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The Effect of Education on Folic Acid in Women on Childbearing Age and Low Socioeconomic Status

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THE EFFECT OF EDUCATION ON FOLIC ACID IN WOMEN OF CHILDBEARING AGE AND LOW SOCIOECONOMIC STATUS

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GRADUATE RESEARCH APPROVAL

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ABSTRACT

The purpose of this study was to investigate the effect of education to women of lower socioeconomic status about the importance of folic acid use before and during pregnancy. Previous research has shown the significance of folic acid in preventing neural tube defects; however, research has shown that women of lower socioeconomic status are not equipped with proper education regarding folic acid usage periconceptionally. An educational session was provided to three women's shelters regarding folic acid, and questionnaires were used to gauge knowledge on folic acid before and after the sessions. The statistical analysis was consistent with our hypothesis in that the educational session was effective in communicating the data surrounding folic acid use periconceptionally. On average, participants were able to correctly answer 1.6 more questions on the posttest as compared to the pretest. Further research needs to be conducted surrounding this topic, encompassing the ideas around breaking access barriers to women of lower socioeconomic status and of childbearing age and determining the effectiveness of educational sessions provided regarding the use of folic acid periconceptionally.

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INTRODUCTION

Background

Folate is an essential nutrient needed before and after conception of a child. It is required for DNA replication, and it acts as a substrate for amino acid and vitamin metabolism. Demands for folate increase during pregnancy because it is required for the growth and development of the fetus, and deficiencies have been associated with abnormalities in both mothers and fetuses (Greenberg, Bell, Yong, & Yan-hong, 2011). Dietary supplementation with folic acid before conception and during pregnancy has long been known to reduce the risk of neural tube defects. The neural tube closes within one month of conception. Incomplete closure of the neural tube leads to neural tube defects. Folic acid is believed to be required for the process and closure of the neural tube (Brough, Rees, Crawford, & Dorman, 2009). In both developing and developed countries, supplementation with 400 micrograms per day (μg/d) of folic acid is recommended for all women of childbearing age (Ogundipe, et al., 2012). Folate deficiency during pregnancy is a risk factor for preterm delivery and low birth weight and may contribute to poor neonatal health and increased maternal mortality (Ogundipe, et al., 2012).

Very little data exist on the correlation between women of lower socioeconomic status and their education regarding folic acid and its importance in pregnancy. However, a social class gradient in the dietary intake of folate has been consistently shown for the whole population and among pregnant women. Women with lower intakes include the socially disadvantaged with low education levels (Brough, et al., 2009). Conversely, the risk of neural tube defects increases with a decreasing measure of social class (Brough, et

al., 2009). According to Brough et al. (2009), folic acid supplement use was lower among ethnic minority women both in the USA and East London. In the United States, fortification of grain with folic acid has been mandatory since 1998, and subsequent reports suggest it has been successful in reducing the number of neural tube defect by approximately 26%, spina bifida by 31%, and anencephaly by 16%, and is expected to reduce the relative risk of neural tube defects by 30-40% (Centers for Disease Control and Prevention, 2004). The present study explores women's knowledge regarding advantages of folic acid periconceptionally, while also exploring socioeconomic status and education level differences between women.

Statement of the Problem

Women of lower socioeconomic status and low education levels are not equipped with adequate knowledge of folic acid and its importance in pregnancy (American College of Obstetricians and Gynecologists, 2013). The research literature strongly suggests that lower education level and socioeconomic status contribute to inadequate intake of folic acid (Talaulikar & Arulkumaran, 2011). There needs to be an educational emphasis on the importance and potential consequences of insufficient folic acid. Additionally, health care providers need to be made aware of patients' inadequate knowledge of folic acid advantages and of the need for further education.

Purpose

The goal of this study was to educate women of lower socioeconomic status about the importance of folic acid use before and during pregnancy and assess the impact of education on their knowledge level. Rofail et al. (2011) concluded that women are receiving adequate information about folic acid, but it was the means by which they

received that information that sparked interest. For women of lower socioeconomic status, doctor visits or education itself was not always available. Additional efforts are needed to fully educate women on the significance of folic acid periconceptionally.

Adequate folic acid intake is of great importance. Many different consequences occur due to inadequate consumption. Women have many reasons for not taking the recommended intake of folic acid in their diets. One reason may be the expense of purchasing fresh leafy green vegetables and the accessibility to fresh foods. This study will explore, in women of low socioeconomic status, the role of education and comprehension in understanding the advantages of adequate folic acid intake.

A distinct gap exists between maternal education level and understanding health concepts, in particular the knowledge of folic acid periconceptionally. We want to identify the gap in folic acid knowledge in women of low socioeconomic status and use our educational session to assess the comprehension of the importance of folic acid. In understanding where the gap lies, we can stress the importance of folic acid education to health care providers. Although socioeconomic status seems to be a significant underlying factor, we want to further explore the specifics within socioeconomic status which limit an individual's understanding of adequate folic acid intake. This will be done by taking into account income level, race, and educational level.

Significance of the Problem

Many sources comment that women are not adequately educated regarding the positive effects that folic acid can have on their pregnancy. The most common misconception is that folic acid is only to be taken after the woman is pregnant. However, there is evidence which shows that it needs to be taken before conception. This is a very

important topic and is rarely taught to women of childbearing age. It is important to educate those who would be the least likely to go see a provider or seek medical advice because delay in folic acid supplementation has been proven to lead to neural tube defects. This study targets a low socioeconomic group of young women with less than a high school education that live in women's shelters in the Twin Cities area.

