



The relationship between weight gain in high-risk infants and mothers levels of social support
by Kathleen Rae Jaeger

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Nursing
Montana State University

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Abstract:

The purpose of this exploratory descriptive study was to determine the relationship between poor weight gain in the high-risk infant and the mother's level of social support. Thirty-four mother/infant pairs participated. Infant birth weights ranged from 940 to 4010 grams with an average of 2684.44 grams. The mean gestational age was 35.88 weeks. Infants' chronological ages ranged from 18.75 to 26.25 months at study time.

There were 32 mothers in the study since two sets of twins were included. The mothers' ages ranged from 22-43 years of age with the mean of 30.69 years. Twenty-nine mothers were married, one was single, and two were divorced.

The mother of each infant completed the Personal Resource Questionnaire-85 (PRQ-85). The PRQ-85 includes two areas of social support. Part 1 is an estimate of the number of interpersonal resources a person can rely on across 10 life situations and the person's satisfaction with these resources. Part 2, a 25 item Likert scale, was developed to measure the level of perceived social support. The total PRQ-85 Part 2 sum was used to operationalize social support. Each infant's current weight was obtained via health care records. Weights were then converted to weight percentile levels by plotting measurements on growth grids. Each infant's age was corrected for prematurity.

The correlation coefficient (Pearson r) for the two variables, percentile for weight and the total PRQ-85 Part 2 sum, was -0.0354. There was no significant relationship when the entire group was used. There was a moderately positive relationship when only the infants ($n=6$) with weight gains of less than the 10th percentile were examined ($r=0.5124$). It is this low weight group which requires further nursing research.

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LEVELS OF SOCIAL SUPPORT

by

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A thesis submitted in partial fulfillment
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ABSTRACT

The purpose of this exploratory descriptive study was to determine the relationship between poor weight gain in the high-risk infant and the mother's level of social support. Thirty-four mother/infant pairs participated. Infant birth weights ranged from 940 to 4010 grams with an average of 2684.44 grams. The mean gestational age was 35.88 weeks. Infants' chronological ages ranged from 18.75 to 26.25 months at study time.

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CHAPTER 1

INTRODUCTION

Introduction to Problem

The intensive care nursery has developed out of a need to provide care for the high-risk infant. Typically, this neonatal critical care unit is involved with infants "at high medical risk, critically ill babies with serious pediatric or surgical problems, or infants suffering from congenital abnormalities" (O'Leary, 1985, p. 123). Included within this grouping are low birth weight infants and premature infants. At present, the term "low birth weight infant" refers to an infant whose birth weight is 2,500 grams or below, regardless of the cause and without regard to the duration of gestation (Sweet, 1986). In contrast, the "very low birth weight infant" weighs less than 1,500 grams at birth (O'Leary, 1985).

The newborn infant can also be categorized according to birth weight and gestational age factors. Gestational age is determined by assessments based on neurological examination and external physical characteristics. With this information the newborn can then be termed either "appropriate (in weight)-for-gestational-age" (AGA), "small-for-gestational-age" (SGA), or "large-for-gestational-age" (LGA) (Sweet, 1986). Neonates can also be identified as "preterm" (less than 37 weeks gestation), "term" (37 through 42 weeks

gestation), or "post-term" or "postmature" (greater than 42 weeks gestation) (Kattwinkel, Cook, Hurt, Nowacek, & Short, 1983a).

Although categorization may appear redundant and time-consuming, it does serve a purpose. Based on classification, health care professionals are alerted to potential medical problems peculiar to each category.

Together low birth weight and preterm infants account for the majority of neonatal deaths. With the introduction of neonatal intensive care nurseries, the mortality rate for high-risk infants has decreased. Although the survival rate has improved, there is concern related to the developmental outcome of these infants (Trotter, Chang, & Thompson, 1982). High-risk infants may exhibit a variety of clinical problems in accordance with the degree of prematurity, birth-related trauma, and function of immature or stressed organ systems (O'Leary, 1985). Examples of specific problems that may be further related to deviations in infant physiological growth patterns include failure to thrive and bronchopulmonary dysplasia. These complex physiological deviations affect the infant's psychosocial development and influence the family system. The influence of physiologic and psychosocial deviations sometimes found in the low birth weight infant can be negative, neutral, or even positive. A key element in both the individual infant developmental outcome and the family system developmental outcome is social support.

