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by

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Abstract

Breastfeeding has been identified as a protective measure to defend against infection, while cigarette smoking is linked with increasing the risk of infection. The purpose of this research was to determine if there is a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants. The Betty Neuman Systems Model was the theoretical framework which guided the study. The researcher, using a correlational ex post facto study design, sought an answer to the question: Is there a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants? A convenience sampling of 128 infants two years old or younger who had undergone myringotomy with pressure equalization tube insertion was utilized. A hospital in north Mississippi was the site of the study. The medical records of subjects were reviewed for data collection. Categorical data were analyzed utilizing a chi-square test of independence with a 0.05 level of significance, 95% confidence interval, and one degree of freedom. The critical chi-square value was 3.841. The research test

statistic of 0.119 did not exceed the critical value. Therefore, no statistically significant relationship was found between dietary influences and exposure to cigarette smoke on myringotomy rates of infants. A serendipitous finding which indicated a significant increase in myringotomy rates in bottle fed infants (78%) was a strong implication for the encouragement of breastfeeding through parental education by the nurse practitioner. Recommendation for further research included conduction of a similar study which incorporated a different research design to allow for prospective data collection.

Table of Contents

List of Tables

Chapter I

The Research Problem

Research has revealed that infants exposed to cigarette smoke are at an increased risk of developing otitis media (OM) and recurrent otitis media (ROM) than infants who are not exposed to cigarette smoke. An estimated three billion dollars are spent annually to provide health care to clients with middle ear infections. An estimated three million prescriptions for oral antimicrobial agents are written annually for the treatment of OM in the United States (Bluestone, 1995). The National Center for Health Statistics reported an increase in the diagnosis of OM from 10 million in 1975 to approximately 25 million in 1990 (Schappert, 1992). The annual office visit rate for the diagnosis of children with OM under the age of two years has increased by 224% since 1975 (Bluestone, 1995).

Ey et al. (1995) reported that heavy maternal smoking was associated with OM during the first year of infant life. The researchers found that children exposed to mothers who smoked at least 20 cigarettes per day had twice the risk of ROM than those who were exposed to less or no maternal

smoking. Research by Owen et al. (1993) revealed that as the number of cigarettes smoked by household members increased, periods of OM increased during the second year of life.

Duncan et al. (1993) found that breastfeeding infants for the first four months of life added protection against episodes of acute otitis media (AOM). Research by Aniansson et al. (1994) also supported breastfeeding as a method of protection against AOM. The purpose of the current study was to determine if there is a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants less than two years of age in Mississippi.

Introduction to the Problem

The review of current literature focused on studies that identified the factors of bottle feeding, exposure to cigarette smoke, and daycare exposure as potential elements which promote the development of OM in a child. Kleinman, Kosecoff, Dubois, and Brook (1994) found that OM was the most common diagnosis of children, the second most common diagnosis in medicine, and tympanostomy tube placement was the most common operation of children. According to Kleinman et al., approximately 670,000 tympanostomy tubes were implanted in the United States in 1988. Myringotomy

with implantation of tympanostomy tubes is the most common minor surgical procedure performed in children for which a general anesthetic is required (Bluestone, 1995).

Breastfeeding as a means of dietary intake for infants less than two years of age is associated with decreased infections if the infant is not exposed to cigarette smoke (Owen et al., 1993). In the early months of life, breast feeding provides the basis for a good foundation of immunity to defend the infant against infections. Colostrum obtained through breast milk has a high concentration of secretory IgA which protects the infant from infections (Howie, Forsyth, Ogston, Clark, & Florey, 1990). Duncan et al. (1993) concluded that breast feeding for the first four months of life protected infants from single and recurrent episodes of AOM. Infants who were exclusively breast fed for more than six months had an OM rate of 10%, as compared to infants who were breast fed less than four months with a rate of 20.5%. Aniansson et al. (1994) also concluded that the frequency of AOM was significantly lower in breast fed infants ($P<0.05$). No episodes of AOM were identified in 24 children who were breast fed longer than 10 months ($P<0.05$) (Aniansson et al., 1994).

Human breast milk contains specific proteins which increase the resistance of the infant to gastrointestinal

infections, respiratory infections, and OM (Janke, 1993). Preparation of formulas with contaminated diluents or utensils can cause disease by transmitting infectious microorganisms or toxic substances into the infant. Thus, breast fed infants have a decreased risk of contracting infectious diseases through the breast milk than bottle fed infants (Janke). Aniansson et al. (1994) supported the Janke findings with research which revealed that the contents of human breast milk contains immunoglobulins and secretory IgA which are active against *Streptococcus pneumonia* and *Hemophilus influenza*. Burrell (1992) lists *Streptococcus pneumonia* and *Hemophilus influenza* as the common organisms which invade and grow in the middle ear resulting in otitis media.

Significance to Nursing

Nursing has a responsibility to act as a client advocate. The role of the nurse practitioner involves informing clients about the benefits to the child of: breast feeding their infants, feeding them in an upright position, encouraging smoking cessation, and limiting childcare to small group settings. The parent can then make an informed decision concerning the environment and feeding for their infant. Preventive education should be instituted

in an attempt to decrease the occurrence of OM in infants and toddlers.

With the advent of shorter hospitalization following vaginal and cesarean delivery, practitioners must utilize every opportunity to educate the client. Parental education is vital to the overall health of the infant. Education should start on or before the first pre-natal visit with the nurse practitioner. Research supports the importance of promotion of breastfeeding by all health care practitioners. The current research will attempt to identify if there is a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants less than two years of age in northeast Mississippi.

Theoretical Framework

The Betty Neuman Systems Model served as the theoretical framework to guide the current research. Neuman (1982) wrote that the first step toward providing professional nursing care was the assessment of client needs. The Neuman Systems Model is a total individual approach to client problems (Neuman, 1982). Neuman (1989) regards an individual as a unique holistic system. The holistic individual is a dynamic composite of physiological, psychological, sociocultural, developmental, and spiritual

variables. According to the Neuman Systems Model, the child with OM would be affected by the following: physiological variables, such as possible exposure to cigarette smoke and modes of feeding the infant; psychological variables such as parental stress; sociocultural variables, such as parenting skills and lack of privacy for breast feeding; developmental variables, such as the impact of OM on hearing and education by the nurse practitioner about OM (Neuman, 1989).

Health or wellness is viewed by Neuman (1982) as the condition in which all parts are in harmony with the whole. The environment of the individual consists of external and internal forces which are in constant motion. Individuals are continually exposed to environmental conditions, such as bottle feeding and cigarette smoke, and must continually strive to maintain equilibrium. The individual is in constant interaction with the environment which leads to a varying degree of wellness or illness. The wellness state is reduced by disharmony, such as bottle feeding and cigarette smoke exposure which are external sources of environmental stressors and may lead the infant to a state of illness. OM qualified as a state of illness for the infant. Health and wellness reflect needs which are met as opposed to a state of illness in which needs are not met (Neuman, 1982).

Neuman (1982) defined a stressor as a disrupting force operating within or upon the balance of a system. Smoking, bottle feeding, or both which may lead to infection have been identified as major stressors for the infant client.

Neuman (1995) described an individual as one who has normal lines of defense, flexible lines of defense, and lines of resistance against stressors. Normal lines of defense were identified as the state of the individual which has developed through life. The individual strengths were reflected in the flexible lines of defense and protected the normal lines of defense. The lines of resistance were resources mobilized by the individual to combat a stressor which had threatened the normal lines of defense (Neuman, 1995). Research has shown breastfeeding to strengthen the immune system of the infant, therefore strengthening the flexible line of defense. If defense mechanisms, such as an immature immune system, are not intact, nurse practitioner intervention is directed at restoring and maintaining health through teaching to alleviate stressors. Stressor identification is critical due to the premise that some stressors are beneficial (Neuman, 1982).