A review of the literature finds few articles examining the effect of folic acid education for women of low socioeconomic status. This lack of research warrants this study with hopes it can have an impact on prenatal care by alerting medical providers to the importance of educating women about folic acid. By providing women of lower socioeconomic groups with an educational session we hope to increase their knowledge regarding the importance of folic acid and prevention of neural tube defects.

Research Hypothesis

The study's hypothesis is that women of lower socioeconomic status will gain knowledge about the importance of folic acid before and during pregnancy after an educational information session. The null hypothesis would be that such women would not learn the benefit of taking folic acid before and during, their pregnancy.

Definitions

The term folate is typically used as a generic name for the group of chemically related compounds based on the folic acid structure. Dietary folate is a naturally occurring nutrient found in foods such as green leafy vegetables or citrus fruits. Folic acid is also found as an artificial dietary supplement that presents in synthetically-enriched foods and pharmaceutical vitamins (Talaulikar & Arulkumaran, 2011). For the purpose of this study, the knowledge and/or use of both natural folate and folic acid as a

supplement or vitamin will be accepted. Level of education and knowledge on folate and folic acid will be determined by a pre-test administered as a part of the study. The U.S. Census Bureau defines low socioeconomic status as an income level of $11,945 for a single individual with no children (United States Census Bureau, 2013); the income level is $18,498 for women with one to two children (United States Census Bureau, 2013). As the number of children increases the income level that determines this status increases. Participants in the study will be defined as women who live in a women's shelter, are between age 16-31, have an education level of a high school diploma or less, and an annual income of less than $25,000.

Overall, little data exist on the correlation between women of lower socioeconomic status and their education with respect to folic acid and its importance in pregnancy. The goal of this study is to educate women of lower socioeconomic status about the importance of folic acid use periconceptionally and assess the impact of education on their knowledge level. It is hypothesized that women of lower socioeconomic status will retain knowledge about the importance of folic acid, before and during pregnancy, after receiving an educational session. Much research has been conducted surrounding the topic of folic acid usage and its importance periconceptionally. This will be discussed in depth in the following chapter.

LITERATURE REVIEW

Introduction

Overall, limited research is available in regard to the knowledge and consumption of folic acid in women of low socioeconomic status. The majority of research found has been based on women of all ages and social classes. In this literature review, the research pertaining to folic acid supplementation, consumption, usage, knowledge, and awareness of folic acid in various patient groups will be discussed. There will be further exploration into the natural and fortified food sources rich in folic acid and the effects of folate deficiency in the mother and fetus. Finally, relevant healthcare campaigns associated with folic acid awareness will be outlined in detail.

Folic Acid Supplementation

Folic acid is a supplement that has proven to decrease neural tube defects. Talaulikar and Arulkumaran (2011) looked at the need for folic acid supplementation in various patient groups, natural and fortified food sources rich in folic acid, and the effects of folate deficiency in the mother and fetus. "Folic acid is one of the B complex vitamins and is now recognized as a major component of the periconceptional care of women in the reproductive age group" (Talaulikar & Arulkumaran, 2011, p. 241). In the 1960's a link was found between folic acid and neural tube defects (NTDs). To date, folic acid supplementation has remained the only intervention that can prevent serious congenital abnormalities in the fetus.

An adverse gestational event, such as conception culminating in spontaneous abortion or stillbirth, is an unwelcome, but not an unusual, pregnancy outcome (Johnson & O'Scholi, 2000). Poor outcomes such as preterm deliveries and intrauterine growth

restriction can also occur. Today, healthcare professionals have recognized that folic acid supplementation drastically reduces the risk of NTDs. The programs of mandatory food fortification with folic acid in various countries have been a huge public health success with regard to reduction of congenital anomalies (Talaulikar & Arulkumaran, 2011). As research has progressed, evidence suggests that certain groups of patients may have an increased need for folic acid supplementation.

Folate is a water-soluble B vitamin that cannot be synthesized by the body and therefore must be obtained in the diet or through supplementation (Obican, Finnell, & Mills, 2010). Folic acid is the synthetic version of folate and is used in vitamin supplements and fortified foods because of its increased stability. Natural foods like leafy green vegetables, spinach, brussel sprouts, turnip greens, fruits, potatoes, wheat germ, dried beans, and organ foods such as liver are rich sources of folate (Talaulikar & Arulkumaran, 2011). These natural foods are great sources of folate, however, the body absorbs only about 50% of food folate. In March of 1996, to overcome folate deficiencies in patients, the US Food and Drug Administration mandated that all enriched flour and uncooked cereal grains sold in the United States should be fortified with 140-µg folic acid/100 g of flour no later than January 1998 (Talaulikar & Arulkumaran, 2011).

The recommended daily allowances for folates are expressed in dietary folate equivalents (DFEs). The recommended daily allowance for both men and women is 400 µg/d of DFEs, increasing to 600 µg/d in pregnancy and 500 µg/d in lactation (Talaulikar & Arulkumaran, 2011). To reduce the risk of NTDs in women capable of becoming pregnant, the recommendation is to take 400 µg of folic acid daily from fortified foods,

supplements, or both in addition to consuming food folate from a varied diet (Talaulikar & Arulkumaran, 2011).

