the use of active progressive muscular relaxation to decrease anxiety and tension and enhance relaxation; (b) increasingly complex patterned breathing with use of focal points, a form of cognitive control, to dissociate the painful aspects of contractions, thereby reducing pain perception and increasing pain tolerance; (c) provision of both subjective and objective information about childbirth prior to the onset of labor in attempts to lessen or eliminate the fear-tension-pain cycle; (d) positive support and encouragement by the coach and others actively involved in the birth process to enhance self-esteem and reinforce coping ability; and (e) rehearsal for labor, which allows the couple to experience mock labor, practice techniques learned, explore feelings and reactions, and gain confidence in themselves (Bergstrom-Walan, 1963;

Davenport-Slack & Boylan, 1974; Stone et al., 1977; Yahia & Ulin, 1965).

In a 1973 study of 317 psychoprophylactic births, Cogan reported no pain during early labor in 48% of cases, no pain during late first stage in 35%, and absence of pain during transition in 17% of the subjects. During the second stage of labor, 60% reported no pain at all. Other studies, utilizing control groups, also supported the belief that prepared women experience less pain and require less intrapartum analgesia than their unprepared counterparts (Bergstrom-Walan, 1963; Huttel et al., 1972; Scott & Rose, 1976). Later researchers argued that medication levels did not necessarily reflect the amount of pain experienced, and sought the use of laboratory stressors such as ice immersion, shock application, or pressure in attempts to induce pain. Results of such investigations also suggested that the use of relaxation techniques, cognitive strategies, and adequate information regarding an impending stressful event can diminish the painfulness of various laboratory stressors. The mechanism of pain reduction may be an increase in pain tolerance (Mulcahy & Janz, 1973; Stone et al., 1977).

One very notable and consistent finding in the literature was that women who prepared for birth were calmer, more relaxed, and able to exercise greater control during their labors and deliveries. Enhanced control was manifested

by greater degrees of muscular relaxation, decreased muscular rigidity, less motor unrest, fewer outcries and need for less pain-relieving medication (Bergstrom-Walan, 1963; Cogan et al., 1976; Davenport-Slack & Boylan, 1974; Huttel et al., 1972; Yahia & Ulin, 1975). Willmuth, in a 1975 study, found that a positive delivery experience was closely associated with perceived control.

Cogan et al. (1976) noted that other factors such as the husband's participation in both classes and labor, feeling prepared for the birth, encouragement by the physician, and perceived degree of relaxation also contributed to a positive birth experience. Zacharias, in a 1981 study of 50 high-risk indigent women found that those who had completed childbirth education had significantly more positive attitudes toward childbirth than those who did not.

Jiminez (1980) described psychoprophylactic methods as coping tools. Through preparation, couples learn to examine their feelings, to assess how and why they react to situations in peculiar ways, and learn how to respond appropriately to a stressful encounter. Successful childbirth education necessitates that parents possess both the ability and self-esteem to use the coping tools (breathing, exercises and relaxation techniques).

Summary of Related Literature

Although the physiologic response to stress with stimulation of the hypothalamic-pituitary axis and sympathetic nervous system is relatively invariate, numerous psychosocial and environmental variables contribute to stress perception and response in very unique, individualistic ways. Variables identified include the individual's (a) perception of the threat, (b) appraisal of coping ability, (c) cognitive coping style, (d) perceived degree of control, (e) presence or absence of social or emotional support, and (f) socio-economic status.

Even though exact pathophysiological mechanisms remain obscure, all incorporated studies designed to explore immune responses to major life stressors have equated stress with immunosuppression and resultant illness. Psychosocial factors including personality characteristics were also seen as variables in many of the studies.

All components of prepared childbirth education facilitate coping and decrease the somatic consequences of stress by assisting the expectant couple to manage stress more effectively, both physically and psychologically. Such preparation involves mobilization of both personal and social resources to decrease anxiety and increase satisfaction, predictability and control. Studies included in review of the literature support the belief that Lamaze training fosters effective coping. This chapter provided a

review of related literature regarding the effect of childbirth stress on immune function. Chapter III follows with an inclusion of the research design, operational definitions, methodology, instruments, and data collection.

CHAPTER III

DESIGN AND METHODOLOGY

The design and methods utilized in this study are delineated in the following sections of this chapter: (a) research design; (b) description of groups; (c) restatement of the hypothesis; (d) operational definitions; (e) methodology; (f) instruments; and (g) data collection.

Research Design

This quasi-experimental pilot study was conducted in order to determine whether a parameter of immune response to the stress of childbirth differed significantly in prepared versus unprepared indivduals. In addition, an attempt was made to ascertain whether a relationship existed between self-reported life changes and anxiety and immune function. Finally, the relationship between immunosuppression and maternal morbidity was studied.

Description of Groups

Demographic characteristics of treatment and control subjects are presented in Table 1. All subjects were female, Caucasian, and primagravidas. The control group had a mean age of 20.2 years, with a range of 16 to 24 years, while the treatment group mean age was 24.8 years with a range of 20 to 31 years. Statistics on marital status revealed that 94.5% of

TABLE 1
Demographic Characteristics of
Treatment and Control Subjects

Characteristic	Treatment (n = 18)	Control (n = 11)
Age (yrs)*		
mean	24.8	20.2
range	20-31	16-24
Marital Status		
married	94.5%	81.8%
single	5.5%	18.2%
Income (thousands)*		
15	5.9%	45.4%
15-25	29.4%	36.4%
25-35	41.2%	18.2%
35-50	17.6%	0%
50+	5.9%	0%
Education Level*		
grade 10-11	0%	27.3%
high school	29.4%	45.4%
college 1-2 yrs	35.3%	27.3%
college 3-4 yrs	17.6%	0%
college 5-6 yrs	11.8%	0%
college 7-8 yrs	5.9%	0%

*Significant at $p < .05$

the treatment subjects and 81.8% of the control subjects were married at the time of study participation.

Regarding income, 81.8% of the control subjects' gross family income was within the two lowest income brackets (less than $15,000, and between $15,000 and $25,000 per year). In

contrast, 70.6% of treatment subjects had gross family incomes between $15,000 and $35,000 per year. The greatest percentage of control subjects reported incomes of less than $15,000 per year (45.4%), while 41.2% of treatment subjects reported yearly incomes between $25,000 and $35,000. Of the 11 control subjects participating in the study, 27.3% were still in high school (grades 11 and 12), 45.4% had high school educations, and the remaining 27.3% had completed one or two years of college. The minimum education level for treatment subjects was high school graduate (29.4%), while 35.3% had completed 1 or 2 years of college, and 17.6% had completed 3 or 4 years of college. Seventeen percent of the treatment subjects had graduate level educations. The demographic data indicated that treatment subjects tended to be older, better educated, and of a higher socio-economic status in comparison to control subjects. The difference between groups on these variables utilizing one-way analysis of variance reached statistical significance at $p < .05$.

Restatement of the Hypotheses

The dependent or criterion variable for this study was salivary Ig-A concentration. The independent variables were prepared childbirth education and self-reported life changes and state anxiety. In the final hypothesis, maternal morbidity was the dependent variable, while Ig-A concentration was the

independent variable. The hypotheses for this study are restated below:

1) There will be no significant difference in salivary Ig-A concentration in treatment (prepared) and control (unprepared) groups at initial (baseline) sampling.
2) There will be a significant decrease in salivary Ig-A concentration from baseline to final determinations in both treatment and control groups.
3) The decline in Ig-A concentration will be greater in the control group than in the treatment group.
4) Subjects with high scores on the Homes and Rahe Social Readjustment Rating Scale and State-Trait Anxiety Inventory will have lower Ig-A concentrations than subjects with low scores on the same scales.
5) Subjects with the lowest Ig-A levels at the time of delivery (final sampling) will have a higher incidence of post partum morbidity than subjects with higher Ig-A levels.