The Neuman Systems Model can be initiated by nurse practitioners to assist clients to attain and maintain wellness and to alleviate or reduce stressors. A nurse

practitioner intervention begins when a stressor is suspected or identified. Neuman (1989) described the point of entry into the health care system for both the client and caregiver as either at the primary prevention level before a reaction to stressors has occurred, at the secondary prevention level after a stressor reaction (infection) has occurred, or at the tertiary prevention level following treatment of a stressor reaction (recovery from infection). Primary prevention is aimed at identifying stressors and the risk factors. Nurse practitioners have a responsibility to educate parents of the risks of cigarette smoke exposure to the infant and potential deterioration of the flexible line of defense for the infant. Risks versus benefits of bottle feeding, breastfeeding, and exposure to cigarette smoke should be explained to parents in the pre-natal period and reinforced with each healthcare visit.

Secondary prevention provides intervention and treatment. This stage usually occurs in a clinic or emergency room setting when the infant is treated for OM. Education remains a vital part of the secondary prevention level to strengthen the lines of resistance (Neuman, 1989). Secondary prevention may eliminate tertiary prevention if there is effective education of the parents.

Tertiary prevention is related to the reconstitution

process and the circular move toward primary prevention (Neuman, 1982). Follow-up care and continuing emphasis on education with the parent are vital components of the tertiary level. Infants, following myringotomy with insertion of pressure equalization tube, should move toward the infection free state and maintain that state if secondary prevention was successful.

External stressors in the environment of the infant are identified in the current research as dietary influences and exposure to cigarette smoke. The immature immune system of the infant lacks the normal line of defense necessary to defend the body from invading organisms. Impaired immunity allows for the development of OM. The broken lines of resistance result in a state of illness. Thus, the goal of the nurse practitioner is to promote a balance between the infant and environmental stressors and strengthen the lines of resistance by parental education, dietary changes, and eliminating smoke exposure.

Pierce and Hutton (1992) applied the Neuman Systems Model to the client with human immunodeficiency virus (HIV). All variables of the model were incorporated to optimize wellness: physiological, psychological, sociocultural, developmental, and spiritual. The client environment was assessed to determine the wellness-illness state. With the

infant, the parents must also be assessed due to the effects of beliefs and parental habits, such as smoking, on the welfare of the infant.

In contrast to the infant, the client with HIV has many spiritual needs. Pierce and Hutton (1992) described the HIV client as spiritually lacking due to the poor prognosis of the disease and feelings of hopelessness. The mind is controlled by the spiritual variable and the body is controlled by the mind (Pierce & Hutton, 1992).

Pierce and Hutton (1992) concluded that stimuli encountered by individuals created their environment. It is essential for the nurse practitioner to educate parents concerning the stimuli of the infant environment which place them at risk for infections, such as cigarette smoke and formula feeding.

Assumptions

1. Nurses accurately assessed subjects and documented information in the medical record.

2. All subjects who had myringotomies were diagnosed with recurrent otitis media.

3. Parents accurately reported the infant feeding method.

4. Parents were honest in reporting smoking around the

infant.

5. The environment of the client is responsible for either a dynamic state of wellness or some degree of illness.

Statement of the Problem

Is there a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants?

Hypothesis

There is a relationship between myringotomy rates of infants who are breast fed as opposed to bottle fed and who are exposed to cigarette smoke.

Definition of Terms

For the purpose of this research, the following definitions were used:

Dietary influences: Intake of commercially prepared formulas in the form of bottle feedings, or intake of breast milk from breasts of mother.

Infants: Human children from birth to two years of age.

Myringotomy: Surgical incision of the tympanic membrane of the ear.

Exposure to cigarette smoke: Infant in direct contact with, or living in environment where cigarettes are smoked (in the household or daycare facility).

Breast fed: Infants who consumed only breast milk for a minimum of one week or breast milk with a formula supplement after the one week period since birth.

Bottle fed: Infants who only consumed commercially prepared formula since birth.

Chapter II

Review of the Literature

Review of the current literature focused on the protective effects of breastfeeding infants. Protective effects of breastfeeding against otitis media (OM) and other respiratory infections were targeted. Cigarette smoke exposure and group childcare settings were additional issues of concern which placed infants at risk for upper respiratory infections.

Infants are routinely exposed to environmental stressors which place them at risk for infection, including cigarette smoke, commercially prepared formulas, supine feedings, and daycare settings. Otitis media is a common diagnosis of early childhood. Frequent occurrence of OM may necessitate placement of tympanostomy tubes. Research that focuses on environmental stressors which lead to the diagnosis of OM will be discussed in this chapter. It is essential for healthcare providers to identify areas of environmental stressors so education can be formulated to assist clients to provide care for infants. Breastfeeding has been identified by some researchers to protect infants

from episodes of OM. The review of the literature which follows will explore the relationship between breastfeeding infants and various environmental factors to the diagnosis and outcome of OM.

Duncan et al. (1993) assessed the impact of exclusive breastfeeding for four months on acute and recurrent OM during the first year of life. In the descriptive research study acute otitis media (AOM) was defined as three or more episodes of OM in a six month period and recurrent otitis media (ROM) was defined as four episodes of OM in a 12 month period. Potential risk factors were identified as socioeconomic status, gender, number of siblings, maternal smoking, and familial allergy status. The diagnosis of OM had no specific criteria (Duncan et al., 1993).

Seventy four percent of the information obtained by Duncan et al. (1993) was gathered prospectively and 26% was gathered by questionnaires retrospectively. Initial enrollment totalled 1,246 newborns, but only 1,220 records were reviewed. Newborns totalling 1,013 were followed for the first year of life. Medical records were reviewed from a pediatrician office a Health Maintenance Organization urgent care center. A Kruskal-Wallis nonparametric analysis of variance was used to assess significant difference in the mean rank of feeding category cases and logistic regression

models were used to provide odds ratios related to feeding practices. The Lee-Desu statistic was utilized to assess the statistical significance of differences in incidence of different categorical feeding groups (Duncan et al., 1993).

Duncan et al. (1993) found that infants who were breast fed for four or more months exclusively had half the mean number of AOM episodes compared to those who were not breast fed, and 40% less than those whose diets were supplemented before four months of age. The frequency percentage of ROM decreased significantly with the increasing duration of breastfeeding. The ROM rates in infants breast fed exclusively for more than six months were 10% as compared to 20.5% in those who did not breast feed or who breast fed less than four months. The researchers supported the premise that breastfeeding had a prolonged protective effect on AOM. The findings may reflect that if episodes of OM were prevented early in life, subsequent episodes would be less likely to occur later in life. The researchers concluded that breastfeeding for the first four months of life protected the infants against single and recurrent episodes of AOM (Duncan et al., 1993).

Early childhood is the age group most commonly plagued by AOM. Research has been ongoing to establish the value of breastfeeding to protect the infant against AOM. The

research of Aniansson et al. (1994) assessed the relationship of breastfeeding to the frequency of AOM in infants from birth to 12 months of age. A prospective cohort study design was utilized. Subjects were selected from three well-baby clinics. A midwife visited all families within two weeks post-partum. Informed consent was obtained at the two month visit. Complete information was obtained from approximately 400 children. Each child was examined at two, six, and ten months of age. Information gathered on breastfeeding, daycare use, nasopharyngeal cultures, and physical examinations was completed at each visit (Aniansson et al., 1994).

The researchers determined that a majority of the infants (79%) had no signs or symptoms of AOM. One episode of AOM was experienced by 16% of the infants and 6% had two or more episodes of AOM. No significant difference in frequency of AOM was shown between sexes of the infants (Aniansson et al., 1994).