Several different factors contribute to folate deficiency in different populations. In pregnancy, the rising demand of increased red blood cell production and growing fetal tissue cause a fall in blood levels of folate (Talaulikar & Arulkumaran, 2011). Malabsorption, intestinal disease, liver or renal failure, and use of certain medications are other conditions where folate requirements are increased (Talaulikar & Arulkumaran, 2011). Presence of any of these factors in addition to inadequate absorption of folate and further losses through cooking practices, means that considerable numbers of women of reproductive age fail to get enough daily folates from diet alone (Talaulikar & Arulkumaran, 2011).

Maternal folate deficiency is associated with fetal congenital malformations. The best documented are neural tube defects, including anencephaly and spina bifida. Each year these two most common forms of neural tube defects occur in one in 1,000 pregnancies in the United States and in an estimated 300,000 or more newborns worldwide (Talaulikar & Arulkumaran, 2011). Several studies suggest that folate deficiency may also lead to other birth defects including cleft lip, cleft palate, certain heart defects, and limb malformations (Talaulikar & Arulkumaran, 2011). However it was found that folic acid, alone or in combination with vitamins and minerals decreases NTD risk but did not have a clear effect on the occurrence of other birth defects (Talaulikar & Arulkumaran, 2011).

Adequate folate stores are essential before conception since neural tube development occurs in the first few weeks after conception, typically before the woman is

aware of her pregnancy. Periconceptional use of folic acid supplements reduces the risk of the first occurrence as well as the recurrence of NTDs (Talaulikar & Arulkumaran, 2011). The exact mechanism of folic acid prevention of birth defects is unknown; however, differential methylation of the insulin-like growth factor 2 gene or abnormal homocysteine metabolism are some of the suggested possibilities (Talaulikar & Arulkumaran, 2011). Supplementation with folic acid has also variably been shown to reduce the risk of structural cardiac and craniofacial abnormalities. The level of protection offered by folic acid against NTDs increases with higher dosages (Talaulikar & Arulkumaran, 2011).

Current recommendations suggest that all women of childbearing age should take 0.4 mg (400 μg) of folic acid daily when planning a pregnancy (Talaulikar & Arulkumaran, 2011). Those women who have had a previous pregnancy affected by a neural tube defect should take 5 mg folic acid daily periconceptionally, starting at least one month before conception and continuing throughout the first trimester of pregnancy (Talaulikar & Arulkumaran, 2011).

Obstetricians, primary care physicians and general practitioners have long recommended folic acid in the periconceptional care of women in the reproductive age group (American College of Obstetricians and Gynecologists, 2013). Healthcare professionals need to be aware of varying needs and recommend the correct dose of supplements to their patients. Education should be provided to all women of childbearing age about the importance of folic acid use.

Studies Investigating Consumption and Usage of Folic Acid

Nine reference articles were reviewed to support our research. Overall these articles have shown that in the age group of 18-24 years, education level, pregnancy intention, and socioeconomic status influence the awareness, knowledge, and usage of folic acid in women. Research also has shown that there is a need for further education regarding folic acid intake in women of childbearing age.

Research done by Dr. Green-Raleigh and colleagues (2006) concluded that folic acid awareness is on the rise but that a gap in understanding the benefits of folic acid exist among different age, race, and income groups. The Gallup Organization and the March of Dimes Foundation conducted a study in which random phone calls were made to about 2,000 women each year from 1995-2005. Their survey consisted of multiple questions asking women ages 18-45 if they were aware of folic acid, their daily usage of folic acid, knowledge of folic acid, and where they learned about folic acid (Green-Raleigh, et al., 2006). The data was then compiled and put into groups such as age, pregnancy status, income, education, and race. It was found in non-white women ages 18-24, who had less than a high school education, and an income less than $25,000 were least likely to use folic acid. Only 23% overall of non-white women used folic acid daily. Additionally, those that were 18-24 years old were the least likely to use folic acid by about ten percent (Green-Raleigh, et al., 2006).

Another study conducted by Cena and colleagues (2008) focused on folate intake and food-related behaviors of low-income, nonpregnant women of childbearing age. It was found that eighty-five percent of participants met the Recommended Dietary

Allowance for folate, but only 37% met the current synthetic folic acid recommendation of 400μg for reducing the risk of neural tube defects (Cena, et al., 2008).

Studies Investigating Awareness and Knowledge of Folic Acid

Petrini, Hamner, Flores, Mulinare and Prue (2008) conducted a study built off of the collaborative study of the March of Dimes and Gallup Organization. They asked the same questions about awareness, knowledge, and consumption of folic acid for their survey. They too found that women, ages 18-24, with minimal education, low income, and non-white status were the least likely to take folic acid. One of the main problems this article addressed was the difference in awareness and knowledge observed among different age groups. In 2007 61% of women ages 18-24 that were surveyed were aware of folic acid as compared to 87% of 25-34 year olds and 89% of women ages 35-45 years old (Petrini, et al., 2008). The gap in knowledge and awareness should strongly encourage health campaigns to target education regarding folic acid to younger women.

Carmichael, Shaw, Yang, Laurent, Herring, Royle and Preven (2006) found that participants who were not taking folic acid supplements in the periconceptional period tended to be unaware of their pregnancy until after the first trimester, younger than 25 years of age, identified themselves as non-white, and had low education levels (Carmichael, et al., 2006). The participants were asked to identify if they began taking folic acid prior to becoming pregnant, in the second or third month of pregnancy (early pregnancy), after the fourth month of pregnancy (late pregnancy), or no intake throughout their pregnancy (Carmichael et al., 2006). The research found that by the end of pregnancy 96% of women were taking folic acid supplements. However, in the first few

weeks, when the neural tube is closing, only one third of women were actually taking the recommended amount of folic acid (Carmichael, et al., 2006).