Operational Definitions

Immunoglobulin - A (Ig-A) — a secretory immunoglobulin obtained from each subject's saliva and quantified utilizing Kallestad's radial

	immunodiffusion assay kit and procedure (see Appendix C for complete procedure).
Immunosuppression	decreased salivary Ig-A concentration.
Morbidity	maternal illness(es) occurring during the last trimester of pregnancy and the 6-week postpartum period; specifically noted were bacterial and viral infections of the repiratory, gastrointestinal, and genitourinary systems, and breasts.
Medications	all drugs (other than prenatal vitamins, iron, or calcium) ingested during the 12 week antenatal observation period; particularly noted were drugs capable of altering immune response such as antibiotics.
Life change unit	social readjustments felt to

	increase both stress and illness frequency, and necessitate adaptation, measured by the Holmes and Rahe Social Readjustment Rating Scale (see Appendix D).
Stressor	childbirth.
State anxiety	situational apprehension, tension, or worry as measured by the state portion of the State-Trait Anxiety Inventory (see Appendix E).
Prepared childbirth education	a 6 week education series completed by all treatment participants, designed to provide education and physical and emotional conditioning for childbirth.
Circadian rhythms	innate, biologic, 24-hour cyclic variations in body processes and reactions, including immunoglobulin secretion.

Methodology

The subjects for this study were selected from a private obstetrical practice during routine prenatal visits. The selection of subjects was influenced by three factors: expected delivery date, parity, and willingness to participate in the study. All subjects were primigravidas, delivered at the same hospital, by the same private physician and hospital staff.

The study was initiated following College of Nursing and Institutional Review Board approval. A total of 40 control and treatment subjects agreed to participate in the study; however 12 subjects were excluded from the statistical analysis. Of these twelve, 2 subjects experienced pre-term labor, and were unable to collect both baseline samples, while 3 subjects were excluded from the statistical analysis. Of these twelve, 2 subjects experienced pre-term labor, and were unable to collect both baseline samples, while 3 subjects wer excluded for noncompliance. Two subjects who had received antibiotic therapy for upper respiratory infections during the last trimester of pregnancy and 5 subjects who were unable to collect final specimens because of dryness were also excluded from the study.

An explanation of the study by the researcher was given each participant individually during a routine prenatal office visit, and informed consent obtained. It

was emphasized that participation in the study was totally voluntary, that there would be no compensation for participation, and that discontinuance was acceptable at any time if desired. Subjects were not considered to be at any risk due to participation in the study.

The subjects were informed that the data being collected were to help determine the effect of childbirth stress on one aspect of immune (body defense) function, and to explore possible relationship(s) between stress, immune function, and illness. Data on demographic and other variables such as age, gender, socio-economic status, educational level, health status, medications taken, previously learned stress reduction techniques and other information were collected at initiation of the study (see Appendix A).

The treatment group consisted of 17 individuals who had: (a) opted to participate in prepared childbirth education; (b) completed at least four of the six classes; and (c) practiced the various childbirth techniques at least twice weekly for 20-30 minutes from initiation of the classes until delivery. The control group was comprised of 11 individuals opting not to participate in prepared childbirth education. In attempts to ensure constancy of information and training, childbirth classes were conducted by trained instructors who followed a specific content outline for each of the six classes (see Appendix B for complete

outline). Class attendance and frequency of practice were recorded by the instructors. Previous training and current practice of any stress reduction technique by treatment and control subjects was also noted.

This pilot study consisted of three phases. During phase one, two timed, 5-minute baseline samples of saliva were collected at 2-week intervals between 30 and 34 weeks gestation (lower stress period) from all subjects during a routine office visit. Because Ig concentration fluctuates on a cyclic, 24-hour basis (circadian rhythms) saliva was collected at 4:00 p.m. from subjects and stored frozen in a controlled laboratory at -20 °C until sample analysis was performed. Treatment subjects collected baseline samples prior to initiation of childbirth classes. In phase two, treatment subjects completed a 6-week prepared childbirth education series (independent variable). During phase three, timed, 5-minute samples of saliva were again collected within 1 to 2 hours after birth (higher stress period) and frozen. Due to the nature of the study and timing of samples, it was not feasible to consider circadian rhythms in the final sampling. All study participants were hydrated during labor and recovery with intravenous fluids at a controlled rate of 125 mL/hr.

Subjects submitted salivary samples into prepared, labeled specimen bottles by chewing a small piece of paraffin for a timed, 5-minute period, and then transferring

the saliva and paraffin into the container. Specimens were immediately frozen. All samples were analyzed at the same time in a controlled hospital laboratory utilizing a commercially available radial immunodiffusion assay kit specific for salivary Ig-A quantitation (see Appendix C for procedure). Analysis was carried out by the researcher and a certified medical laboratory technician trained in the technique.

Code numbers were utilized in data collection, and only the investigator was able to identify individual subjects. The investigator remained blind to the specimens during analysis. Data were not revealed from any phase until study completion at which time they were made available in summarized form to all participants.

Information regarding chronic health problems and illnesses as well as medications taken during the last trimester of pegnancy was obtained from prenatal office records and recorded. Note was also made of length of the labor, manner of infant feeding (breast or bottle), as well as intrapartum and postpartum complications, including maternal and neonatal morbidity during the 6-week period after delivery. This information was obtained from each mother's and infant's hospital record and from pediatric medical records.

In attempts to quantify the degree of stress and anxiety at both sampling periods, as well as changes from baseline to

final determinations, subjects were asked to respond to the Holmes and Rahe Social Readjustment Rating Scale (see Appendix D), and the state portion of the State-Trait Anxiety Inventory (see Appendix E). All subjects were requested to respond to both scales at the time of baseline sampling, and again with the onset of regular uterine contractions (early labor).

Instrumentation

The demographic data were obtained through a questionnaire developed by the researcher (see Appendix A). A data sheet, also designed by the investigator, was used to compile individual information (see Appendix F).

Life changes were assessed with the Holmes and Rahe Social Readjustment Rating Scale which is presented in Appendix D (Holmes and Rahe, 1967). This particular instrument, used extensively since the mid 1960's, has enabled researchers to study empirically both the quality and quantity of life events and positively correlate life changes with illness frequency. Previous studies have established that a cluster of life events necessitating changes in lifestyle are significantly associated with illness causation, the time of illness onset, and disease severity (Wyler, Masuda, & Holmes, 1971). Life events listed on the Social Readjustment Rating Scale pertain to significant areas in the social structure of American life,

including marriage, education, occupation, family, group and peer relationships, economic concerns, religion, recreation, and health. Pregnancy is also included as a major life event. Each life event listed on the scale necessitates some adaptive or coping behavior and requires significant change in living pattern. This need for adaptation is accompanied by psychophysiologic reactions which alter body function and render the body vulnerable to pathogens. The greater the life change or adaptive requirement, the greater will be bodily disruption and vulnerability (Holmes & Rahe, 1967; Wyler et al., 1971).