The infants were divided into three age groups: one to three months of age, four to seven months of age, and eight to twelve months of age. The breastfeeding mothers weaned their infants and instituted bottlefeeding in 77% of the infants by the eight to twelve month age group. Aniansson et al. (1994) found AOM in all age groups was significantly

lower in the breast fed children ($p<0.05$). No AOM occurred ($p<0.05$) in the children who were breast fed for longer than 10 months (Aniansson et al., 1994).

Aniansson et al. (1994) compared nasopharyngeal colonization with *Hemophilus influenza*, *Streptococcus pneumonia*, and *Moraxella catarrhalis* to the occurrence of AOM. Infants from four to seven months of age with AOM carried *Haemophilus influenzae* significantly more than those without AOM ($p<0.05$). Infants from eight to twelve months of age with AOM carried *Haemophilus influenzae* ($p<0.001$), *Streptococcus pneumoniae* ($p<0.05$), and *Moraxella catarrhalis* ($p<0.01$) significantly more than those infants without AOM. Episodes of upper respiratory infections at four to seven and eight to twelve months of age were significantly lower ($p<0.001$) in the breast fed infants (Aniansson et al., 1994).

The results of Aniansson et al. (1994) supported breastfeeding as protection against AOM. The current study will attempt to determine if there is a relationship between dietary influences and myringotomy rates of infants in Mississippi. Observations by Aniansson et al. suggested that breastfeeding protected the infant from AOM through the antibacterial and antiviral antibodies acquired from human milk which were specific to attack respiratory tract

pathogens.

Owen et al. (1993) sought to evaluate the relationship of infant feeding practices, cigarette smoke exposure, and group childcare to the onset and duration of otitis media with effusion (OME). General demographic information, feeding practices, cigarette smoke exposure, and group childcare were variables which were identified in the study. Gender, feeding positions, total number of packs of cigarettes smoked per day in the home, ethnicity, and number of hours spent in group childcare per week were analyzed by Owen et al.

A prospective research design was utilized to evaluate 534 healthy, term infants from three nurseries in Galveston County, Texas. Of this sample, 435 were followed to two years of age which represented a 38% attrition rate (Owen et al., 1993).

Informed consent was obtained from the parents. A standard surgical consent form was signed by parents before the insertion of tympanostomy tubes. Infants were recruited at birth without respect to sex, ethnicity, or socioeconomic status. Exclusion of infants from the study occurred if English was not the primary spoken language. Neonatal complications and craniofacial anomalies were further variables for exclusion from the study. Families who

planned to move from the area within the next five years were omitted from the study. A major source of bias was parental willingness to participate in a long term study (Owen et al., 1993).

Home visits were made every two to four weeks. The child's middle ear status was tested by trained technicians using tympanometry. If abnormal testing occurred, the test was repeated and the most normal test result was submitted. Each ear was evaluated separately. A computer program calculated the percentage of time each child had OME for a certain period of time. The parent was informed of the middle ear status at each visit (Owen et al., 1993).

The LISREL computer program was used to explore associations between the OME variables and the risk factors while controlling for interrelations among demographic and environmental variables. Path analysis took into account the relationship between the endogenous and exogenous variables. LISREL allowed for separation of direct and indirect relationships (Owen et al., 1993).

The greater number of cigarettes smoked by household members was associated with longer duration of OME during the second year of life. Infants from 12 to 18 months of age who were exposed to cigarette smoke were found to have an 11% increase in the amount of OME for each pack smoked

(Owen et al., 1993).

Infants fed in the supine position had earlier onset of OME. Breastfeeding for the first six months of life had a 10% decrease in the amount of OME, but a shorter duration of breastfeeding during the first six months of life resulted in more OME as compared to those who were not breast fed. Male gender was related to an earlier age of onset of OME. Females from 18 to 24 months of age were more likely to have increased OME (Owen et al., 1993).

Owen et al. (1993) concluded that OME was common and the onset was early in the study group. More frequent OME was associated with breastfeeding of shorter duration. Recommendations by Owen et al. included encouraging prolonging time spent breastfeeding infants, upright positioning during feeding, smoking cessation, and limiting childcare to smaller group settings. Owen et al. recognized certain variables, such as values, beliefs, economic status, and convenience were involved when decisions were accomplished involving the infant.

In 1990, Rubin et al. explored the relationship between infant feedings and infectious illnesses through a descriptive study utilizing 500 infants. Close observation was maintained to avoid conflict with results of the study. Issues which were closely monitored included: collection of

frequent prospective data, presence of siblings in the home, parental definitions of infectious illnesses and breastfeeding, and application of appropriate statistical strategies (Rubin et al., 1990).

Mothers were interviewed during the third or fourth postpartum day to retrieve information concerning the plans for infant feeding. Monthly questionnaires were mailed during the first year of child life to retrieve information concerning infectious illnesses, variables which may relate to the infection, and type of infant feedings. Infants had to meet the following criteria: no evidence of serious congenital defects or underlying illness, birth weight greater than or equal to two thousand grams, and gestational age greater than or equal to 36 weeks. Interviews were conducted by one of three trained research assistants or the principal investigator. Socioeconomic status was evaluated utilizing the Hollingshed Scale of Social Class and a standardized Danish classification of social class based on the employment of the mother and educational level (Rubin et al., 1990).

Information was gathered about feeding, infectious illnesses, and variables which may be related to the risk of infection using questionnaires. Infant feeding methods were categorized monthly into one of five feeding groups: 100%

breast fed, breast fed more than formula fed, breast fed the same as formula fed, breast fed less than formula fed, and 100% formula fed. Breastfeeding was defined as 100% breast fed and breast fed more than formula fed, and the remaining categories were defined as formula fed. Diagnosis of infectious illnesses were based on the maternal reports of symptoms and information learned from the visit by the child to the physician office. Illnesses of interest were gastroenteritis, upper respiratory illnesses, OM, and lower respiratory illnesses (Rubin et al., 1990).

Variables were classified according to the risk of infection. Social class had two categories: upper and lower; daycare had three categories: none, small group (one to four children), and large group (five to twenty children); two categories were allowed for other children in the family: none and at least one; and infectious illnesses in family members: none and at least one (Rubin et al., 1990).

The incidence density was the primary rate of analysis. The ratio of the incidence density of infections among the formula fed infants divided by the incidence density of infections among the breast fed infants was referred to as the incidence density ratio. This was conducted to test the null hypothesis. The statistical package utilized to

analyze the data was GLIM 3.77. The Poisson option was incorporated to analyze log-linear models of person-time methods (Rubin et al., 1990).

The results of the study revealed a monthly questionnaire return rate of 92% at one month, 75% at six months, and 44% at twelve months. During the first six months of life, breastfeeding was predominant, whereas during the second six months, formula feeding was the choice. The monthly incidence densities of illness in each feeding group were similar, suggestive of no substantial protective effect of the breastfeeding method for the infant. The overall adjusted ratio for gastrointestinal illness was 1.067 and upper respiratory illness was 0.984. These results indicated no substantial protective effect of breastfeeding for these illnesses. A statiscally significant protective effect of breastfeeding on OM was identified after adjustment was made for birth weight, social class, number of children in the family, daycare, and other familial illnesses. After the addition of the age variable, the breastfeeding effect was no longer statistically significant ($P>0.05$). The age-dependent nature of OM exhibited statistical significance (Rubin et al., 1990).

The results of Rubin et al. (1990) suggested that

breastfeeding was not substantially protective against common infectious illnesses during the first year of life in a middle class, urban population of a developed country. Surveys were made at frequent intervals to minimize the problem with detection bias. Criteria for infant feeding methods and illnesses were carefully defined and applied systematically. The conclusions of this study cannot be generalized to rural populations in developed nations due to the high rates of infections and morbidity (Rubin et al., 1990).

In contrast to the study by Rubin et al. (1990), Paradise, Elster, and Tan (1994) analyzed the relationship between middle-ear status and feeding methods in a large group of infants with cleft palate. The purpose was to determine whether infants with cleft palates who received breast milk were less likely to develop or maintain continued presence of OM.