"Follow-up reports show morbidity rates ranging from 44% to 85% for preterm and very low birth weight infants" (Trotter et al., 1982,

p. 83). It is these infants with the lowest birth weights, regardless of gestational age, that generally show the highest incidence of developmental delay (Trotter et al., 1982). Hack and Fanaroff (1984) state:

Physical growth and ultimate body size, although strongly influenced by genetic potential, is a highly sensitive index of the effects of early environmental events on the developing organism. Any deviation from the normal trajectory of growth thus provides an easily documented, yet important outcome measure. (p. 647)

Many studies have been conducted in the last two decades regarding the physical development of the high-risk infant (Davies & Kennedy, 1985; Fitzhardinge, 1975; Fitzhardinge et al., 1976; Hack & Fanaroff, 1984; Hoskins, Elliot, Shennan, Skidmore, & Keith, 1983; Kimble, Ariagno, Stevenson, & Sunshine, 1982; Kitchen, McDougall, & Naylor, 1980; Kumar, Anday, Sacks, Ting, & Delivoria-Papadopoulos, 1980; Pape, Buncic, Ashby, & Fitzhardinge, 1978; Ross, Lipper, & Auld, 1985; Saigal, Rosenbaum, Stoskopf, & Milner, 1982; Shennan & Milligan, 1980; Teberg et al., 1982; Vohr, Oh, Rosenfield, Cowett, 1979). Varying results have been reported depending on birth weight, size for gestational age, severity of complications, and follow-up time length. Despite medical advances, growth patterns for premature and term infants still differ. Longitudinal studies involving long-term results continue to report contradictory results (Fischer, 1978). But if weight and often height continue to fall below expected standards the situation is termed "failure to thrive" (Harrison, 1986).

Bronchopulmonary dysplasia (BPD) is a term used to describe the clinical, radiographic, and pathologic changes that occur in some newborn infants after prolonged mechanical ventilation and oxygen management due to hyaline membrane disease or respiratory failure (Goldberg & Bancalari, 1986; Nickerson, 1985). BPD develops in 15% to 38% of infants under 1,500 grams who require mechanical ventilation for hyaline membrane disease (Nickerson, 1985). Associated problems involve recurrent respiratory infections, congestive heart failure, and poor growth and development (Abman, Accurso, and Koops, 1984).

Certain concepts of development apply to the infant as well as the adult. Part of growing up consists of meeting developmental tasks and developing appropriate behaviors in order to meet expectations (Meili & Murray, 1975). These tasks are significant to the newborn high-risk infant as well as the overwhelmed fearful parents. For the family of the newborn there may be a need for development of skills not yet nurtured. Individual development plays a role in parenting any infant, including the high-risk infant.

Family reactions to the birth of a high-risk infant include grieving, fears, and guilt. Socioeconomic status, age, previous life experience, and family relationships all influence parental coping ability. Parents already confident in their parenting skills are less likely to display feelings of inadequacy than firsttime parents (Johnson, 1986b). These reactions can be related to family developmental levels and ultimately family systems concepts.

Particular sociological factors which increase the risk of coping difficulty involve low economic status, no insurance, communication barriers, no telephone, no transportation, low self-esteem, inability to easily change roles, no previous experience in dealing with crisis, and no social support (Johnson, 1986b). The family who is alone and without social support systems has more difficulty coping with the high-risk situation and obtaining assistance from others in supportive ways (babysitting, transportation, emotional support) (Johnson, 1986b).

It is therefore obvious that multiple factors influence the development of the high risk infant. All are important but for the purpose of this study only four elements were pursued: (1) infant physiologic growth patterns and influences; (2) individual development; (3) family systems concepts; and (4) social support.

Problem Statement and Purposes

Regardless of the admitting diagnosis, the investigator has noted that poor weight gain is a common occurrence with the developing high-risk infant. Several questions can be asked: Why do some high-risk infants develop to a normal weight level while others lag behind with failure to thrive? Are medical problems such as BPD the only contributing elements? Are there other socioeconomic or psychosocial components which have not been pursued? Of particular interest to this researcher was the psychosocial element of social support systems. Therefore, the purpose of this study was to

determine the relationship between poor weight gain in high-risk infants and the psychosocial factor of social support systems.

Research Question

Only one research question was addressed in this study: What is the relationship between poor weight gain in the high-risk infant and the mother's level of social support?