Canfield, Przybyla, Case, Ramadhani, Suarez and Dyer (2006), in a study targeting women of Hispanic descent, also noted a gap in age and knowledge with respect to folic acid. In the Canfield et al. study, 80% of women ages 35-44 had heard of folic acid while only 66% of women younger than 25 had heard of folic acid. Canfield et al. (2006) also conducted research based on the March of Dimes/Gallup survey targeting women with an emphasis on Hispanic descent. Their research found general awareness of folic acid to be high, (78%), but only 28% of those who had heard of folic acid knew it could prevent neural tube defects (Canfield, et al., 2006). Of the Hispanic women surveyed, 67% had read or heard of folic acid while only 20% had supplemented with folic acid daily. Canfield noticed the gap between "knowing" and "doing" (Canfield, et al., 2006). The study identified that even though most women had the knowledge of folic acid, it did not mean that they were taking, or will take, folic acid. Whether this was due to limited funds, resources, or due to inadequate knowledge of foods containing folic acid was unknown.

Educational status may play a large role in folic acid awareness, however, pregnancy status also seems to have an impact. Prue, Hamner, and Flores (2010) conducted research among Hispanic women in several U.S. communities. They asked demographic questions along with questions aimed at exposure, knowledge, and behavior towards folic acid (Prue, et al., 2010). The survey also asked the participant to identify themselves as a pregnancy wanter (wanting to become pregnant in the next year), pregnancy waiter (respondents reporting they plan to become pregnant sometime in the

future but not in the next year), and pregnancy avoiders (respondents reporting that they did not plan to become pregnant at any time in the future) (Prue, 2010). Pregnancy wanters reported the highest percentage of folic acid use and awareness. Those who considered themselves to be pregnancy avoiders were the least aware of folic acid and its benefits during pregnancy (Prue, 2010). The attitude towards folic acid seemed to be dependent on whether the subject was wanting to become pregnant within the next year.

Sharp, Hyder, and Guillory (2008) assessed awareness using a survey asking participants if they had heard, read, or seen anything about folic acid. The participants were women ages 18 to 44 years old. Demographic information such as age, race, education, and income was also obtained. Knowledge was assessed in the participants by answering a question correctly about what folic acid prevented. The results of this study showed that education beyond high school was the factor most strongly associated with having general awareness of folic acid (Sharp, et al., 2008). Most women that had general knowledge of folic acid, answering that folic acid prevents

Similarly, Lolkje and colleagues (2005) conducted a study describing trends in folic acid awareness and its use periconceptionally during the years of 1988 to 2002. Participants were interviewed about demographic information and their medication usage before and during pregnancy, including multivitamins and folic acid. They were also asked whether they were aware of any vitamins that might decrease the risk of birth defects (Lolkje, et al., 2005). Results revealed that in 1988 women were unaware of folic acid and its benefits. Awareness rose to 50% in 1996 and was maintained through the remainder of the study (Lolkje, et al., 2005). Further findings demonstrated that education was a strong predictor of both awareness and usage of folic acid (Lolkje, et al.,

2005). Other predictors included ethnicity, whether the pregnancy was wanted, family income, and interaction with healthcare providers prior to becoming pregnant.

Studies Investigating Effects of Education of Folic Acid

Cena and colleagues (2008) performed a study regarding educational sessions on folate intake and how this impacted behaviors. In their study the effect of learner-centered nutrition education of folate intake and food-related behaviors among nonpregnant, low-income women of childbearing age, compared to education unrelated to nutrition was evaluated (Cena, et al., 2008). This was done by randomly assigning participants to receive either the nutritional lesson or a control lesson regarding resource management. Results indicated that participants who received nutritional education had greater increases in folate intake and use of the Nutritional Facts label than the control group (Cena, et al., 2008). The study also asked women if they participated in Special Supplemental Nutritional Program for Women, Infants, and Children (WIC) or received food stamps. Both women using WIC and food stamps demonstrated no significant changes in folate intake but did increase the frequency of eating more than one kind of vegetable each day, compared to controls (Cena, et al., 2008).

In another relevant study a question was proposed by Green and colleagues (2006) that focused on where women were receiving information about folic acid. Common answers were healthcare providers, books, magazines, television, and commercials (Green-Raleigh, et al., 2006, Table 1). Healthcare providers seemed to have the most impact increasing folic acid use in 2005 two fold (from 13% in 1995 to 26% in 2005). One very interesting point the survey revealed was that 30% of women in 2005 reported that their healthcare provider informed them that folic acid prevented birth

defects (Green-Raleigh, et al., 2006). Of that same group of women only 7% said their provider educated them on the importance of taking folic acid before they had become pregnant (Green-Raleigh, et al., 2006). Primary care providers may be sharing the importance of folic acid with their patients, but they need to express the importance of taking the supplement before conception. If supplements are not taken at the correct time it may minimize the neural tube defect prevention that providers are seeking.

Women ages 18-24 have the highest rate of unintended pregnancies in the United States (Petrini, et al., 2008). In addition to age, education level, pregnancy intention, and socioeconomic status have proven to influence the awareness, knowledge, and usage of folic acid in women. Our study will target women of low socioeconomic status to assess the awareness, knowledge, and usage of folic acid. The educational information will be tailored to women ages 16-31. This age group was chosen because it spans the average age of mothers at first birth by 7 years in either direction. This age group also has the highest number of unintended pregnancies. The aim is to help change behaviors, increase awareness and knowledge of folic acid consumption, and ultimately decrease the incidence of neural tube defects.