The descriptive study included 315 infants with cleft palate, with or without cleft lip. Data were reviewed and analyzed concerning feeding methods and the presence or absence of middle-ear effusion. Analysis was limited to periods preceding infant tympanostomy tube placement, palate repair, or their second birthday, whichever occurred first. For infants more than six months of age, tympanometry was

performed routinely by a certified audiologist. An electroacoustic impedance meter with manual or automatic plotting was the instrument utilized for testing (Paradise et al., 1994). Mothers were contacted after the direct observation period to obtain the following information: maternal education level and age at infant birth, and the amount of cigarette smoking in the home. Most of the infants were enrolled in the study by one month of age, and virtually all were enrolled by three months of age. Demographic information was obtained on each infant at enrollment. Follow-up visits were scheduled monthly during the first six months of life, bimonthly during the second six months, and every three months thereafter until three years of age (Paradise et al., 1994).

All statistical tests were two-tailed. Fisher exact or x2 tests were utilized to test for proportional differences. Pearson's correlation coefficient was calculated to evaluate the degree of variable association. The Mantel-Haenszel adjustment procedure was utilized to calculate the weighted relative risk. The Student's *t* test was utilized to differentiate between means. The confidence interval was calculated at 95% (Paradise et al., 1994).

Milk from cows or soy formula was exclusively fed to 261 (82.9%) of the infants. Breast milk exclusively or in

part for varying periods was fed to 54 (17.1%) of the infants.

Seven (2.7%) of the 261 formula fed infants and 17 (31%) of the 54 breast fed infants ($P<0.0001$) had one or more middle-ear effusion free visits. The period over which the infants were observed to be middle-ear effusion free was related to the duration of feeding with breast milk ($P=0.06$). A mean duration of 75 days and a median duration of 51 days was calculated for the 37 breast fed infants who had no middle-ear effusion free visits. The statistically significant differences found between formula fed infants and breast fed infants in relation to clinical and demographic characteristics were higher parental socioeconomic status ($P=0.02$) and higher parental educational attainment ($P<0.04$) among the breast fed infants. Formula fed infants were exposed more to smoking in the household ($P=0.09$) and had consistently more middle-ear effusions (Paradise et al., 1994).

Placement of tympanostomy tubes for persistent middle-ear effusions was performed on 253 (96.9%) of the 261 formula fed infants at least once by 24 months of age. Tube placement was performed on 48 (89%) of the 54 breast fed infants during the same period. Tube placement was also performed on one formula fed and two breast fed infants

between 24 and 30 months of age. Parents refused the operation for one formula fed infant. Three formula fed infants were unable to be evaluated prior to two years of age for unknown reasons. Three formula fed and four breast fed infants remained free of middle-ear effusion and received no tube placement prior to six years of age (Paradise et al., 1994).

Paradise et al. (1994) discovered no source of susceptibility bias. All infants had cleft palate. Formula fed and breast fed infant groups had similar distributions in regard to sex, birth weight, race, cleft type, and amount of palatal impairment. Observations were completed prior to formulation of the study question which minimized the risk of observer bias. The findings supported the diagnosis validity of the middle-ear effusion free periods. Tympanograms were obtained and were consistent with findings of the otoscopic and tympanometric findings (Paradise et al., 1994).

The findings of Paradise et al. (1994) were consistent with Goldman (1993) who found evidence that certain components of breast milk, for example various cytokines and prolactin, enhanced or activated the immunity roles of the infant through intrinsic protective processes. Paradise et al. suggested that breastfeeding for only limited periods

may help protect the infant against OM. Four of the breast fed infants who had at least one middle-ear effusion free visit had received breast milk for less than one month. The feeding of breast milk to infants with cleft palate for short periods of time would not likely limit the development of middle-ear disease (Paradise et al., 1994).

Paradise et al. (1994) concluded that breast milk feeding for infants with cleft palate during the first year of life was recommended in an attempt to minimize the development of OM and the need for tympanostomy tube placement. The findings confirmed the protection of breast milk against OM and suggested that impaired eustachian tube function was not the only factor in the initial development of middle-ear effusion for the infant (Paradise et al., 1994).

In contrast to the previously reviewed literature, Alho et al. (1990) studied the relationship between OM and respiratory infections to the antenatal and perinatal periods. The investigation was prospectively selected to determine the effect of antenatal and perinatal factors on OM, wheezy bronchitis, and other acute respiratory infections on infants up to two years of age (Alho et al., 1990).

A random block design method from a prospective one

year birth group of 9,478 children born in Northern Finland was utilized to select a series of 2,512 children from 10 local government districts. The children were studied from the antenatal period up to two years of age. The data were collected by one of the authors from the medical records. The average time for follow-up was 653 days (Alho et al., 1990).

The diagnosis of AOM was made by the primary physician. When effusion was suspected, myringotomy was performed at the primary health care center. A child was "otitis-prone" if three or more episodes of AOM with effusion occurred. The number of acute respiratory tract infections which necessitated consultation with a physician were also recorded (Alho et al., 1990).

The following information was retrieved from the medical record: gestational age, special neonatal care, intrauterine growth retardation, mode of delivery, birth weight, APGAR scores at one and five minutes, birth order, intubation, intermittent or continuous positive pressure ventilation, socioeconomic class of both parents, parental smoking during pregnancy, maternal age at delivery. Parents were sent a questionnaire concerning postnatal factors when the child reached two years of age. The questionnaire response rate was 86.8%. Postnatal factors included:

duration and position of the child during breastfeeding, duration and type of daycare, type of housing, pets, socioeconomic class, parental smoking, family residence, number of people encountered daily by the child, and number of siblings. The association of different etiologic factors with OM was tested with a logistic regression model. GLM and CATMOD procedures of statistical software were utilized for the analysis (Alho et al., 1990).

Results from the study of 2,512 children had a total of 1,745 episodes of AOM with effusion, 4,316 episodes of AOM and 3,820 episodes of respiratory infections. Maternal smoking occurred during pregnancy in 542 cases (21.6%) and both parents smoked in 283 (11.3%) of the cases. Parity of less than three and maternal smoking were significantly associated ($P<0.001$) with low birth weight (Alho et al., 1990).

Alho et al. (1990) concluded that no statistically significant association was found between low birth weight, prematurity, or respiratory treatments on the total number of AOM episodes. The number of siblings was associated with the infective factors. Elimination of selection bias was achieved by random enrollment and utilizing a cohort-based experimental design. Data were collected retrospectively regarding infections (Alho et al., 1990).

Knowledge of possible risk factors aided in the diagnosis and treatment of AOM. Acute respiratory infections and OM were significantly affected by antenatal and perinatal factors (Alho et al., 1990).

In comparison to the 1990 study by Rubin et al., Howie et al. (1990) assessed the relationship between breastfeeding and infant illness in the first two years of life, but made a particular reference to gastrointestinal disease. A prospective observation study design was utilized. The sample consisted of 750 pairs of infants and mothers. Exclusion of 76 pairs was made due to low birth weight, prematurity, or special care of more than 48 hours. Of the remaining 674 pairs, 618 pairs were followed for the entire two year period (Howie et al., 1990).

Definitions for the study were as follows: gastrointestinal illness-diarrhea, vomiting, or both lasting for 48 hours or more; respiratory infections-coryza, associated with wheeze, cough, or both lasting for 48 hours or more; ear infection-discharge or pain from the ear lasting for 48 hours or more; other infections-infections of ear, eye, mouth, or skin lasting for 48 hours or more; colic- attacks of intermittent abdominal pain associated with infant screaming and accompanied by drawing up of the legs with no illness exhibited between episodes; eczema-

diagnosed by the attending medical staff from clinical appearances; supplementary feeding-introduction of formula, cows milk, or solid food omitting the use of water or juice. Detailed observations of infant feeding and illnesses were made on planned visits at two weeks, and one, two, three, four, five, six, nine, 12, 15, 18, 21, and 24 months by health visitors. Utilizing a standardized form, information was recorded at each visit concerning all episodes of maternal health, infant illness, and illness among siblings since the previous visit (Howie et al., 1990).