Definition of Terms

appropriate (in weight)-for-gestational-age (AGA)

a baby whose weight is above the 10th percentile and below the 90th percentile for babies of that gestational age (Kattwinkel et al., 1983a)

bronchopulmonary dysplasia (BPD)

chronic lung disease of infancy related to ventilator and oxygen management of newborns with respiratory disease - characteristics include respiratory symptoms and oxygen requirements beyond one month of age, recurrent respiratory infections and wheezing, congestive heart failure, poor growth and development (Abman et al., 1984)

failure to thrive (FTT)

failure of somatic growth, with height and/or weight below the third percentile of a standard growth chart, weight for height below the fifth percentile, or deceleration of growth velocity

resulting in a fall of two major percentiles (Berkowitz & Sklaren, 1984)

high-risk infant

for the purpose of this study, a high-risk infant is an infant, regardless of gestational age or birth weight, whose extrauterine existence is compromised by prenatal, natal, and/or postnatal factors and who is in need of special medical care (Rudolph & Garcia-Prats, 1986) which necessitates the admission to an intensive care nursery

large (in weight)-for gestational-age (LGA)

infant whose weight is above the 90th percentile for infants of that gestational age (Kattwinkel et al., 1983a)

low birth weight infant (LBW infant)

any infant whose weight at birth is 2,500 grams or below, regardless of cause or of duration of gestation (Sweet, 1986)

non-organic failure to thrive (or psychosocial FTT) (NFTT)

failure to thrive for which no medical etiology can be detected (Berkowitz & Sklaren, 1984)

organic failure to thrive (or physical growth failure) (OFTT)

failure to thrive due to a diagnosable physical disorder (Berkowitz & Sklaren, 1984)

poor weight gain

for the purpose of this study, poor weight gain is weight below the 10th percentile for adjusted age on a standard growth chart (Ross Laboratories physical growth chart) for which there is no organic explanation

post term infant

fetus or baby whose gestation has been longer than 42 weeks (Kattwinkel, et al., 1983a)

premature (or preterm) infant

fetus or baby whose gestation has been less than 37 weeks (Kattwinkel, et al., 1983a)

social support

for the purpose of this study, social support is information that leads a person to believe he is cared for and loved, esteemed and valued, and belongs to a network of communication and mutual obligation (Cobb, 1976)-social support was operationalized by using the Brandt and Weinert (1981) Personal Resource Questionnaire-85

small (in weight)-for-gestational-age (SGA)

an infant whose weight is lower than the 10th percentile for infants of that gestational age (Kattwinkel, et al., 1983a)

term infant

fetus or baby whose gestation has been between 37 and 42 weeks
(Kattwinkel, et al., 1983a)

very low birth weight infant (VLBW infant)

infant whose weight at birth is less than 1,500 grams (O'Leary,
1985)

Significance to Nursing

The survival rate for infants born at progressively earlier gestational points is on the increase. With this trend comes more medical and psychological complications resulting in a need for longer follow-up care. A rising number of these high-risk infants are returning to their home environments, whether the area be urban or rural. Therefore, the pediatric nurse is destined to deal with such infants despite location of practice. Over the past nine years, this researcher has had numerous contacts with growing high-risk infants while working on a general pediatrics unit in a northcentral Montana medical center. The rising number of developing high-risk infants signals the need for increased nursing research to facilitate better care of this distinct population group.

Studies have found that the support provided by family and friends in times of stress helps to buffer the effects of many stressors, including illness. Health care providers are becoming increasingly aware of the major influence support systems have on health and illness. The impact of social support has been noted in

all areas of nursing. Although nursing research concerning social support has been conducted on a generalized basis, there is still a need for more study in specific fields of nursing. One area is the physical and psychological development of high-risk infants.

The goal of this study was to gather information concerning social support systems available to high-risk families. The topic is of significance to nursing due to the expanding needs and concerns of its clientele. The information gained can then be utilized by nurses to identify and/or prevent the potentially hazardous consequences of a high risk birth as related to the infant and the family system.

Conceptual/Theoretical Framework

Weight gain in high-risk infants is influenced by a multitude of factors. These influences make their mark throughout the infant's development and in some cases, even before conception. No one study can address all contributing factors. Four related conceptual approaches were pursued: (1) infant physiologic growth patterns; (2) individual development; (3) family systems concepts; and (4) social support.