A total of 394 subjects were utilized in development and testing of the Holmes and Rahe Social Readjustment Rating Scale. Subjects were grouped according to gender, marital status, age, race, socio-economic status, generation American, and religion. The order and magnitude of the 43 life event items included in the ratio scale demonstrated high concensus among the discrete groups utilized in testing. All of the correlation coefficients between groups were above .90, the only exception being between white and Black, which was .82. Kendall's correlation coefficient for the 394 subjects involved in testing was .477, significant at $\underline{p} < .0005$. The high degree of similarity between populations within the sample suggests that universal concensus between groups and among individuals regarding the significance of life events exists. This agreement

transcends variations in education, sex, age, social class, marital status, race, and religion. (Holmes & Rahe, 1967).

Scores ranging from 150 to 199 on the Holmes and Rahe Social Readjustment Rating Scale have been associated with a 37% chance of physical illness within one year; 200 to 299, a 51% chance of illness within a year; while scores greater than 300 were associated with a 90% chance of physical illness within one year (Wyler et al., 1971). All subjects participating in this study responded to the Holmes & Rahe scale at initiation of the study and again with the onset of labor. Subjects were requested to identify any events experienced since becoming pregnant. The scale was utilized in an attempt to quantify the magnitude of stress (secondary to life changes) that subjects were experiencing as well as changes in stress level from baseline to final sampling.

The State-Trait Anxiety Inventory (Spielberger, 1983), used extensively since 1966 in research and clinical practice, was utilized in this study to measure self-reported anxiety. The scale incorporates two anxiety concepts, trait and state anxiety. The state portion of the scale was deemed most appropriate for the study sample and was utilized in this study.

The state portion of the anxiety scale (Form Y-1) shown in Appendix E, consists of 20 statements that evaluate how

respondents feel at the time the scale is administered. Essential qualities evaluated by the state section of the scale are feelings of apprehension, tension, worry, and nervousness. The scale is also useful in assessing how subjects felt at a certain time in the recent past as well as how they anticipate they will feel in a future situation. Based on previous studies, scores on the state anxiety scale have been shown to increase in response to physical danger and psychological stress and decrease as a result of relaxation training. The scale has been used extensively to assess anxiety induced by stressful procedures and unavoidable real-life stressors such as job interviews, testing, and impending surgery. Each study participant responded to the state portion of the State-Trait Anxiety Inventory (STAI) on two occasions, initially at the time of baseline sampling (30-34 weeks gestation) and finally at full term, with the onset of regular contractions. Scores were recorded.

The state portion of the STAI was individually self-administered in pencil and paper fashion by all study participants at the designated times. There was no time limit for completing the survey. Subjects were instructed to be honest in their responses since there were no right or wrong answers. They were assured that their identity would not be disclosed. Individual scores were tabulated using the provided score key and recorded.

The following normative data for the STAI were obtained from the STAI manual (Spielberger, 1983). Data for working adults on the STAI (for state anxiety) included a mean score of 35.2, a standard deviation of 10.61 and an alpha coefficient of .93. State anxiety alphas for all of the normative samples (high school students, college students, military recruits, and working adults) were above .90, with the exception of one which was .86. The median coefficient for state anxiety in all groups was .93. The range of scores for the state scale was 20 to 80. Scores were directly proportional in that increasing scores denoted increasing anxiety.

To examine the relationship between age and state anxiety scores, Spielberger divided the data for the working adult sample into three subgroups (ages 19 to 39, 40 to 49, and 50 to 69) and then subdivided by sex. The female subgroup, age 19 to 39, most representative of study participants, had mean state anxiety scores of 36.17, with a standard deviation of 10.96, and an alpha coefficient of .93. Due to the transitory nature of state anxiety, test-retest correlations for the state portion of the STAI were expectedly low and felt not to be a meaningful index of reliability for state anxiety (Spielberger, 1983).

Spielberger's findings demonstrated a high degree of internal consistency as denoted by the high alpha

coefficients for the state anxiety scale. Test-retest correlations were not felt to be useful in determining the reliability of the state anxiety scale. Convergent and divergent validity of the STAI has been documented by correlation of the scale with numerous anxiety, personality, aptitude, and achievement scales (Spielberger, 1983).

In this study salivary Ig-A quantitation was carried out using Kallestad's endoplate low level immunoglobulin test kit, provided by research funds from the dean's office of the University of Tennessee College of Nursing, following the procedure described in Appendix C. The single radial immunodiffusion technique used in analysis was discovered by Mancini, Carbonara, and Heremans (1965). Through experimentation, Mancini discovered that after placing both reference sera and test samples in wells in an agarose gel containing a monospecific antiserum, the samples diffused through both the gel and antigen, forming a ring with the monospecific antiserum. Mancini observed that preciptin ring diameters stopped increasing at a point where the antigen had been reduced and antigen-antibody complexing had attained equivalence. At equivalence, for equal volumes of test samples, a linear relationship was found to exist between the antigen concentrations and their corresponding ring diameters (Mancini et al., 1965).

Intra-assay precision of the low level Ig-A kit was determined by assaying high, medium, and low concentrations

of Ig-A within a plate. The coefficients of variation were small, ranging from 1.1% in the small concentration serum to 1.7% in the high concentration serum. Inter-assay precision was determined by assaying the same concentrations between plates. The coefficients of variation for this assay were also minimal, ranging from 1.2% to 1.3%. Ig-A values, expressed in mg/dL, were calibrated against the College of American Pathologists Reference Preparation for Serum Proteins. All kits used in analysis were noted to have the same lot number and were stored at the appropriate temperature until analysis.

Data Collection

The data collection period for this study extended over a nine month period from February to October, 1987. Demographic data sheets and stress and anxiety scales were completed by subjects at the pre-designated times during routine office visits. Office visits were also arranged so that salivary samples could be collected at 4:00 p.m. on the appropriate dates. Obstetrical personnel were instructed in the method of obtaining and freezing salivary samples and were compliant. Medical maternal and neonatal data were obtained from hospital and office medical records. The researcher provided instructions and was available to answer any questions. An effort was made to ensure that the materials, conditions, and procedures for the study were as identical as possible.

The Statistical Analysis for the Social Sciences package (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) was utilized for statistical analysis in this study. Analysis of variance and linear regression analysis were utilized to test the hypotheses. The level of significance was set at $p < .05$.

Summary

This chapter has delineated the research design, description of groups, operational definitions, methodology, instrumentation, and the data collection for this study. Copies of the demographic sheets, stress and anxiety scales, assay procedure, and childbirth course outline are included in the Appendixes. The results obtained from the analysis are described in Chapter IV.

CHAPTER IV

RESULTS

This chapter provides information on the study variables of the 28 study participants. Each hypothesis is stated and followed by the type of statistical analysis used to obtain the results. Tables are included that illustrate the findings. The discussion of the results and limitations of the study appears in the latter portion of this chapter.