The methods of hospitalized infant feeding were retrieved from the hospital record. Number and type of feedings were recorded at each scheduled visit. Record cards were supplied to mothers for documentation of feedings and infant illness to aid with recall accuracy. Mothers were divided into one of four groups: full breast feeders (>13 weeks), partial breast feeders (>13 weeks but introduced supplements), early weaners (discontinued breast feeding before 13 weeks), and bottle feeders (bottle fed from birth)(Howie et al., 1990).

Collection of maternal data included: parity, age, height, social class, marital status, smoking habit, pregnancy complications, age at leaving school, illness at delivery, and previous medical illness. Infant data

collection included: birth weight, sex, APGAR score, gestational age, mode of delivery, duration of labor, neonatal jaundice, immunization history, sibling illness, and attendance at daycare facilities. Social and paternal information collection included: social class, smoking habit, maternal and initial reaction to pregnancy, age, family planning, time of first antenatal attendance, defaults from antenatal clinic, and childbirth class attendance (Howie et al., 1990).

The statistical package for the social sciences (SPSS-X) was utilized to describe the distribution of risk factors and illness incidence. Differences in risk factors between feeding groups were compared utilizing the $X2$ tests. Linear interactive modelling was utilized to perform the calculations for tests of significance and standard errors. An adjusted incidence rate was converted from the average logarithmic odds. Data were verified and dictated on IBM microcomputers with the dBase III+ program (Howie et al., 1990).

Of the 674 mother-infant analyzed pairs, 267 mothers bottle fed from birth, 180 were early weaners, and 227 chose to breast fed for 13 or more weeks. Of the women who breast fed, 130 were partial breast feeders and 97 were full breast feeders. Mothers who breast fed had longer secondary

education, were older, smoked fewer cigarettes, more often married, of lower parity, and from higher social classes. Factors more common in bottle fed infants were mothers who initially had adverse reaction to pregnancy, non-attendance at childbirth classes, missed clinic visits, short height, and paternal smoking. Three variables were identified by multiple logistic regression which explained important amounts of variation in the incidence of gastrointestinal infection in infants during the first three months: maternal age, paternal social class, and smoking incidence of one or both parents (Howie et al., 1990).

Infants who were breast fed for 13 weeks or more had significantly less gastrointestinal illness than those who were bottle fed from birth at ages 0-13 weeks ($p<0.01$), 14-26 weeks ($p<0.01$), 27-39 weeks ($p<0.05$), and 40-52 weeks ($p<0.05$). This reduction in illness was found without regard to supplement introduction before 13 weeks. Infants who were breast fed for less than 13 weeks had rates of gastrointestinal illness similar to those observed in bottle fed infants. Smaller reductions in respiratory illness rates were observed at 1-13 and 40-52 week age groups ($p<0.05$) in infants who were breast fed for more than 13 weeks. There was no consistent protective effect of breast feeding against ear, eye, mouth, or skin infections,

infantile colic, or eczema (Howie et al., 1990).

Howie et al. (1990) concluded that breastfeeding during the first 13 weeks of life confers protection against gastrointestinal illness that persists beyond the period of breastfeeding itself. However, no evidence was found to suggest that brief periods of breastfeeding were sufficient to offer any significant protection against gastrointestinal illness. A smaller protective effect of breastfeeding against respiratory illness was found at the time periods of 0-13 and 40-52 weeks of age. Howie et al. concluded that mothers should be told without ambivalence that breastfeeding offers an advantage for their infants, but to obtain that advantage breastfeeding should be maintained for at least three months. Health professionals responsible for lactating mothers should encourage perseverance if problems are encountered during the first few weeks of breastfeeding. Conclusion of the study indicated that breastfeeding played an important role in preventing infection among infants in developed countries (Howie et al., 1990).

Ey et al. (1995), unlike the previously reviewed authors, compared passive smoke exposure exclusively to the incidence of OM in the first year of infant life. The purpose of the study was to assess the relationship between OM and parental smoking. The medical records of 1,220

infants were reviewed for the diagnosis of OM and 1,013 were followed for the entire first year of life. Risk factors identified were: formula feeding, cold weather months, male gender, presence of siblings, daycare attendance, and parents with allergies or a history of ROM. ROM was defined as the diagnosis of AOM for a minimum of three episodes in a six month period or four episodes in a 12 month period (Ey et al., 1995).

Enrollment questionnaires contained information on gender, maternal marital status, socioeconomic status, number of siblings in the family, and physician-diagnosed history of hay fever in either parent. Statistical significance of associations and trends between categorical variables used the $X2$ distribution. Analysis of variance (ANOVA) and the multiple-range test were utilized to compare the daily number of cigarettes smoked by the parents and the mean number of AOM episodes. The Kruskal-Wallis nonparametric test was utilized for assessment of significant differences in the mean cases by smoking categories. One-tailed P values of $\leq .05$ were considered significant (Ey et al., 1995).

Smoking prevalence varied from 30% in mothers who bottle fed to 14% in those who breast fed their infants for six or more months. There was an inverse relationship

between education and paternal smoking. Children of mothers who smoked 20 or more cigarettes per day had a significantly higher mean number of AOM episodes than those infants whose mothers smoked less than 20 cigarettes per day ($P \leq 0.05$). Paternal smoking habits showed no significant relationship to the number of AOM episodes in the child. ROM ranged from 27.5% in the group of mothers smoking 20 or more cigarettes per day to 15% for infants mothers smoking 0-19 cigarettes per day ($P \leq .05$). No significant difference was identified in the infant rate of ROM from paternal cigarette smoking (Ey et al., 1995).

Male gender and having siblings were significant risk factors for AOM and ROM. A parental history of physician-diagnosed hay fever was a significant risk factor for any AOM. Heavy maternal smoking during the ante-partal period was associated with a significantly increased risk of ROM. No significant associations between AOM or ROM and maternal education were found. Mothers smoking 20 or more cigarettes per day increased the child risk 1.8 times for developing ROM but no significant increase in odds for AOM. A significant protective effect for both AOM and ROM was shown by breastfeeding for at least four months (Ey et al., 1995).

Ey et al. (1995) demonstrated that in the first year of life, heavy maternal smoking was a significant risk factor

for ROM. No relationship between ROM and paternal smoking was found. Smoking mothers were less likely to breast feed infants. ROM was more likely related to maternal smoking after delivery rather than smoking during pregnancy. Parental questionnaires administered when the child was six years of age revealed that 15.3% of children with ROM and 1.8% with no OM had received tympanostomy tubes in the first year of life ($P \leq .0001$). Conclusion of the study acknowledged that exposure to cigarette smoke increased the risk for ROM in the first year of infant life and heavy smoking by the mother was an important independent risk factor for ROM (Ey et al., 1995).

Although many of the variables included in the research by Dewey, Heinig, and Nommsen-Rivers (1995) were closely related to the previous authors reviewed, Dewey et al. compared morbidity rates between breast and formula fed infants. The purpose of the study was to determine the protective effects of breastfeeding against infection in a prosperous population. The Davis Area Research on Lactation, Infant Nutrition, and Growth (DARLING) study evaluated morbidity differences. The DARLING criteria evaluated the infants who were either fully breast fed or formula fed during the first year of life. Longitudinal data collection were continuous and frequently monitored

(Dewey et al., 1995).