Infant Physiologic Growth Patterns

"Growth may be defined as an increase in the physical size of the body as a whole or as an increase in any of its parts associated with an increase in cell number and/or cell size" (Pipes, 1985, p. 2). Development is the acquisition of function related to cell differentiation and individual organ system maturation. Both growth

and development are influenced by genetic, hormonal, environmental, and behavioral factors. Growth and development proceed in an orderly, predictable manner while each organ has its own period of rapid growth (Pipes, 1985).

Birth weight is affected by the mother's pre-pregnancy weight and pregnancy weight gain. Typically, the newborn experiences a weight loss immediately after birth with a return to birth weight by approximately ten days. Weight gain during infancy progresses at a rapid but decelerating rate. By four months, most infants have doubled their birth weight. By 12 months, birth weight has usually been tripled. Males double their birth weight sooner than females while smaller newborns double their birth weight earlier than larger infants. Weight gain during the second year is slightly less than the birth weight (Pipes, 1985). Males also grow faster than females in height and head circumference while still in utero up until three to six months of age. After that time, gender differences level out (Wieczorek & Natapoff, 1981).

Racial differences also affect growth rates. Black American infants are smaller than Caucasian American infants. But they grow more rapidly during the first two years and from that time through adolescence are taller than Caucasians of the same age group. Asian children tend to be smaller than either black or Caucasian children (Pipes, 1985).

"During the first year of life, the healthy premature infant who is appropriate for gestational age grows at approximately the same rate as the full-term infant of the same postconceptual age"

(O'Leary, 1985, p. 165). Growth patterns are comparable provided the premature infant's age is corrected for prematurity. Infants who have encountered severe medical stress or undernutrition in the early postnatal time or those small for gestational age frequently require a period of catch-up growth. The catch-up time involves acceleration of all growth parameters. Once the infant has caught up, the growth rate should slow to a more normal curve (O'Leary, 1985).

With the heightened survival rate of low birth weight infants, there is concern for the short-term and long-term neuro-developmental outcome of these children (O'Leary, 1985). One factor is the development of bronchopulmonary dysplasia. Attention to the nutritional needs of infants with BPD is imperative to support physiological growth and repair new lung tissue. The energy requirements of BPD infants may range from 150-200 kcal./kg./day to offset losses in the premature intestine and increased respiratory requirements (Sirois, 1984). This compares to energy requirements of approximately 120-130 kcal./kg./day for most low birth weight infants who are fed enterally (O'Leary, 1985).

"If inadequate growth in height or weight occurs in the absence of disease or other medical concerns, environmental and/or nutritional deprivation is suspected" (Pipes, 1985, p. 25). This state is labeled failure to thrive. Some researchers believe that nonorganic failure to thrive is the result of endocrinological changes in children suffering from inadequate mothering. Others believe the condition involves mothers, with unmet needs and distorted perceptions of food, that do not offer their children

adequate food. Therapy is then directed at correction of the psychosocial problems (Pipes, 1985).

Individual Development

Several theorists have established theories concerning human development. The more well known authors include Freud, Erikson, Sullivan, Piaget, and Bowlby (Wieczorek & Natapoff, 1981). Two theorists were reviewed: Erikson and Sullivan.

At present there is no authoritative theory of personality development. Erik Erikson, who is considered to be an important figure in the field of psychoanalysis, has described the "Eight Stages of Personality Development". Erikson received national acclaim when he presented this theory to the White House Conference in 1950. Since that time his model has been adopted by many disciplines, including nursing, as a useful theory of human development (Howe, 1979).

Erikson's theory looks at the whole life span from "infancy" to the "aged" stage. Listed in order, the stages are infancy, toddler, pre-school, middle years, adolescence, young adulthood, adulthood, and aged. In each stage of development there is a central problem that must be solved, at least temporarily, if the person is to proceed to the next stage. These problems, conflicts, or crises are never entirely solved. Each new experience and environment presents the problem in a new form. If conflict is well solved at the time, the basis for progress to the next stage is laid. The developmental task for the infant is trust versus mistrust. According to Erikson,

basic trust develops in relation to the mother who feeds, reassures, and cuddles. The psychosocial attitude to be learned at this stage is that the infant can trust the world in the form of his mother, who will feed and comfort at the appropriate time. Trust can exist only in relation to something. The learning of mistrust is also important. The individual must eventually learn to differentiate how much to trust and mistrust (Tribe, 1973).