Study Variables

The study variables of treatment and control subjects are presented in Table 2. All treatment subjects attended at least four of the six prepared childbirth classes, with 58.8% attending five classes. Illnesses incurred during the last trimester of pregnancy were documented; twenty-three percent of the treatment subjects experienced upper respiratory infections; 18.2% of control subjects experienced upper respiratory infections or intestinal viruses during this time period. None of the subjects' illnesses were severe enough to require antibiotic therapy. The length of active labor was also recorded. The mean length of labor for treatment subjects was 9.85 hours with a range of 4.5 to

TABLE 2
Study Variables of Treatment
and Control Subjects

Variable	Treatment (n = 18)	Control (n = 11)
Delivery Method		
vaginal	76.5%	63.6%
Cesarean section	23.5%	36.4%
Length Active labor (hours)		
mean	9.85	9.77
range	4.5-17	6.5-12
Maternal Postpartum Complications	11.8%	18.2%
Neonatal Postpartum Complications	29.4%	27.3%
Feeding		
breast	58.8%	36.4%
bottle	41.2%	63.6%

17 hours, while control subjects experienced a mean labor length of 9.8 hours with a range of 6.5 to 12 hours. Treatment and control groups were found not to differ significantly ($p < .05$) regarding length of labor utilizing a t-test.

The method of delivery was also felt to be a significant study variable. Of those in the treatment group, 76.5% delivered vaginally (with two forcep deliveries), while 23.5% underwent Cesarean section (three for failure to progress, and one due to a face presentation). A somewhat higher percentage (36.4%) of control subjects experienced Cesarean section, (three for failure to progress, and one for fetal distress), while 63.6% delivered vaginally. One forceps delivery was noted in the control group. A t-test revealed that treatment and control groups did not differ significantly in terms of method of delivery.

Postpartum maternal complications were documented for both treatment and control groups. Two subjects in both the control group (18.2%) and treatment group (11.8%) experienced postpartum complications. The subjects from the control group experienced complications consisting of one abdominal incision infection and one episiotomy infection. One treatment subject experienced mastitis and one subject had sinusitis. Groups were found not to be significantly different with respect to postpartum maternal complications utilizing a t-test.

A higher percentage of treatment subjects (58.8%) breastfed their infants during the postpartum period in contrast to 36.4% of the control subjects. In spite of this

difference, there was no significant difference between treatment and control groups in the occurrence of neonatal complications during the postpartum period, as 29.4% of the treatment subjects' infants and 27.3% of the control subjects' infants experienced complications during this period. Documented complications were upper respiratory infections (3), bronchiolitis (1), conjunctivitis (2), umbilical cord infection (1), and gastroenteritis (1).

Testing of the Hypotheses

Hypothesis I

There will be no significant difference in salivary Ig-A concentration in treatment (prepared) and control (unprepared) groups at initial (baseline) sampling.

The mean salivary Ig-A concentration at the first baseline sampling was 6.35 mg/dL for the control group as compared to 3.89 mg/dL for the treatment group. This difference approached statistical significance at $p = .053$. Mean salivary Ig-A concentration at the second baseline sampling period was 7.17 mg/dL for the control group and 4.194 mg/dL for the treatment group. This unexpected difference reached statistical significance at $p = .0441$. Within group analysis revealed no significant difference in the treatment group ($p = .5996$) or control group ($p = .7083$) in salivary

Ig-A concentration at the time of baseline sampling (Table 3).

A difference approaching significance (p = .053) was found between groups at baseline sampling one, and a significant between group difference (p = .0441) was noted at the time of the second baseline sampling. These findings resulted in rejection of hypothesis one.

Hypothesis II

> There will be a significant decrease in salivary Ig-A concentration from baseline to final determinations in both treatment and control groups.

Table 3
Analysis of Variance for Treatment and Control Groups in Baseline Salivary Ig-A Concentration

Source	DF	Mean Square	F	p
		Ig-A Baseline One		
Between Groups	1	40.624	4.099	.0533
Within Groups	26	9.912		
		Ig-A Baseline Two		
Between Groups	1	59.253	4.478	.0441*
Within Groups	26	13.233		

*Significant at $p < .05$.

This hypothesis was evaluated using a one-way analysis of variance. Salivary Ig-A concentrations obtained at each baseline sampling were compared to final Ig-A concentrations in both treatment and control groups. The results showed a significant decrease in salivary Ig-A concentration in the control group when each baseline sample was compared to the final sample concentration. Within the control group, the mean Ig-A concentration at baseline sampling one was 6.35 mg/dL, 7.17 mg/dL at baseline sampling two, and 3.07 mg/dL at the time of final sampling. Both comparisons reached statistical significance at $\underline{p} = .0475$ (baseline one versus final) and $\underline{p} = .0354$ (baseline two versus final).

Within the treatment group, the mean salivary Ig-A concentration at baseline one was 3.89 mg/dL, at baseline two 4.19 mg/dL, and 2.92 mg/dL at the time of final sampling. Although a decline in Ig-A concentration was noted, none of the comparisons for the treatment group reached statistical significance at $\underline{p} = .21$ (baseline one versus final) and $\underline{p} = .09$ (baseline two versus final). Although both groups experienced decreases in salivary Ig-A concentration, the decline within the treatment group did not reach statistical significance. Hypothesis two is rejected by the data. Statistics for hypothesis two can be found in Table 4 and Table 5.

Table 4
Analysis of Variance for the Control
Group in Baseline and Final Ig-A Concentration

Source	DF	Mean Square	F	p
Ig-A One (Baseline) Versus Ig-A Three (Final)				
Between Groups	1	59.237	4.457	.0475*
Within Groups	20	13.29		
Ig-A Two (Baseline) Versus Ig-A Three (Final)				
Between Groups	1	92.455	5.092	.0354*
Within Groups	20	18.156		

*Significant at $p < .05$.

Table 5
Analysis of Variance for the Treatment
Group in Baseline and Final Ig-A Concentration

Source	DF	Mean Square	F	p
Ig-A One (Baseline) Versus Ig-A Three (Final)				
Between Groups	1	7.911	1.636	.21
Within Groups	32	4.835		
Ig-A Two (Baseline) Versus Ig-A Three (Final)				
Between Groups	1	13.722	3.055	.0901
Within Groups	32	4.492		

An analysis of variance was used to test this hypothesis. The difference between groups in salivary Ig-A concentration approached significance at baseline sampling one (p = .053) and reached significance at baseline sampling two, indicating that the groups were significantly different in terms of salivary Ig-A concentration at the time of baseline sampling. There was no significant between group difference on this measure at the time of final sampling (p = 88.).

As indicated previously, the decline in Ig-A concentration within the control group from 6.35 mg/dL (baseline one), and 7.17 mg/daL (baseline two), to 3.07 mg/dL at final sampling reached statistical significance (p = .475 for baseline one versus final, and p = .0354 for baseline two versus final). The decline in salivary Ig-A concentration in the treatment group did not reach statistical significance. Hypothesis three is supported by the data.

Hypothesis IV

> Subjects with high scores on the Holmes and Rahe Social Readjustment Rating Scale and the State-Trait Anxiety Inventory will have lower salivary Ig-A concentrations than subjects with low scores on the same scales.

Both the treatment and control group experienced increases in life changes from baseline to final sampling,

as evidenced by increasing scores on the Holmes and Rahe Social Readjustment Rating Scale during this period. The control group mean score increased 3.6 points from a baseline score of 144.8 points to 148.4 points ($p = .89$). Mean scores for the treatment group increased from 189.4 to 197, a difference of 7.6 points ($p = .88$). Treatment group scores were higher generally than control group scores. The increases in scores were not statistically significant.

The predictive value of the Holmes and Rahe for illness placed both the treatment and control group at 37% risk for illness within one year as a result of life-change stresses. Higher scores on the Holmes and Rahe by treatment subjects indicated that these subjects may have been more stressed by life changes than control subjects at both sampling periods.