The DARLING study objective was the comparison of nutrient intake, morbidity, growth, and activity levels during the first two years of life. Matched groups of infants were compared who were either breast fed (n=46) or formula fed (n=41) through the first 12 months of life. Neither group of infants received solid foods before the fourth month of age. Groups were matched to ensure similarity between parental socioeconomic status, birth weight, ethnicity, sex, and education. Parental smoking was uncommon in both groups (Dewey et al., 1995).

Mothers were contacted weekly to record symptomology of infant illness. Calendars were utilized to record daily symptoms. Morbidity data were divided into four categories: respiratory symptoms, diarrhea, AOM, and other symptoms or disorders. Groups were statistically compared at 12 month intervals (Dewey et al., 1995).

The Statistical Package for the Social Sciences (SPSS) was utilized for data analysis. A unit of analysis was considered as one infant. The Student *t* test was used when the data were normally distributed in bivariate analyses. Mann-Whitney U tests and chi-square tests were utilized to compare groups. Logistic regression or hierarchic log linear models were utilized for multivariate analyses for

diarrhea, OM, and other illnesses (Dewey et al., 1995).

Incidence of respiratory illness and daycare use were positively related in the formula fed group ($p<0.05$), but not in the breast fed group ($p>0.05$). Incidence of respiratory illness and number of siblings were positively related in the breast fed group ($p<0.05$), but not in the formula fed group. After controlling for number of siblings and daycare use, no significant differences in prevalence or incidence of respiratory illness between formula and breast fed infants were found (Dewey et al., 1995).

The incidence of diarrheal illness among formula fed infants was twice that of breast fed infants during the first year of life. Infants with diarrheal illness were positively associated with daycare use in the formula fed group but not in the breast fed group (Dewey et al., 1995).

The prevalence of OM varied from 2.2% to 3.1% of days in breast fed infants and 4.2% to 7.2% of days in formula fed infants. OM was not significantly associated with daycare use, but was associated with presence of siblings among the formula fed group only. Incidence of OM between the breast and formula fed groups differed significantly during the first year of life. The percentage of infants with zero episodes of OM was 42% in the breast fed groups as compared to 18% in the formula fed group; with two or more

episodes, 34% were breast fed and 57% were formula fed. The mean age of onset for the first episode of OM for formula fed infants was 12 weeks earlier than the breast fed infants. Formula fed infants exhibited a longer episodic duration of OM. The percentage of formula fed infants with prolonged ear infections was five times higher in the first year and 3.6 times higher in the second year of life. No significant differences were found in regard to other illnesses between the groups (Dewey et al., 1995).

Study results indicated that breastfeeding during the first year of life was protective against OM and diarrheal illness in a prosperous, highly educated population. Statistically significant differences in rates of OM and diarrhea between infant groups were found. During the first year of life, incidence of diarrhea was approximately 50% lower in breast fed infants. The number of breast fed infants with one or more episodes of OM was 19% lower and the number of infants with prolonged episodes of OM was 80% lower than those infants who were formula fed during the first year of life. Breast fed infants were less likely to have prolonged episodes of OM during the second year of life (Dewey et al., 1995).

The results of the study indicated the protective effect of breastfeeding against illness was of significance

to public health in a prosperous population. Reduction in morbidity was evidenced through the breastfeeding of infants and was of sufficient magnitude to be of significance to public health (Dewey et al., 1995).

Recurrent episodes of AOM, a persistent middle ear effusion, or both which increase the risk of hearing loss are diagnoses considered for placement of tympanostomy tubes. The magnitude of tympanostomy tube placement in the United States prompted Kleinman, Kosecoff, Dubois, and Brook (1994) to research the medical appropriateness of tympanostomy tubes proposed for children younger than 16 years of age. The sample included all cases of tympanostomy tube placement proposed for the aforementioned children between January 1, 1990 and July 31, 1991 who were insured in health plans requiring precertification by one of three clients of a national utilization review (UR) firm. Children between 22 days of age and 15.9 years of age from 49 states and the District of Columbus were included. The UR firm compiled a panel of four otolaryngologists and five pediatricians to develop criteria for the tympanostomy tube placement procedure. The criteria was developed utilizing the two-round modified Delphi method (Kleinman et al., 1994).

Kleinman et al. (1994) defined appropriate tympanostomy

tube placement as those which expected health benefits to exceed the expected negative health consequence and implied that benefits exceed risks; inappropriate that risks exceed benefits; and equivocal that risks and benefits are approximately equal. Appropriateness for reasons other than recurrent AOM, OME, or both were excluded from the analyses (Kleinman et al., 1994).

Total sample size was 6,429 cases. Males constituted 61% of the sample and the mean age was 3.1 years. Distribution of age was positively skewed. Results revealed 41% had appropriate indications, 32% equivocal indications, and 27% inappropriate indications for tympanostomy tubes. Children with OME for 30 days or less had 97% inappropriate indications for tube placement. Appropriate indications were found in children who had documentation of effusions for longer than 90 days. The children studied were not a nationally representative sample, but did represent a national population who were insured under the three major insurance companies (Kleinman et al., 1994).

The conclusion of the study was that generalizable findings in the United States represented several hundred thousand children who had received tympanostomy tubes that offered no demonstrated advantage over less invasive therapies. The surgery may have placed them at increased

risk for undesirable outcomes. Physician agreement with the panel of experts could eliminate inappropriate tympanostomy tube placement in children with recurrent AOM, OME, or both by postponing surgery in uncomplicated cases until further developments occurred (Kleinman et al., 1994).

Review of the current literature was inconsistent with findings which substantiate the methods of dietary influence which is more appropriate for infants. Many authors supported the efficacy of breastfeeding while Rubin et al. (1990) identified no substantial protective effect of breastfeeding. However, Dewey et al. (1995) found the differences in rates of diarrhea and OM between breast fed and formula fed infants were statistically significant. Controversy existed among the sufficient time period of breastfeeding the infant. Howie et al. (1990) found that brief periods of breastfeeding were not sufficient to offer any significant protection against gastrointestinal illness, but should be maintained for at least a three month period.

The incidence of environmental exposure to cigarette smoke varied among the reviewed authors. Ey et al. (1995) identified that paternal smoking habits showed no significant relationship to the number of AOM episodes in relation to the infant, while ROM was more likely to be related to maternal smoking after delivery rather than

smoking during pregnancy. The current research will attempt to relate the influence of dietary habits and the environmental exposure to cigarette smoke on the myringotomy rates of infants less than two years of age in Mississippi.

Chapter III

The Method

The review of the literature revealed inconsistencies with regard to the methods of dietary influences which are more appropriate for infants. Hazards of environmental exposure to cigarette smoke were controversial among the reviewed authors. The current research will review dietary influences and exposure to cigarette smoke on the myringotomy rates of infants less than two years of age. The information obtained will serve as a resource for the nurse practitioner involved with educating the parents concerning care of infants.

Design of the Study

A correlational, ex post facto research design was utilized for the current descriptive research project to answer the question: Is there a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants? Ex post facto research attempts to understand relationships among phenomena as they occur without any researcher intervention (Polit & Hungler,

1995). Instead of introducing or manipulating an independent variable, the investigator selected subjects who had undergone myringotomy with insertion of pressure equalization tubes and observed data about method of feeding and exposure to cigarette smoke. When the independent variable cannot be manipulated and random assignment of subjects to control and experimental groups are not possible, an ex post facto study is appropriate and worthwhile (Wilson, 1989). Manipulation of feeding practices, assignment of feeding practices, or both for infants were not ethical for this research.

Variables

Independent variables in this study were the feeding methods for infants, breast versus bottle, and exposure to environmental cigarette smoke. The dependent variable was otitis media which resulted in myringotomy with insertion of pressure equalization tubes. Control variables were the date and time of data collection, who collected the data, and the subject selection. These variables were controlled in order to maintain a constant environment with as little outside interference as possible. Extraneous variables included the parental educational level, historical background, religious beliefs, daycare attendance, number of

siblings, and amount of cigarette smoke exposure.