Healthcare Campaigns and the Perception of Folic Acid

In recent literature, an attempt has been made to understand and correlate how the knowledge of folic acid is acquired and understood. Although seeing a medical provider seems to be a consistent source of knowledge, public health campaigns have also aided in advancing knowledge. Many aspects that have been addressed relate to population demographics, accessibility and support, and length of such campaigns (Rofail, Collings, Abetz, Lindemann, Maguire, 2011). Research regarding healthcare campaigns aided in

the creation of this study by influencing where and how information on folic acid should be provided so that it can have the largest impact on the target population.

The literature review set forth by Rofail et al. (2011) addressed three main ideas in relation to public health campaigns: awareness, knowledge, and/or consumption of folic acid. Awareness of folic acid was simply defined as having heard about folic acid. It was found that the vast majority of women had heard about or became aware of folic acid consumption from public media, and in particular television. Before the media campaign in the United States, folic acid awareness was at 26%, but after the campaign, awareness rose to 92% (Rofail, et al., 2011).

Knowledge of folic acid preventing birth defects, particularly neural tube defects was assessed in the literature review conducted by Rofail et al. (2011). They found that women were more knowledgeable about folic acid and its perceived benefits, although that knowledge did not necessarily influence their taking the supplement (Rofail, et al., 2011). Also, women in this study who were exposed to the health campaigns did not understand the proper timing of taking folic acid for the maximal periconceptual benefits (Rofail, et al., 2011). The observation related to appropriate consumptive timing exposed a weakness of the campaigns. A more careful look at the actual consumption of folic acid after the health campaigns showed that folic acid consumption average rose from 12.4% to 25.3% (Rofail, et al., 2011). However, once the campaigns were completed, 43% of women were no longer taking the correct amount of folic acid (Rofail, et al., 2011). This number is striking and means that ultimately a large percentage of women were not taking the prescribed amount of folic acid after the campaigns ceased to exist. Future campaigns will need to address this fact.

Further research is needed on how best to implement campaigns to increase awareness of folic acid benefits. The concept of pre-conceptional care is gaining endorsement within recent literature. A study conducted by Temel et al. in 2013 embraced the idea of pre-conceptional care (PCC) and its implications of increasing the health of future pregnancies. PCC encompasses lifestyle modifications such as eliminating alcohol and tobacco use, assessing nutritional status, and folic acid usage as well as encouraging weight control and exercise (Temel, Voorst, Jack, Denktas & Steegers 2013). Their data suggested that there was a need for PCC. What needs to be further evaluated is how this information is best disseminated.

A consistent message from our literature review was that the knowledge of folic acid is limited in certain populations and subsets of individuals. Many factors contribute to patients knowledge regarding folic acid and the success of folic acid campaigns. The campaigns have proven to provide a measurable jump in knowledge of folic acid. However, the campaigns lacked in providing understanding in regard to the timing in which folic acid needs to be consumed to provide its full benefits (Rofail, et al., 2011). The question remains of how and where women are able to view public health campaigns, especially women of lower socioeconomic class, since they may potentially lack the resources needed to fully access and utilize the campaigns.

Summary of the Literature Review

Evidence supports that folic acid is necessary in periconception; however, education is lacking regarding the proper consumption of folic acid. A gap in the knowledge of folic acid use periconceptionally is found in women ages 18-24, and of low socioeconomic status. In this group of at-risk individuals it is unknown if the knowledge

gap regarding folic acid is related to lack of educational sessions or the inability to comprehend this type of information, indicating the need for further investigation. Lastly, campaigns are doing a great job at increasing the awareness of folic acid usage, however, campaigns are not communicating proper timing of folic acid consumption prior to conception. Educational opportunities need to be provided for women ages 18-24 and of low socioeconomic status to decrease the incidence of neural tube defects and other congenital anomalies. This study will provide educational sessions for women of low socioeconomic status in various women's shelters around the Twin Cities area, assessing knowledge of folic acid before and after an educational session.

METHODOLOGY

Introduction

The purpose of this study was to analyze the effectiveness of an educational session for women of lower socioeconomic status regarding the importance of folic acid use before and during pregnancy. This study addressed and analyzed the following question:

"What effect does an educational session on folic acid have on the attitudes and knowledge of folic acid, along with the inclination to use folic acid by women of childbearing age and low socioeconomic status in the Twin Cities area?

The study defined low socioeconomic status as an education level of a high school diploma or less, an income of $25,000 or less, and living in a group home or women's shelter. This definition was used as inclusion criteria for the study. Women's shelters were targeted because it was likely that they would fulfill the education level and income of interest. This chapter describes the study parameters: population, instrumentation and/or materials used, study design, size and duration, specific procedures, statistical methods, validity and reliability, and limitations.

Participants

In order to recruit women of lower socioeconomic status in a convenience sample, women's shelters within the Twin Cities were contacted to request access to available shelters and their residents. The inclusion criteria established within the study included women ages 16-31 years of age with an income of $25,000 or less, living in a group home or women's shelter, and having an education level of a high school diploma or less.

Women that agreed to complete the pretest/posttest on the day of the educational session had their data recorded. The educational session was open to whomever choose to attend; however, the data were only analyzed from those who fit our definition of childbearing age and low socioeconomic status.

Study Design, Size and Duration

This research project was a quasi-experimental design. The research design was a pretest/posttest quantitative analysis of women of childbearing age that are of a low socioeconomic status. Consent was collected in written form before the pretest and educational session began. An educational session was presented between the pretest and posttest on the benefits of taking folic acid before and during pregnancy in order to provide participants with sufficient knowledge to prevent neural tube defects.