One level analysis of variance was utilized to compare treatment and control group scores on the Holmes and Rahe at baseline and final testing. The difference between groups on this scale was not statistically significant at $p = .366$ (baseline) and $p = .3177$ (final), indicating that the treatment group did not differ significantly from the control group on this scale.

The state portion of the State-Trait Anxiety Inventory (STAI) was also administered at the time of baseline and final sampling. The treatment group experienced an increase in mean anxiety scores from 32.6 points (baseline) to 38.6

points (final), an increase of 6 points. This increase in state anxiety within the treatment group was statistically significant (p = .0344), indicating an increase in anxiety regardless of the treatment (prepared childbirth education). State anxiety scores in the control group increased from a mean of 40 points (baseline) to 44.6 points (final), an increase of 4.6 points. This increase in state anxiety for the control group did not reach statistical significance (p = .40). The greater increase in anxiety scores in the treatment group compared to the control group was unexpected. It was anticipated that individuals not receiving childbirth education and training would experience more anxiety than those who had actively prepared, particularly with the onset of labor. Analysis of anxiety scores indicated that prepared childbirth education was not effective in reducing treatment subjects' anxiety, and may in fact have significantly increased anxiety.

Normative data from the state portion of the STAI included a mean score of 35.2 points and a standard deviation of 10.61 points. Both treatment and control group scores were within plus or minus one standard deviation of the mean.

One level analysis of variance was utilized in comparing treatment and control group anxiety scores on the STAI at baseline and final testing. The difference in anxiety scores between groups was not significant at either testing period (baseline, p = .075; final, p = .12).

Linear regression analysis was used to determine whether a correlation existed between STAI and Holmes and Rahe scores and Ig-A concentration. It was anticipated that subjects with high scores on these scales would have lower salivary Ig-A concentrations. As noted previously, none of the scores for the Holmes and Rahe Social Readjustment Rating Scale or the STAI were considered "high scores" at either testing period. Neither treatment or control subjects were deemed "highly stressed" due to life changes or "highly anxious," even with the onset of early labor, making it difficult to draw conclusions from the data.

Linear graphs were plotted comparing both scale scores with their appropriate Ig-A values. No significant clustering of data was found. Hypothesis four was not supported by the data.

Hypothesis V

> Subjects with the lowest Ig-A levels at the time of delivery will have a higher incidence of postpartum morbidity than subjects with higher Ig-A levels.

The relatively small sample number (N = 28) and low incidence of postpartum maternal complications precluded testing this hypothesis. Two control subjects and two treatment subjects experienced postpartum complications. Of these four, two complications occurred in subjects with non-detectable salivary Ig-A (< 1.1 mg/dL) after childbirth. Three of these subjects had Ig-A concentrations that decreased

at each sampling period, while one subject's Ig-A concentration increased.

A linear regression plot was constructed comparing maternal complications with final Ig-A concentrations. No significant relationship existed. Although hypothesis five is not supported by this data, extended testing with a larger sample population might yield different results.

Discussion of Results

Five hypotheses were formulated and tested. The hypothesis that was not rejected related to the degree of decline in salivary Ig-A concentration in subjects who had actively prepared for childbirth by participating in prepared childbirth classes, as compared to those who had chosen not to enroll. The unprepared subjects experienced a significant decrease in salivary Ig-A concentration following childbirth (stressor), while prepared subjects did not. This finding indicates that participation in prepared childbirth education (as a method of stress reduction) may promote immunocompetence, while failed participation may inhibit immunocompetence. Even though state anxiety scores were generally higher in unprepared than prepared subjects, the difference was not significant. No significant increase and state anxiety was noted in either group with the onset of early labor. The study results also indicated no significant relationship between the amount of life changes and state

anxiety and Ig-A concentration. Additionally, a significant relationship between Ig-A concentration and postpartum maternal morbidity was not found.

Limitations

The interpretations, inferences, and conclusions of this study should be considered cautiously. Although a considerable amount of data was generated by this study, there were some inherent weaknesses in the research methodology.

First, the sampling procedure was non-randomized, as subjects were selected for both treatment and control groups on the basis of meeting the criteria for these groups. The subjects' voluntary participation may indicate excessive interest and thus bias. The sample size may not be sufficiently large (N = 28) to be representative of the general population, and the control group was considerably smaller (n = 11) than the treatment group (n = 17).

The demographic data indicated that the groups differed significantly regarding age, income, and educational level. These significant differences could have biased the study results. Additionally, questions might arise as to whether the state portion of the STAI was sensitive enough to detect changes in anxiety related to childbirth.

Four instructors were involved in childbirth class instruction. Two instructors were utilized for each of the two, 6-week series in which the treatment subjects were

enrolled. Although a course content outline was utilized for instruction, different instructors taught various content segments. Classes were held at various times of the year, from January through July, 1987, and all subjects did not attend all six classes. The method of delivery (vaginal birth or Cesarean section) could not be controlled in the study. No attempt was made to determine the presence of factors (other than last trimester illnesses and medications) which may have had a depressing effect on immunocompetence in some of the participants. All of these factors could have inadvertantly affected the study outcome.

Varying degrees of dehydration following childbirth in all study participants could have affected final salivary Ig-A concentrations. Human measurement error in Ig-A analysis and scoring of life change and anxiety scales could also have affected the study results.

The issue of social support emerged as a possible confounding variable among the subjects. This factor was not assessed in the study.

Summary

The limitations, discussion of results, and testing of the hypotheses have been discussed in this chapter. The conclusions and recommendations that have evolved as a result of this study are delineated in Chapter V.

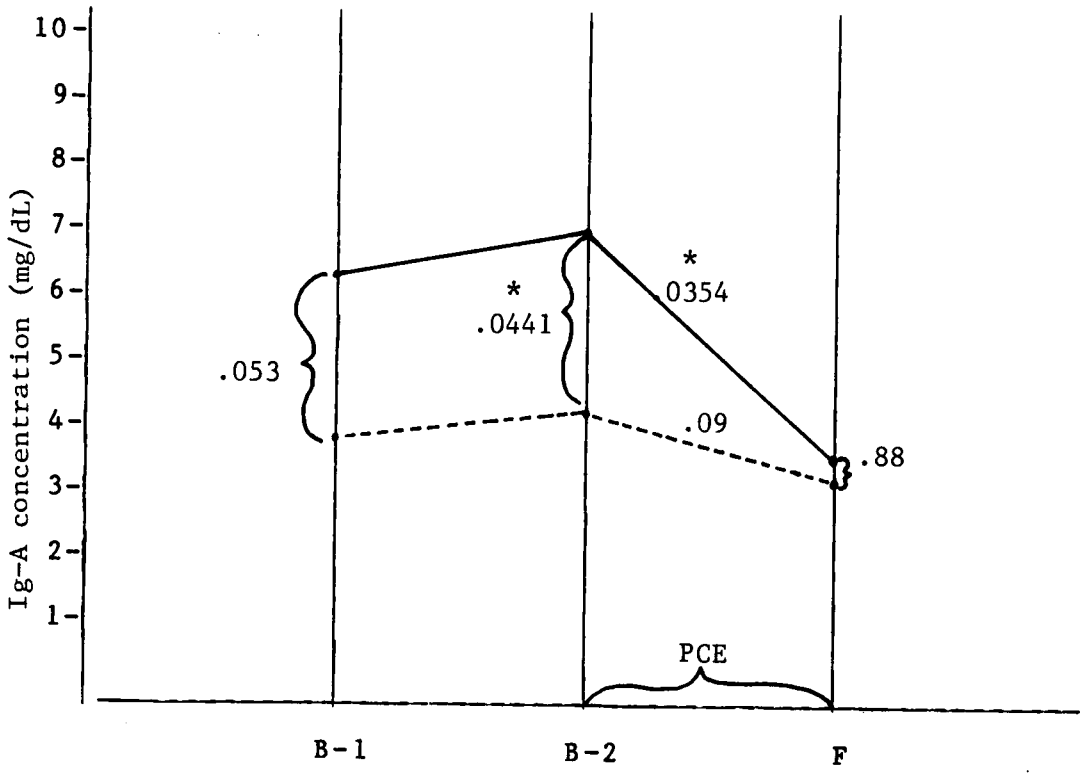
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Results of this study contributed support to hypothesis III and resulted in rejection of the remaining four hypotheses. Regardless of rejection or acceptance of the stated hypotheses, implications for further studies have evolved.