Autonomy is the developmental task for the toddler, the child approximately 15 or 18 months to 30 months of age. At this stage the child establishes himself as an independent human being while still using the help and guidance of others in important matters. This is a time of muscle system maturation and a time of choices. The polarity for this stage is shame and doubt. According to Erikson, the ratio should favor autonomy (Tribe, 1973).

Erikson identified identity as the goal of adolescence, intimacy as the goal of young adulthood, and generativity as the goal of adulthood. The adolescent must clarify who he is and what his place in society is to be. Intimacy refers to the ability to fuse with someone else without fear of losing self. Generativity occurs as the person takes his place in society and assists in the development and perfection of whatever it produces (Tribe, 1973).

Sullivan saw personality development as stages involving various patterns of interpersonal relationships. In early childhood interpersonal relations are characterized by parental efforts toward the child's socialization. The capacity to love other people emerges in later childhood. There is then a gradual emancipation from

parents and an increased importance of peer relationships in adolescence. With young adulthood there comes the establishment of love and then marital and parental relationships in a new family setting (Coleman & Broen, 1972).

Sullivan identified interpersonal communication between mother and infant as one of the more significant stages in infancy. The infant has physiological and psychological needs that must be met by interpersonal cooperation or a process of tenderness. Anxiety in the mothering person leads to disruption in this tender cooperation. Persistent tension leads to sleep disturbances, apathy, and detachment. The concept of "good" or "bad" mother evolves from how anxiety is handled. "Good me, bad me" is then a reflection of "good" mother, "bad" mother (Wieczorek & Natapoff, 1981).

Family Systems Concepts

"The family is the most important unit for the individual and for society. For the individual the family provides the critical unit for development and interactions; for society the family provides new members and socialization of members" (Johnson, 1986a, p. 91). The family composes the most significant social context within which illness occurs and resolves. Understanding the client requires an understanding of the patient's family context (Jones & Dimond, 1982).

Since the 1950's, family theorists have endeavored to organize the bulk of conceptual knowledge on the family. By 1971 after several attempts at categorization, it was finally decided only four

family approaches were theoretically viable. Some authors define three frameworks by combining two theories: 1) structural-functional; 2) interactional; and 3) developmental (Jones & Dimond, 1982). Other writers concur that family concepts can be better organized under four frameworks: 1) structural; 2) functional; 3) interactional; and 4) developmental (Johnson, 1986a).

The family is viewed as a structure or system within society in the structural model. In the family itself, there are additional subsystems such as the parents and children. The family system maintains a boundary between the family structure and society. The goal of the family is to serve as a unit in society (Johnson, 1986a). Using this approach, the family is examined in terms of its relationship with other major social structures (Jones & Dimond, 1982). The family is an open system since it is open to the outside and influenced by society. Homeostasis is then considered the desired state of comfort for the family (Johnson, 1986a).

In the functional model the family is seen as a set of functions that the family provides for society in general. The goal of the family is then to meet society's needs. Universal family functions include affective, socialistic, reproductive, coping, economic, and physical duties. The family is an open system since its functions ultimately affect society. Homeostasis is the desired state (Johnson, 1986a).

The interactional model views the family as sets of interacting roles between members. The focus is on the family and member relationships. The goal is for compatible interactions. The family

is more of a closed unit with low influence from outside. Changes in role relationships are more significant than homeostasis (Johnson, 1986a).

The developmental approach focuses on the family as an ever-changing and developing unit. The goal is growth of relationships with focus on developmental changes (Johnson, 1986a). Several well-defined stages of family life are delineated. Each stage has its own level of family conflict and solidarity. The framework views family behavior according to three dimensions (Jones & Dimond, 1982):

- 1) the changing developmental tasks and role expectations of the children;
- 2) the changing developmental tasks and role expectations of the parents;
- and 3) the developmental tasks of the family as a unit which flow from the cultural imperatives at various stages in the family life cycle. (p. 14)

Thus the model involves both an open system with its relationship to society and a closed system due to influences by family members (Johnson, 1986a).