Limitations

The limitations in this study were identified as follows:

1. The small sample size which resulted from limited available subjects and a limited time factor for data collection.

2. A convenience sampling technique was utilized rather than a random sampling technique.

3. The use of one facility made the results nonrepresentative of the universal population.

4. Small sample size prevents generalization to other populations.

Setting, Population, and Sample

The institutional setting was a hospital based, 29 bed, outpatient facility in northeast Mississippi. This facility reported over 2,500 cases of myringotomy with pressure equalization tube placement over the past five years (L. Barnett, personal communication, November 22, 1995). The target population was all post-operative pressure equalization tube clients. The study population was all clients between birth and two years of age who had undergone

myringotomy with insertion of pressure equalization tubes in the aforementioned setting. The sample consisted of 121 infants. Data were collected over an eight month period between the months of August, 1995 and March, 1996. Sampling design was retrospective chart review utilizing a researcher designed demographic datasheet (Appendix A).

Data Gathering Process

Approval from the Committee on Use of Human Subjects in Experimentation of Mississippi University for Women (Appendix B) was obtained. The institution administrator was contacted and the purpose of the study was explained (Appendix C). Permission was granted and an agreement (Appendix D) was signed by the administrator. Confidentiality was maintained throughout the research study to protect the rights of the client. Each client was assigned a random number and names were not associated with the data collection process.

Collection of data was then obtained through the Health Information Services department of the institution. Chart numbers were obtained from the daily log book located in the Outpatient Services department. Medical records were reviewed without client interaction. The following information was recorded on the demographic data collection

tool: date of surgery, sex, age, exposure to cigarette smoke at home or daycare facility, type of feeding (breast versus bottle), and if breast fed, duration of time when only breastfeeding occurred.

Data Analysis

Descriptive statistics were utilized to examine and describe data obtained regarding the relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants less than two years of age. The statistical analysis utilized a 0.05 level of significance, 95% confidence interval, with one degree of freedom. Categorical data were compiled and analyzed utilizing the chi-square test of independence.

Chapter IV

The Findings

This chapter describes the sample population, results of the analyzed data, and additional findings of the current study. The purpose of this descriptive study was to determine the relationship between myringotomy rates of infants who were breast fed as opposed to bottle fed and those who were exposed to cigarette smoke as opposed to not being exposed to cigarette smoke. A correlational ex post facto research design was utilized for data analysis. Demographic data were compiled on a researcher designed collection tool and analyzed from the results.

Description of Sample

The research subjects selected were clients from an outpatient facility in northeast Mississippi. Age ranges were from birth to two years. The convenience sample consisted of post-operative clients who had undergone myringotomy with insertion of pressure equalization tubes. Subjects were identified and selected for the study from the daily log book which was maintained by the secretary and

nurses of the outpatient facility. Subjects were not omitted from the study if myringotomy with insertion of pressure equalization tubes were in conjunction with another surgical procedure, such as tonsillectomy, adenoidectomy, or both. The sample was collected until an appropriate number was obtained to secure a 95% confidence interval. No client was omitted from the study on the basis of race, national origin, sex, anomaly, or disability.

The sample size was 128 infants. For statistical analysis, the sample was divided into four categories: (a) Group 1, Smoke exposure/Bottle fed; (b) Group 2, Smoke exposure/Breast fed; (c) Group 3, Non-smoke exposure/Bottle fed; (d) Group 4, Non-smoke exposure/Breast fed. Additional information collected included gender, age range, and length of time for breastfeeding. Clients were divided into five age ranges: 0-2 months; 3-6 months; 7-12 months; 13-18 months; and 19-24 months. Identical group ranges were utilized for collection of length of time for breastfeeding. One child from the sample had cerebral palsy. The remainder of the sample was without known anomaly or physical or mental handicap.

Results of Data Analysis

Data were analyzed from the demographic data collection

tool (Appendix A). The collection period started August 28, 1995 and was completed on March 8, 1996. From the total sample (n=128), 61% of the clients were male (n=78) and 39% were female (n=50).

Clients were divided by age groups. Two age groups, 0-2 months and 3-6 months, had no entries (n=0). The 7-12 month age group included 37.5% of the sample (n=48). One child in this age group had cerebral palsy. The 13-18 month age group included 25.8% (n=33) and the 19-24 month age group included 36.7% (n=47) of the sample.

Exposure to cigarette smoke was categorized by yes or no: yes, they were exposed to cigarette smoke; or no, there were not exposed to cigarette smoke. Clients exposed to cigarette smoke totaled 31.3% (n=40), while non-exposure to cigarette smoke totaled 68.7% (n=88). Of the 31.3% who were exposed to cigarette smoke, 75% (n=30) were male clients while 25% (n=10) were female clients.

Methods of feeding for the clients were recorded as breast or bottle. Clients who were breast and bottle fed together were included as breast fed. If the client was breast fed, a length of time was recorded. Bottle feeding was the method chosen for 78% of the clients (n=100). Breastfeeding was the chosen method for 22% of the clients (n=28) with varying lengths of time. These data can be

found in Table 1. Of the infants who were breast fed for 0-2 months, six were breast fed for two weeks or less.

Table 1

Length of Breastfeeding

Age in Months	Number of Clients
0-2	15
3-6	9
7-12	3
13-18	1
19-24	0
Total	28

The chi-square test of independence was utilized to analyze the categorical data from the convenience sample. These data can be found in Table 2. The critical chi-square value was 3.841. The calculated chi-square test statistic for the current research was 0.119. Since the calculated test statistic was less than the critical value, no level of significance was shown between breast or bottle feeding and exposure to cigarette smoke on myringotomy rates of infants for this study. The null hypothesis was supported in the

current study.

Table 2

Chi-square Categorical Data Analysis

	Smoking		Non-Smoking	
	Observed	Expected	Observed	Expected
Bottle	32	31.25	68	68.75
Breast	8	8.75	20	19.25
Total	40		88	

P=<0.05

df=1

Additional Findings

Data analyses revealed more male clients (n=78) than female clients (n=50) undergoing myringotomy with insertion of pressure equalization tubes. Table 3 illustrates the relationship between gender and feeding choices for post-operative myringotomy clients.

Fifty four percent (n=15) of the breastfeeding mothers discontinued breastfeeding and instituted bottlefeeding for the infant between one week and two months of age. An additional 32% of breastfeeding mothers discontinued

breastfeeding and instituted bottlefeeding by six months of age.

Table 3

Comparison of Gender and Feeding Choice

	Breast		Bottle	
	N	%	N	%
Male	20	15.6	58	45.3
Female	8	6.3	42	32.8
Total	28	21.9	100	78.1

N=128

Chapter V

The Outcomes

This chapter will address the outcomes of the current study and summarize the findings. The conclusions and implications for nursing practice will be discussed. Recommendations for further research and nursing study will be addressed.

Some research studies have supported breastfeeding as an immunological defense against infection. Cigarette smoke has been linked with an increased risk of infection. The purpose of the present research was to determine if there is a relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants. The Betty Neuman Systems Model was the theoretical framework which guided the study. A correlational ex post facto study design was utilized to examine a convenience sampling of 128 infants two years old or younger who had undergone myringotomy with insertion of pressure equalization tubes. Categorical data was analyzed utilizing a chi-square test of independence. The test statistic did not exceed the critical chi-square value. Therefore, no statistically

significant relationship was found between dietary influences and exposure to cigarette smoke on myringotomy rates of infants.

Summary of Findings

The null hypothesis guiding this study was that there is no relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants. Conclusions drawn from analyses of data collection supported the null hypothesis. Data were analyzed using the chi-square test of independence at the 0.05 level of significance.