Information concerning demographic data, folic acid usage before and during pregnancy, and benefits of folic acid was gathered through a questionnaire. The questionnaire was distributed prior to the educational session, and the same questionnaire was used following the session to assess the knowledge gained. Questionnaires were given to all women in attendance and analysis of data was conducted on all questionnaires that met the inclusion criteria.

This study compiled data based on independent and dependent variables. The independent variable of this study was the educational session provided to the participants of the study. The dependent variable of this study was the knowledge gained from the educational session, collected through a questionnaire. Further sections explain the procedure of the educational session and the questionnaire used to assess knowledge gained.

Data Collection Instrument

The 13-question questionnaire, found in Appendix A, used in this study included originally-developed questions influenced by the literature review. The questionnaire consisted of three sections devised to collect demographic data of the participants, attitudes towards folic acid, and knowledge of folic acid benefits. Demographic information included age, race, income level, living conditions, number of children, and education level.

In sections two and three, participants replied with a yes or no to statements concerning their attitudes toward and prior knowledge of folic acid. The third section of the questionnaire asked questions reflecting the information provided in the educational session regarding folic acid. The fourth section, included only on the posttest, evaluated the effectiveness of the educational session. The questions were open-ended and allowed the participants to express their new understanding of folic acid and its benefits and the likelihood of the participants taking folic acid in the future.

Specific Procedures

During the summer of 2015, women's shelters in the Twin Cities area were visited following consent of the administration of the women's shelters. A letter (see appendix D) as well as a follow-up phone call was sought in order to gain permission within the organization to conduct the study. The sites were assigned a number; Site 1, Site 2 and Site 3, respectively, in order to maintain confidentiality. A returned signed letter allowed access to the facility and enabled the current residents to participate in the study. Since it was unlikely that all women living in the shelter would attend it was thought that selecting three shelters would likely result in a higher response number,

allowing greater statistical conclusions to be drawn. A poster was hung at the selected shelters to inform the women of the upcoming educational session. An attempt to couple the educational session with an existing class or program was thought to be the most efficient in gaining participants.

After receiving confirmation from administration and prior to the educational session, informed consent was acquired from each participant (see appendix B). The initial questionnaire was dispersed directly from the presenters, which had a defined script in order to facilitate uniformity and rule out any bias. The script contained the purpose of the study and directions as to how to complete the form. The consent and questionnaire material was read to the participants in order to eliminate any bias or any differential literacy competencies. The women were given a paper copy of the pretest in order for them to write down their answers. The women were assured that their performance on the pretest would not reflect poorly on them nor affect their relationship with the shelter or Bethel University. After the pretest was finished, a 20-minute educational session (see appendix D) was provided regarding the importance of folic acid prior to, and during pregnancy. The educational session was followed by a time for participant questions and answers. Following the educational session the participants were given a posttest similar to the pretest, leaving out the demographic questions, using the same protocol done before the educational session (see appendix A). The posttest included two additional questions requesting feedback about whether the participant perceived a personal gain in knowledge from the presented material and how likely they would be to begin taking folic acid supplements. The posttest was collected for data analysis. Participants were thanked for their time and contribution to the research study.

Protection of Participant Privacy and Confidentiality

To ensure confidentiality of the participants, a numbering system was used. Participants' names were not associated with any part of the data collection or analysis process. Each participant was assigned a number in order to track their informed consent, pretest, and posttest answers. This coding of the participants was done to ensure confidentiality of the participants and allow analysis of changes in individual participant data from pretest to posttest. Three identical numbered stickers were dispersed to each participant, one sticker for each document they received. This allowed for an efficient coding system and for correlation and proper data collection and analysis. In addition, each women's shelter that participated in the study was assigned a site number to create an alias for the desired site, allowing for confidentiality of the visited women's shelter.

Throughout the course of the study all people who had access to sensitive participant information, such as researchers and interpreters, signed and abided to a confidentiality agreement. All study related data remained securely kept in a locked file cabinet in the Bethel University PA program for three years. When the retention period for the PA program relating to the research has passed, the record will be properly disposed of in accordance with program policies. The researchers and research advisor were the only people with access to the research documents and abided by strict agreement to keep confidentiality of the data gathered. There were no names presented with the reported data.

Statistical Methods

After collecting the pre and posttest questionnaires the multiple-choice responses were statistically computed using statistical software using a paired t-test. The analysis of

the data involved data reduction methods of the responses of the questionnaires into specific categories for the development of frequency data for descriptive statistics, which involved counts, percentages, and cross tabulation. The open ended question answers were compiled and grouped based on theme.

In order to analyze data points were allotted to each participant based on criteria met and correct answers on the questionnaire. Table 1.0 displays the scoring allotment. To allot a score to the participants, one point was given for each of the following demographic criteria: women ages 16-31, an income of less than $25,000, and an education of a high school diploma or less. A maximum score of three would be possible for the demographic section. One point also was given for each correct answer regarding knowledge of folic acid, with three total questions, giving a maximum score of three. The maximum combined score that a participant may receive is six. It was anticipated that participants would have vague knowledge regarding folic acid prior to the educational session, thus, only getting one question correct in the pretest for a pretest score of four, including demographic criteria. Following the educational session it was anticipated that participants would retain the educational information presented and score a six.