Caution should be used in the interpretation and generalization of the results, as subjects consisted of a non-random sample of young expectant adult females who volunteered their participation. All subjects lived within a 30 mile radius of the study site (Clarksburg, West Virginia), all were selected from a private obstetrical practice, and were primiparas, indicating limited representation with regard to geographical area, obstetrical care setting, and parity. A summary of the study results can be seen in Figure 1.

Hypothesis one resulted in an unexpected outcome in that treatment and control groups differed significantly in salivary Ig-A concentration at the second baseline sampling, and the between group difference on this measure approached significance at the first baseline sampling period. One factor that could have contributed to this result was that the length of time between baseline collections varied from 2 to



The mean salivary Ig-A concentrations for treatment (dotted line) and control groups (solid line) at baseline one (b-1), baseline two (B02) and final sampling (f) are shown. Prepared childbirth education (PCE) by treatment subjects occurred between B-2 and F. Significant findings are also represented (*).

Figure 1. Summary of Study Results

4 weeks for all subjects. Significant differences between groups regarding age, income, and educational level may also have affected baseline Ig-A samples. Infinite unmeasurable individual differences among treatment and control subjects could also have inadvertently affected Ig-A concentrations. Examples of these differences include: (a) previous birth-related life experiences and attitudes toward the

birth process, (b) general childbirth-related knowledge level, (c) perceived coping ability and degree of control, (d) expectancies (what subjects hoped to attain as a result of their birth experience), (e) parenting skills, (f) degree of support from significant others, and even (g) nutritional status. All of these variables could have affected the study outcome. Additionally, a smaller percentage of control subjects (18.2%) than treatment subjects (23.5%) experienced illnesses (in the form of upper respiratory and intestinal viruses) during the last trimester of pregnancy. This difference may have contributed to the subtle but significant change in Ig-A concentration at the second baseline sampling period.

Hypothesis two was related to the belief that the stress of childbirth would cause a significant decrease in salivary Ig-A in all subjects. Although Ig-A concentration decreased in both groups, the decline reached significance only in the control group. The anticipation that treatment subjects would also experience significantly diminished immunocompetence following childbirth was not sustained. The demographic data indicated that treatment subjects tended to be older, better educated, had fewer economic concerns, and were more likely to be married than control subjects. These significant demographic variables could conceivably have influenced Ig-A concentrations at both

baseline and final sampling periods. Data from the second hypothesis indicated that a major life stressor such as childbirth does not always significantly alter immunocompetence.

The mean anxiety scores for the treatment group were lower than control group mean anxiety scores at both testing periods indicating that anticipation of class attendance and actual participation in the classes may have resulted in lower anxiety levels in the treatment group when compared to the control group. Perhaps treatment subjects expected less childbirth anxiety as a result of class enrollment and participation.

A surprising finding was that with the onset of early labor, treatment subjects experienced a significant increase in mean anxiety, while control subjects' anxiety scores did not increase significantly. It was anticipated that unprepared subjects would experience significantly more anxiety than prepared subjects with the onset of early labor. A question must be raised as to whether childbirth preparation actually increased rather than decreased treatment subjects' state anxiety. Possible explanations for this increase include a heightened awareness of the birth process through childbirth education, and enhanced personal goals for the birth experience by treatment

subjects as a result of childbirth education, both of which may have increased state anxiety with the onset of labor. Additionally, although the STAI has been used extensively in research to assess changes in anxiety related to medical and hospital procedures, its reliability in detecting childbirth-related anxiety changes has not been documented.

The belief that unprepared subjects would experience a greater decline in Ig-A concentration than prepared individuals was supported by hypothesis three. It was speculated that subjects who had actively prepared for the birth process by attending a prepared childbirth education series and practicing the various stress-reduction strategies several times weekly would experience less stress during childbirth and less immunosuppression. In spite of a mean increase in state anxiety, salivary Ig-A concentrations were not significantly affected by childbirth in the prepared group. By contrast, unprepared subjects experienced a significant decline in Ig-A concentration following childbirth.

Extraneous factors within the control group that could have contributed to the significant decrease in Ig-A concentration in the control group included a higher Cesarean section rate (presumed to be more stressful), a greater percentage of unmarried subjects (perhaps lacking in

social support), less formal education (with two subjects still in high school), and lower income when compared to the treatment group. The control group also was noted to have a higher mean state anxiety score than the treatment group, indicating a greater degree of unrest, tenseness, strain, nervousness, confusion and worry in this group at baseline and final testing.

Even though subjects were equally hydrated during the labor and recovery period and subjects experiencing difficulty obtaining final salivary samples were excluded from the study, the degree of dehydration may have been an additional factor affecting final salivary Ig-A concentrations in all subjects. The average length of labor and amount of intravenous fluid intake was believed to be comparable for both groups.

Previous research has supported an association between high stress levels and diminished immune function. In hypothesis four, it was postulated that subjects with high scores on the life change and anxiety rating scales would have lower salivary Ig-A concentrations that subjects with low scores on the same scales. Linear regression analysis was used to determine whether a significant negative association existed. The analysis failed to support this hypothesis. The fact that scores for both groups on each of these scales were not in the high range made it difficult to draw conclusions based on this study data.

Hypothesis five considered whether subjects with the lowest salivary Ig-A concentrations (greatest immunosuppression) would manifest a higher incidence of postpartum morbidity. Linear regression analysis plotting final Ig-A concentrations against postpartum maternal complications failed to confirm an association. Although 50% of the maternal complications occurred in subjects with non-detectable Ig-A concentrations immediately following delivery, the relatively small study number (N = 28) and low incidence of postpartum complications in the study sample prevented the researcher from drawing any conclusions from the study data.

List of Conclusions

The following conclusions from this research may be drawn:

1. There was a significant difference between treatment (prepared) and control (unprepared) groups in salivary Ig-A concentration at the second baseline sampling period. The between group difference approached significance at initial baseline sampling. No significant between group difference in salivary Ig-A concentration was noted at final sampling.

2. There were no significant within group differences in salivary Ig-A concentration at either baseline sampling period.

3. There was a decline in salivary Ig-A concentration from baseline to final sampling in both treatment and control groups. The decline in Ig-A reached significance only in the control group.

4. There were no significant differences between groups on the Holmes and Rahe Social Readjustment Rating Scale at either testing time.

5. Control (unprepared) subjects experienced greater anxiety than their prepared counterparts (treatment subjects) during the last trimester of pregnancy and with the onset of early labor.