Discussion, Implications for Nursing

The findings from this study indicated that there was not a relationship on myringotomy rates between infants who were breast fed versus bottle fed or who were exposed to cigarette smoke versus not exposed to cigarette smoke. The results support the findings of Rubin et al. (1990) who found no relationship between types of infant feedings and otitis media (OM). However, the sample from which the infants were selected had all undergone myringotomy for OM. This type of sampling was biased and may have affected the results. A prospective sample selection in which infants

would be followed from birth prior to surgical intervention would have eliminated selection bias.

Information from the present study was collected retrospectively. A prospective study including an intervention with infants and their family members would have provided for more data concerning the potential impact of the immediate environment. Other confounding variables such as number of siblings, daycare exposure, and position for feedings need to be included in future studies. For the infant to receive the most benefit from breastfeeding, a mother should obligate to a minimum of six months of breastfeeding. The position in which the infant is held during breast and bottle feedings differs. The supine position is often maintained during bottle feeding of the infant and has been directly related in research to increased OM infections. Alho et al. (1990) concluded that the number of siblings were associated with increased infections. Owen et al. (1993) studied the variables which included group childcare, infant feeding practices, and cigarette smoke exposure and recommended smoking cessation and limiting childcare to small group settings.

It was interesting to note that one infant from the current study was breast fed for 13 months with no daycare exposure and had no occurrences of OM. After weaning from

the breast and initiation of daycare attendance, recurrent OM occurred and surgery was required for myringotomy and placement of pressure equalization tubes.

In the current study sample of 28 breast fed infants, the researcher found that only four (14%) were breast fed for longer than six months. The short durations of breastfeeding may have been one factor which skewed the results of the study. Duncan et al. (1993) found that infants who were breast fed for four or more months had fewer episodes of otitis media and the frequency percentage decreased significantly with the increasing duration of breastfeeding, while Paradise et al.(1994) recommended breastfeeding for the first year of life to minimize the development of OM and the subsequent need for tympanostomy tube placement.

Male gender (61%) was identified as a risk factor in the current study. Female gender was associated with 39% of the sample (n=50). Ey et al. (1995) identified male gender and siblings as significant risk factors for acute otitis media (AOM) and recurrent otitis media (ROM). The study by Kleinman et al. (1994) also identified males (61%) as the predominant gender associated with OM.

Although the findings from the current study were not statistically significant in relation to breastfeeding, 100

(78%) of the sampled infants undergoing myringotomy were bottle fed. This serendipitous finding alone indicates a significant increase in myringotomy rates in bottle fed infants. Nurse practitioners should continue to support and encourage mothers to breast feed infants.

Infants exposed to cigarette smoke (n=40) constituted 31.3% of the sample. Research has determined that exposure to cigarette smoke is hazardous to the health of individuals. Nurse practitioners should educate parents about the hazards of exposing their infants to cigarette smoke. Parents should be taught preventative health measures for infants prior to delivery and periodically thereafter at follow-up clinic visits.

Findings Relevant to Conceptual Framework

Utilizing the information obtained from the review of the literature, the current research study, and the Betty Neuman Systems Model, nurse practitioners should carefully assess infant clients and family members at every clinic visit. Time should be allocated for anticipatory guidance in which measures for the prevention of otitis media and promotion of health would be taught to the parent. Neuman (1995) contended that assessment of client needs is the first step toward providing professional nursing care.

Thorough assessment of the client, which includes a composite of physiological, psychological, sociocultural, developmental, and spiritual variables, can assist the nurse practitioner in identifying stressors which affect the physical and mental condition of the client. The incorporation of parental teaching into the plan of care should assist the client to attain or maintain wellness and alleviate or reduce stressors. Neuman (1995) identifies this as primary prevention.

Recommendations for Further Study

Based upon the findings of this study, the following recommendations are made:

Research

1. Research study in another geographic area using a general infant population to determine the impact of a narrow sample on the outcomes.

2. Conduction of a similar study which incorporates other variables, such as the number of siblings and use of daycare facilities.

3. Conduction of a similar study which incorporates a different research design to allow for prospective data collection.

Nursing

1. Education of family members concerning effects of bottle feeding, breastfeeding, and exposure to cigarette smoke on the infant.

2. Auricle assessment of those infants exposed to cigarette smoke and bottle feedings.

3. Education of other health care providers concerning effects of exposure of cigarette smoke, bottle feedings, and breastfeeding to the infant.

Conclusions

Based on the results of this study, breastfeeding as opposed to bottlefeeding, and infant exposure to cigarette smoke had no relationship to incidence of otitis media associated with myringotomy and insertion of pressure equalization tubes. However, the sample of breast fed infants were only exposed to breastfeedings for short durations of time. After termination of breastfeeding, infants were subsequently transferred to commercially prepared bottle fed formulas for the duration of infant feedings. Altered infant positioning for bottle feedings, short durations of breastfeedings for less than six months, and a sample of infants who had all undergone myringotomy with insertion of pressure equalization tubes were all

factors which may have contaminated the study and skewed the results. Parental education remains as an integral part of the infant wellbeing.

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Appendix A

Demographic Data Collection Tool

Appendix A

DEMOGRAPHIC DATA COLLECTION TOOL

DATE	SEX		AGE					SMOKING		BOTTLE		BREAST :HOW LONG?					OTHER
	M	F	0- 2 MOS	3-6 MOS	7-12 MOS	13-18 MOS	19-24 MOS	YES	NO	YES	NO	0-2 MOS	3-6 MOS	7-12 MOS	13-18 MOS	19-24 MOS	

Appendix B

Letter of Approval

MISSISSIPPI UNIVERSITY FOR WOMEN
Columbus, MS 39701

Office of the Vice President for Academic Affairs
Eudora Welty Hall
P.O. Box W-1603
(601) 329-7142

March 5, 1996

Ms. Melanie Thompson
c/o Graduate Program in Nursing
Campus

Dear Ms. Thompson:

I am pleased to inform you that the members of the Committee on Human Subjects in Experimentation have approved your proposed research as submitted.

I wish you much success in your research.

Sincerely,

Susan Kupisch
Vice President
for Academic Affairs

SK:wr

cc: Mr. Jim Davidson
Dr. Mary Pat Curtis

Appendix C

Administrative Approval Letter

Appendix C

March 13, 1996

Mr. Stuart Mitchell
Administrator
Baptist Memorial Hospital-Golden Triangle
2520 5th Street North
Columbus, Ms. 39701

Dear Mr. Mitchell:

I am a registered nurse employed on the Out Patient Services department at Baptist Memorial Hospital-Golden Triangle (BMHGT) and currently enrolled in the Graduate Nursing Program at Mississippi University for Women completing a research study on the relationship between dietary influences and exposure to cigarette smoke on myringotomy rates of infants. A retrospective chart review will be utilized for collection of the data.

Your permission is necessary for me to review the medical records of children under two years old who have previously undergone myringotomy surgery at BMHGT since August 15, 1995. Confidentiality will be enforced for all records. Names will not be used and all data will be reported as a group. Mississippi University for Women has granted their approval for this research.

Enclosed, please find a copy of the proposed agreement for your signature. If further information is needed concerning the research project, please call me at extension 1142 in the hospital. Thank you for your assistance toward the completion of my research project.

Sincerely,

Melanie

Melanie E. Thompson, RNC, BSN

Enc.

Appendix D

Agreement to Conduct Study

Appendix D

Agreement

Melanie E. Thompson, RN, is hereby granted permission to review post-operative myringotomy client records in the Health Information Services Department at Baptist Memorial Hospital-Golden Triangle. This review is being conducted to fulfill the research requirements for the Graduate Nursing Program at Mississippi University for Women. It is understood that confidentiality of records will be maintained at all times.

____✓____ Permission granted

_____ Permission denied

Date 3/14/96 Administrator J. Stuart McRae III