Table 1.0

Scoring Criteria

Demographic Criteria: Maximum Score = 3		**Points**
	Age	1
	Income	1
	Education	1
Knowledge of Folic Acid: Maximum Score = 3		
	Question 1	1
	Question 2	1
	Question 3	1
Maximum Total Score		6

Validity and Reliability

The reliability of the study was derived from the ability to achieve reproduction of our study results. In order to achieve reproducibility the same educational session was given. There were no changes or variations either in the script nor in the pre- or posttest forms given at each educational session. Following the same format allowed for the results to achieve reliability in measuring the effectiveness of the educational session on retaining the material.

The validity and reliability of our questionnaire was derived using closed-ended questions, thus reducing error by interpretation of the investigator. A faculty advisor experienced in survey instrumentation and questionnaire format reviewed the document before it was distributed to the subjects. The survey instrumentation and questionnaire information was formatted based on a literature review of the current knowledge of folic acid and its benefits before and during pregnancy. The pertinent information was addressed in the instrumentation to allow for effective understanding and comparable

data reports. Since the instrumentation was derived from a literature review, concrete information was provided with limited argumentative points. The creation of questions from reliable sources reduces the risk of fabrication and attempts to present facts rather than bias toward the usage of folic acid.

Limitations

The findings of the study were limited by the convenience sampling technique and a small sample size. A bias of this study is that women may have opposing views about the importance of folic acid compared to what was provided in the educational session. Interviewer bias was eliminated by the use of a scripted educational session. Validity of this study may be threatened by ambiguous questions on our questionnaire due to the reading level of participants.

RESULTS

This chapter presents the findings of the study by measuring and analyzing pretest and posttest questionnaires regarding knowledge of periconceptional use of folic acid and the surrounding demographics. The results collected demonstrated the effectiveness of the educational session while capturing specific demographic criteria. Participant demographic data, pre/post test data, and qualitative data from the posttest were analyzed. The raw data suggest that participants were able to comprehend the information provided by the educational session.

Data Analysis

Data were collected from three women's shelters within the Twin Cities area. The data collected from the pretest and posttest questionnaires were compiled and analyzed. Below is a discussion of the demographic criteria collected within the study along with a statistical analysis of the data using a paired t-test.

The tables below represent the demographic inclusion criteria of the data collection. Ages between 16 and 31, an education level of a high school diploma or less, and an annual income of less than $25,000 were the three areas that were needed in order to analyze the data. Most individuals attending the educational sessions fit within this criteria. However, without the inclusion criteria, a larger sample could have been attained. Residing in a women’s shelter was also an inclusion criteria for the study. This was not scored since the educational sessions were conducted at women's shelters and those participating were residents within the facilities.

The ages of the individuals collected during the informational sessions are recorded below. The concentration of ages represented in the data collection lie within the ages 16-31. Because the educational sessions did not exclude any individual who wanted to take part in the session, there were outliers whose data was still collected. The table below captures the ages represented within the study. Of the individuals that took part in the educational session, 80% fit the inclusion criteria between the ages of 16 and 31.

Table 2.0

Demographic Data: Age

Age	17 & Under	18-24	25-31	32-38	39+
Participants	1	13	6	3	2

The educational level of the individuals that attended the educational session varied from less than a high school diploma to one individual completing a bachelor's or graduate degree. The target within the study was a high school diploma or less. It was found that 76% of the individuals that attended the educational session had a high school diploma or less, as demonstrated by the table below.

Table 2.1

Demographic Data: Education

Education	Less than High School Diploma	High School Diploma	Some College	Vocational/Associate Degree	Bachelor's or Graduate Degree
Participants	8	11	5	0	1

Even though individuals that participated in the study were residents within the women's shelter, the annual income should not be assumed. Data needed to be collected

pertaining to this demographic criteria. Most of the participants met the criteria; however some of the participants had other means of income and held jobs while living at the women's shelter. The table below demonstrates that 92% of the individuals that attended the educational session had annual incomes less than $25,000. It also indicates the outliers who had an annual income greater than or equal to $25,000.

Table 2.2

Demographic Data: Annual Income

Annual Income	**$0 - $24,999**	**$25,000 - $49,999**	**$50,000 - $99,9999**	**$100,00+**
Participants	23	2	0	0

Race was not a determinant within the inclusion criteria of the study. However, the importance of collecting racial data helped to understand the diversity within the women's shelters. Of the individuals that took part in the educational session, 64% were African American or Black, 12% were American Indian or Alaskan Native, 20% were Caucasian and 4% claimed Other.

Table 2.3

Demographic Data: Race

Race	**American Indian or Alaskan Native**	**African American or Black**	**Asian**	**Caucasian**	**Hispanic**	**Native Hawaiian or Pacific Islander**	**Other**
Participants	3	16	0	5	0	0	1

The tables below demonstrate the percentage of women in the study who have had children and those who have taken folic acid in their pregnancies. Furthermore, the table shows the timing of folic acid supplementation. As table 3.0 indicates, 94% of the

women participating in the study have had children. Of the women that have children in the study, only 53% had taken folic acid in their pregnancies, as seen in table 3.1. Table 3.2 demonstrates folic acid supplementation timing for women who participated in the study. It was found that only 6% of women started using folic acid prior to pregnancy. Initiation within the first and second trimester was most common, 19% and 13% respectively. It is clear from these findings that more education needs to be provided regarding the importance of folic acid and appropriate timing for supplementation.