6. The treatment group experienced a significant increase in state anxiety with the onset of early labor. No significant increase in state anxiety was noted for the control group at this time.

7. There were no significant between group differences in state anxiety at either testing time.

8. There were no significant relationships between life changes (Holmes and Rahe Social Readjustment Rating Scale) and state anxiety (STAI) and salivary Ig-A concentrations at baseline and final sampling.

9. Fifty percent of maternal complications occurred in subjects with non-detectable salivary Ig-A following childbirth.

10. The sample study number was too small to support an association between final Ig-A concentrations and postpartum maternal morbidity.

11. There were no significant between group differences in the method of delivery, length of labor, number of last trimester illnesses, or incidence of postpartum maternal and neonatal complications.

Recommendations and Implications for Additional Research

Recommendations and implications that have evolved from this study include:

1. An expansion of the present study to include the 6-week postpartum period in attempts to examine whether Ig-A concentrations return to baseline levels during this time.

2. Replication of the present study utilizing multiparas, subjects from various clinical settings and geographical areas to determine whether the study findings are generalizable.

3. Replication of the present study utilizing a larger sample and controlling for age and social status in attempts to attain a more homogeneous group.

4. A comparison of Ig-A levels in women experiencing Casarean section versus women delivering vaginally.

5. An expansion of the present study utilizing additional immune parameter markers such as lymphocyte counts, cortisol levels, or catecholamine excretion.

6. Replication of the present study utilizing expectant fathers as subjects to determine possible relationships between expectant fatherhood anxiety and immune function.

7. An expansion of the present study to determine Ig-A levels in breast milk of highly-stressed versus minimally stressed lactating mothers, following childbirth.

8. Development of a reliable and valid tool to assess childbirth related anxiety.

9. Development and utilization of a tool to measure social support in future similar studies.

Summary

This study and those recommended in the future posit critical questions for health and nursing. The results of this study support the previously held belief that major life stressors such as childbirth can disrupt immunocompetence and significantly increase anxiety. Subjects failing to participate in childbirth education as a mechanism of stress reduction manifested significant immunosuppression in comparison to individuals who actively prepared for the birth process by completing a 6-week prepared childbirth education series. The results reinforce the importance of stress-reduction strategies in maintaining immunocompetence. Implications for such strategies in health promotion and maintenance within the nursing

profession are endless. Nurses must strive to promote utilization of stress-reduction techniques among their clientele (including childbirth preparation) as a method of promoting biopsychosocial integrity. Biological integrity includes immunocompetence.

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APPENDIXES

APPENDIX A

SUBJECT QUESTIONNAIRE

1. What is your current age? _____yrs.
2. Marital status (please circle one) married, single, divorced, widowed, separated
3. What is your educational level?

   _____(grade completed)

   _____(years of college completed)
4. What is your spouse's educational level? (complete only if applicable)

   _____(grade completed)

   _____(years of college completed)
5. Family income level: (circle nearest estimate of gross yearly income)

   less than $15,000 per year

   $15,000 to $25,000 per year

   $25,000 to $35,000 per year

   $35,000 to $50,000 per year

   greater than $50,000 per year
6. Do you have any health problem (other than pregnancy) that requires frequent physician follow-up, treatment, or medication? If yes, describe_____

   _____
7. Other than prenatal vitamins, iron, and/or calcium supplements, do you regularly take any medications? If so, what?

   _____

8. Have you previously learned or practiced any type of stress reduction technique? If yes, what type?_____

_____

Do you currently practice this technique?_____

_____

9. How many of the six prepared childbirth sessions did you attend? (answer only if applicable)_____ sessions.

10. To the best of your knowledge, how frequent were at home practice sessions? (circle only if applicable):

less than 1 practice session per week

1 practice session per week

2 - 3 practice sessions per week

greater than three practice sessions per week

11. Please list any illness experienced during the last trimester (last twelve weeks) of pregnancy:

_____

_____

APPENDIX B

PREPARED CHILDBIRTH EDUCATION SERIES OUTLINE

The prepared childbirth education series utilized in this study consisted of six consecutive weekly, two hour sessions, conducted during the last trimester of pregnancy. Techniques utilized in the series included education regarding all facets of the birth process, relaxation, exercise, cognitive control, cognitive rehearsal, and desensitization.

The first hour of each session consisted of lecture, film/video presentations, discussion, questions and answers. The second hour was comprised of introduction and practice of breathing, body-building, and relaxation exercises. One class session was reserved for a hospital tour. Class lecture content included:

Class One

Hour One:

Overview of the series, pupose(s), program rationale

Nutrition, weight gain

Anatomy and physiology of pregnancy

Fetal growth and development from conception to birth

Effects of alcohol, smoking and infectious diseases

Special tests during pregnancy (NST, OCT, amniocentesis)

Breast and bottle feeding (advantages/disadvantages, preparation)

Role of the coach

Discussion, questions and answers

Hour Two:

Introduction to body building excercises, including purpose (tailor sit, tailor press, Kegel, pelvic rock, Indian shuffle, leg lifts, posturing)

Introduction to breathing exercises, including purpose (cleansing breaths, slow chest breathing, accelerated- decelerated breathing)

Introduction to muscular relaxation, including purpose and intended effects, demonstration, and practice of contraction/relaxation exercises

Class Two:

Hour One:

Signs and symptoms of labor

Effacement and dilation

Stages and phases of labor (latent, active, and transition) including explanation/definition of each, what to expect during each phase, role of the coach, feelings, comfort measures

Episiotomy

Birth film #1

Discussion, questions and answers

Hour Two:

Practice previously learned breathing, body-building, and relaxation exercises

Add choo-choo and pyramid breathing patterns

Class Three

Hour One:

Review stages and phases of labor with emphasis on second stage (pushing) and the actual delivery

Fetal positions/presentations

Analgesics/anesthetics

Hospital procedures (I.V.'s, fetal monitor, perineal prep, enemas)

Timing contractions; when to come to the hospital

Birth film #2

Discussion, questions and answers

Hour Two:

Practice all previously learned breathing, body-building and relaxation exercises

Demonstrate and practice positions for the second stage

Expulsion breathing

Class Four:

Hour One:

Cesarean birth

reasons for performing (indications)

reasons for the increasing Cesarean rate

VBAC (vaginal birth after Cesarean)

fetal distress

what to expect

post-op care

anesthetics

Slides: Cesarean section under spinal anesthesia

Film: Cesarean section under general anesthesia

Discussion, questions and answers

Hour Two:

Practice all previously learned breathing, body-building and relaxation exercises

Class Five:

Hour One:

Pospartum and new baby care

what to expect from birth to discharge

vital signs, vaginal bleeding, involution

voiding, B.M.

episiotomy care

diet

breast changes

routine OB procedures (sunlamp, sitz baths, anesthetic sprays, surgigator for perineal care)

contraception

feelings/relationships

tips for easing transition into parenthood

New baby care

newborn appearance, bathing and general care

feeding

circumcision, cord care

bonding, infant stimulation

nursery procedures/schedules

hazards for the infant

Discussions, questions and answers

Hour Two:

Discussion, questions and answers

Continued practice; labor simulation

Class Six:

Hospital tour

orientation to hospital facilities (admissions office pre-admission, elevators, waiting rooms, visiting hours, special visitation, policies, admission process, location of postpartum, labor and delivery and nursery)