Social Support

The concept of social support has earned much attention as a major psychosocial variable in health-related research in recent years. Social support has been defined differently by various researchers. Support can be defined as "any action or behavior that functions to assist the focal person in meeting his personal goals or in dealing with the demands of a particular situation" (Tolsdorf, 1976, p. 410). Still another definition by Kaplan, Cassel, and Gore (1977, p. 50) describes support as the "'metness' or gratification of

a person's basic social needs (approval, esteem, succorance, etc.) through environmental supplies of social support."

According to Crnic, Greenberg, Robinson, and Ragozin (1984) social support encompasses several dimensions, including instrumental assistance, information provision, and emotional empathy and understanding. Henderson, Byrne, and Duncan-Jones (1981) have proposed that social support operates on a number of levels such as close affectional relationships, friendships, and less formal community contacts.

Cobb (1976) describes social support as information leading the subject to believe three points: (1) he is cared for and loved; (2) he is esteemed and valued; and (3) he is part of a network of communication and mutual obligation. The feeling of being cared for and loved is communicated via trust or emotional support.

"Information that one is valued and esteemed is most effectively proclaimed in public. It leads the individual to esteem himself and reaffirms his sense of personal worth" (Cobb, 1976, p. 301). Esteem support is a frequent label for this public affirmation. Knowledge that one belongs to a network of mutual obligation must be shared and common. It is shared when each participant is aware that every other member knows. It must be common in that everyone in the network has the information (Cobb, 1976).

Dean and Lin (1977) state that the primary group is the major type of group seen as fulfilling social support functions. The primary group had two major axes of organization: 1) the instrumental system geared to the fulfillment of tasks; and 2) an

expressive system focusing on satisfaction of individual needs and the maintenance of solidarity. Within the primary group, the emphasis is upon fulfillment of expressive functions.

The family is the best example of the primary group. According to Dean and Lin (1977) the family has the following six distinct properties or social support functions:

- a) emphasis on mutual responsibility, caring and concern;
 - b) strong mutual identification;
 - c) emphasis upon the person as a unique individual rather than upon his/her performance;
 - d) face-to-face interaction and communication;
 - e) intimacy;
 - f) close association and bonds; and
 - g) provision of support, affection, security, and response.
- (p. 407)

Weiss (1974) also viewed social support as a combination of categories. The categories of relational provisions include six points: (1) attachment or a sense of security and place, a sense that one is loved; (2) social integration; (3) opportunity for nurturance; (4) reassurance of worth; (5) reliable alliance where there is an expectation for continuing assistance; and (6) obtainment of guidance or access to a trusting figure.

Social support begins in utero. With birth it is communicated in a variety of ways, but especially by the way the baby is held or supported. "As life progresses, support is derived increasingly from other members of the family, then from peers at work and in the community, and perhaps, in case of special need, from a member of the helping professions" (Cobb, 1976, pp. 301-302). In the American culture, social support is then again provided by family members as life ends (Cobb, 1976).

The review of theories pertaining to growth patterns, individual development, family systems concepts, and social support further emphasizes the significance of each as they relate to the high-risk infant and family. The degree of interrelatedness is obvious by the blending of concepts especially since it is often difficult to identify the specifics of one framework from the others. The conceptual similarities are not a detriment to this researcher's framework but an indicator of the need to include each concept.

The degree of interrelatedness between growth, individual development, family systems, and social support make it difficult to distinguish between the four concepts. The nurse cannot separate the client from his source(s) of social support established through personal and family development without disturbing a delicate network which may ultimately affect the illness process. Each concept is influenced by changes in the other concepts. It is this meshing process which makes all four concepts significant to the client and the nurse. This level of significance exemplifies the need for further study in regard to physical/individual/family development and social support.

CHAPTER 2

REVIEW OF LITERATURE

Chapter 2 contains a summary of the literature reviewed for each subject area pertinent to this study. The high-risk infant, the high-risk family, and this research project are influenced by four areas of concern: infant physiologic growth patterns and the effects of bronchopulmonary dysplasia and failure to thrive; individual development; family systems concepts; and social support.

Infant Physiologic Growth Patterns

"Normal pregnancy is an alteration of the normal health state of the mother rather than an illness. The high-risk pregnancy, however, presents a risk to the health or the normal development of the child or mother" (Jones, 1986, p. 111). The cause of most premature births is unknown. It is most likely a combination of several factors: maternal, paternal, fetal, and environmental. Some maternal physical aspects which may contribute to prematurity are hypertensive disease, toxemia, placenta previa, abruption placentae, and cervical incompetence. Maternal personal contributions may include cigarette smoking, very young or old age, history of other premature births, lack of prenatal care, and malnutrition. Genetic background and older age are possible paternal factors. Some fetal contributors may be congenital anomaly, fetal disease, or multiple birth.

Environmental factors that may lead to premature birth involve nutrition, stress, and trauma. Many yet unknown factors may be of equal influence (Johnson, 1986b).

The mortality rate for high-risk infants has decreased since the introduction of neonatal intensive care units (NICU) in the 1960's. "With increasing numbers of NICU survivors, the developmental outcome of these infants continues to be a major concern" (Trotter et al., 1982, p. 83). Weight gain, even with all its imperfections as a specific measurement of growth, is the most widely used clinical determinant of overall nutritional well-being and physical development during infancy (Davis & Kennedy, 1985). Despite current research, there is a lack of general agreement as to what constitutes a normal rate of postnatal growth in the low birth weight infant. It is known that low birth weight infants typically lose some weight after birth. This loss needs to be closely monitored since greater than a 15% to 20% deficit can result in dehydration and tissue wasting. Once the infant's condition stabilizes and full nutrient intake is possible many high-risk infants grow at a rate that parallels intrauterine growth curves, resulting in a gain of 20 to 30 grams per day (O'Leary, 1985).

During the first year of life, the healthy premature infant who is appropriate for gestational age grows at a rate similar to the full-term infant of the same postconceptual age. Growth is comparable as long as the premature infant's age is corrected for prematurity (O'Leary, 1985). There are special growth charts for low birth weight or premature infants that attempt to account for

gestational age (Gifford & Lieberman, 1980). Using longitudinal data, Tanner and Whitehouse (1973) have developed growth curves for children 32 weeks gestation through five years of age. Babson and Benda (1976) have also created standards useful for work with infants of 26 weeks gestation through one year.

If nutrition and care are adequate, the growth pattern for AGA preterm infants is largely dependent on postmenstrual age (of the fetus), regardless of postnatal (chronological) age (Brandt, 1978). "For weight, there are significant differences between corrected and uncorrected age from birth until 21 months" (Brandt, 1978, p. 610). After 24 months no correction is necessary (Brandt, 1978). More current growth curves established by the National Center for Health Statistics (NCHS) may be used with this older group of preterm infants. Examples of this data are the Ross Laboratories growth charts adapted from work performed by Hamill, et al., (1979) of the NCHS.

Infants who have encountered severe medical stress or undernutrition in the early postnatal period and infants who are small-for-gestational-age often exhibit a catch-up growth period. High energy intakes are required to facilitate this accelerated growth. This catch-up period is characterized by rapid growth in all parameters. Once the infant has caught up, the rate of growth slows to a more normal increment (O'Leary, 1985).

The literature regarding the growth of SGA preterm infants is incomplete. The SGA infant may have experienced asymmetrical intrauterine growth retardation (where intrauterine weight gain was

poor but linear and head growth were appropriate) or symmetrical intrauterine growth retardation (where weight, length, and frontal occipital circumference were all below the 10th percentile standard). Symmetrical intrauterine growth retardation is usually due to early and prolonged intrauterine deficit with an increased probability of later growth and developmental detriment (O'Leary, 1985).

Infants of low birth weight may be either premature or more mature infants who are small due to intrauterine growth retardation. The distinction is important due to clinical problems specific to each category. Many of the causes of prematurity are unknown while intrauterine growth retardation has been associated with maternal hypertension, congenital infection, and chromosomal abnormalities. Approximately seven percent of all live births in the United States are low birth weight (Trotter et al., 1982). About one-third of this group are SGA, and two-thirds AGA and preterm (Sweet, 1986). Analysis of the U.S. Natality Statistics showed a 7.1% decline in the incidence of preterm low birth weight for all races between 1970 and 1980. During the same time period, the number of term low birth weight infants decreased by almost three times as much. The term LBW incidence was 24.6% lower among whites and 14.9% lower among blacks for the same period (Kessel, Villar, Berendes, & Nugent, 1984).

Over the past decades many studies have been conducted regarding the developmental outcome of high-risk infants. Table 1 presents a summary of a limited number of studies and their findings regarding weight gain. More recent studies reveal that AGA low birth weight infants are achieving better weight measurements by two to five years