Tour of labor and delivery

initial interview, vital signs, pelvic examination

explanation and demonstration of the fetal monitor

operation of the birthing bed

consent forms

routine procedures, rationale

newborn care in delivery room

APGAR scoring

Tour of nursery

newborn assessment

special tests (PKU, thyroid)

vitamin K injection

isolettes

jaundice and phototherapy lights

feeding schedules; demand feeding; rooming-in

special sibling visitation

rules and regulations

Tour of postpartum area

APPENDIX C

IG-A RADIAL IMMUNODIFFUSION ASSAY PROCEDURE

Each subject was given a small piece of paraffin, was asked to chew the paraffin for a timed, 5-minute period without swallowing, and finally directed to transfer both the paraffin and saliva into a pre-labeled specimen container. Samples were obtained on three occasions by all study participants. Two baseline samples were collected at two-week intervals between 30 and 34 weeks gestation. Baseline samples were collected at 4:00 p.m. in attempts to minimize variations due to circadian rhythms. Final specimens were collected within two hours after delivery. Volume was recorded, and samples were immediately frozen until analysis. After thawing, specimens were assayed by the researcher and a certified laboratory technician, trained in radial immunodiffusion assay technique. Analysis was carried out in a controlled hospital laboratory.

Both the reference sera contained in the kit and the same reference sera which had been diluted by 3.25 (the factor for comparing secretory and serum Ig-A) were utilized as controls for the analysis. Equal volumes (5 mL.) of the three reference sera (with concentrations of 69, 35, and 3.7 mg/dL) and the three diluted reference sera (with concentrations of 21.2, 10.8, and 1.1 mg/dL) were pipetted into specified endoplate wells containing a monospecific horse or rabbit antiserum using a micropipette delivery

system. Salivary samples (5 mL.) were dispensed into the remaining 16-well agar plates. The endoplates were then incubated at room temperature for 48 hours, at which time results were recorded. Preciptin ring diameters were measured to the nearest 0.1 mm with an ocular micrometer.

Reference sera ring diameters were found to be within the accepted plus or minus two standard deviation range reported by Kallestad. A reference curve was constructed, plotting the ring diameters of the diluted reference sera against their concentrations. Diameters were noted to be 5.4 mm, 4.4 mm and 3.0 mm, with corresponding concentrations of 21.1 mg/dL, 10.8 mg/dL, and 1.1 mg/dL respectively. Ig-A concentrations in the salivary samples were derived from the reference curve and recorded. Minimum detectable precipitation was noted at 1.1 mg/dL.

APPENDIX D

HOLMES AND RAHE SOCIAL READJUSTMENT RATING SCALE

Please Respond To Any Stressors Experienced Since Becoming Pregnant

Life Event	
___ Death of a significant other	100
___ Divorce	73
___ Marital separation	65
___ Jail term	63
___ Death of a close family member	63
___ Personal injury or illness	53
___ Marriage	50
___ Fired at work	47
___ Marital reconciliation	45
___ Retirement	45
___ Change in health of a family member	44
___ Pregnancy	40
___ Sex difficulties	39
___ Gain of a new family member	39
___ Business readjustment	39
___ Change in financial state	38
___ Death of close friend	37
___ Change to a different line of work	36
___ Change in number of arguments with spouse	35
___ Mortgage	31
___ Foreclosure of mortgage or loan	30
___ Change in responsibilities at work	29
___ Son or daughter leaving home	29
___ Trouble with in-laws	29
___ Outstanding achievement	28
___ Wife beginning or stopping work	26
___ Change in living conditions	25
___ Revision of personal habits	24
___ Trouble with boss	23
___ Change in work hours or conditions	20
___ Change in residence	20
___ Change in recreation	19
___ Change in church activities	19
___ Change in social activities	18
___ Mortgage or loan less than $10,000	17
___ Change in sleeping habits	16

___	Change in number family get-togethers	15
___	Change in eating habits	15
___	Change in schedule (vacation)	13
___	Christmas	12
___	Minor violation of the law	11

_____ total score

From Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. Journal of Psychosomatic Research, 11, 213-218.

APPENDIX E

STATE-TRAIT ANXIETY INVENTORY
SELF-EVALUATION QUESTIONAIRE

Developed by Charles D. Speilberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name_____Date_____S____
T____

Age_____Sex: M___ F____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel **right** now, that is, **at this moment**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1.	I feel calm.....	1	2	3	4
2.	I feel secure.....	1	2	3	4
3.	I am tense.....	1	2	3	4
4.	I feel strained.....	1	2	3	4
5.	I feel at ease.....	1	2	3	4
6.	I feel upset.....	1	2	3	4
7.	I am presently worrying over possible misfortunes.....	1	2	3	4
8.	I feel satisfied.....	1	2	3	4
9.	I feel frightened.....	1	2	3	4
10.	I feel comfortable.....	1	2	3	4
11.	I feel self-confident.....	1	2	3	4

12.	I feel nervous.....	1	2	3	4
13.	I am jittery.....	1	2	3	4
14.	I feel indecisive.....	1	2	3	4
15.	I am relaxed.....	1	2	3	4
16.	I feel content.....	1	2	3	4
17.	I am worried.....	1	2	3	4
18.	I feel confused.....	1	2	3	4
19.	I feel steady.....	1	2	3	4
20.	I feel pleasant.....	1	2	3	4

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APPENDIX F

RESEARCHER DATA SHEET

Subject's name_____ Code number_____

Age_____

Educational level_____

Marital status_____

Income level_____

****

Chronic health problems_____

Regularly taken medications_____

Previously learned/practiced relaxation techniques?

_____

Holmes and Rahe score_____(baseline) _____date

_____(final) _____date

STAI _____(baseline) _____date

_____(final) _____date

s-IgA value _____(baseline) _____date/time

_____(baseline) _____date/time

_____(final) _____date/time

Number of childbirth education sessions attended_____

Frequency of 20-30 minute at-home practice sessions_____

****

Delivery date/time_____

Length of gestation_____

Labor, hours (2.5cm to birth)_____

Breast or bottle feeding_____

Breast or bottle feeding at time of six-week check-up

_____

Antepartum complications_____

Intrapartum complications_____

Postpartum complications (maternal):

episiotomy infection	hematoma
mastitis	endometritis
urinary tract infection	upper respiratory infection
thrombophlebitis	other_____

Postpartum complications (neonatal):

upper respiratory infection	viral infection
bacterial infection	other_____

Induction of labor_____

VITA

Cathy Lynn Annie was born and raised in Clarksburg, West Virginia. She completed her elementary and secondary education in Clarksburg, graduating from Victory High School. Following graduation from high school she entered an Associate Degree nursing program, graduated, and became a registered nurse. She later obtained a Bachelor's Degree in Psychology, a Bachelor's Degree in Nursing, and finished Pre-Med studies at Salem College, West Virginia. She became one of the first nurses in the state of West Virginia to gain certification as an Obstetric-Gynecologic Nurse Practitioner. She has received numerous awards in the areas of scholarship and leadership, having served as president of her nursing class.

Currently, she is a certified Obstetric-Gynecologic Nurse Practitioner in practice with a private physician. She is also employed as a staff nurse on the Maternal-Child Unit at United Hospital Center, Clarksburg, West Virginia. In addition, she serves as both director and instructor of the Prepared Childbirth Education Association of Clarksburg, having founded the organization. Her professional organization memberships include the Nurse's Association of the American College of Obstetricians and Gynecologists, National League for Nursing, Tri State Perinatal Organization, and Sigma Theta Tau.