Table 3.0

Number of Women Who Have Had Children

Yes	**No**
15	1
94%	6%

Table 3.1

Percentage of Women that have Taken Folic Acid

Yes	**No**
8	7
53%	47%

Table 3.2

When Was Folic Acid Supplementation Used

Prior to Becoming Pregnant	**6%**
1st Trimester	**19%**
2nd Trimester	**13%**
3rd Trimester	**6%**

Data Collection

Upon the collection and input of data, 16 residents of the women's shelters that attended the educational sessions fit the inclusion criteria. The table below demonstrates the scores of the participants' pretests and posttests and allows for comparison and recognition of scores allotted to each participant. The mean score of the pretest questionnaire was 4.0 while the mean score of the posttest questionnaire was 5.6. This resulted in a mean statistical difference between pretest and posttest scores of 1.6. The mean difference demonstrates that after the educational session participants were able, on average, to do 1.6 points better on the posttest.

Table 4.0

Data Collection

Participant	Pretest Score	Posttest Score	Difference
1	5	5	0
2	3	6	3
3	5	6	1
4	3	6	3
5	3	5	2
6	5	6	1
7	4	6	2
8	3	4	1
9	3	5	2
10	3	6	3
11	6	6	0
12	5	6	1
13	5	5	0
14	3	6	3
15	5	6	1
16	3	6	3
Mean	**4**	**5.625**	**1.625**

The table below represents the statistical analysis of the data collected. A paired t-test using statistical software allowed for a total of 16 pretest and posttest questionnaires to be scored and analyzed. The two-tailed probability, or p value, was less than 0.0001, indicating strong evidence against the null hypothesis and giving the study statistical significance. The data below demonstrates that within a 95% confidence interval participants will get one more answer correct on the posttest after the educational session. However, at the upper confidence level, participants will get two more answers correct.

Table 4.1

Statistical Analysis

Two Tailed Probability	<0.0001
Mean Difference	1.625
Standard Deviation of Difference	1.147460965
Standard Error of Difference	0.2868652413
T alpha half 95% CI	2.131449536
Lower Confidence Level	1.013561215
Upper Confidence Level	2.236438785

Table 4.2 demonstrates that when participants were asked during the pretest when to begin folic acid supplementation, 56% answered incorrectly. Following the educational session, participants were again asked and 100% answered correctly that folic acid supplementation should begin prior to conception.

Table 4.2

When should women of childbearing age begin taking folic acid?

Pretest:		**Posttest:**	
Correct	**Incorrect**	**Correct**	**Incorrect**
7	9	16	0
43.8%	56.3%	100.0%	0.0%

Participants in the study were asked how much folic acid should be taken in the first trimester of pregnancy. As shown below, 25% of women answered correctly in the pretest. It is evident that following the educational session women learned that folic acid supplementation should consist of 400 mcg during the first trimester. Table 4.3 demonstrates that 93.8% of women answered correctly in the posttest.

Table 4.3

How much folic acid should be taken in the first trimester?

Pretest:		**Posttest:**	
Correct	**Incorrect**	**Correct**	**Incorrect**
4	12	15	1
25.0%	75.0%	93.8%	6.3%

Table 4.4 demonstrates the percentage of women who understood that folic acid primarily prevents neural tube defects. The pretest scores revealed that only 31.3% of women understood that. After the educational session 81.3% of women answered correctly that folic acid helps to prevent neural tube defects.

Table 4.4

What does folic acid prevent when taken during pregnancy?

Pretest:		**Posttest:**	
Correct	**Incorrect**	**Correct**	**Incorrect**
5	11	13	3
31.3%	68.8%	81.3%	18.8%

Following the educational session, the participants were asked to provide feedback about the educational session, specifically whether it changed their view on using folic acid for future pregnancies. The answers to these open-ended questions are demonstrated in the table below. The feedback was positive and suggested that the sessions were effective. The data was not computed into the participant's score but it was used to support the study's hypothesis. Of the participants, 94% found the educational session to be beneficial. One participant wrote in the comments section, "I didn't know what folic acid was but now I know and I also know why it is good for the body."

Regarding what folic acid consumption prevents another participant commented that, "Folic acid prevents cleft lip, neural tube defects and with anemia." One individual found the educational session helpful and with regard to understanding how to read labels saying, "Yes (it was beneficial), learning to read labels." The participants appeared to agree that the educational session was beneficial and that they understood now why periconceptional folic acid was necessary. Table 5.0 demonstrates that 94% of the participants found the educational session to be beneficial.

Table 5.0

Participants Response to if the Educational Session was Beneficial

Yes	**No**
15	1
94%	6%

The data collected and analyzed within the current study were statistically significant. There were great improvements in posttest scores compared to the pretest. By evaluating participants opinions' following the educational session it appeared that the majority of the individuals found the session to be beneficial, thus supporting the effectiveness of the educational session surrounding folic acid consumption periconceptionally.

DISCUSSION

This chapter discusses conclusions drawn from the study. Furthermore, a discussion on implications, limitations, and recommendations for further research and future practice will be provided. It is also encouraged that providers begin incorporating folic acid education to women of childbearing age into their practices.

Study Conclusions

Knowledge of the benefits and proper timing of folic acid supplementation increased in the posttest for 81% of participants in the study. Per the literature review and data analysis within the study, there is a lack of knowledge regarding the benefits of folic acid in pregnancy. In this study, the effectiveness of an educational session was measurable and statistically significant. Within this study there were obstacles and limitations encountered. Areas will be identified where further development and research would be necessary. It is evident that there is a need for education among women of low socioeconomic status and childbearing age regarding the benefits of folic acid.

Limitations

There were several limitations present within this research study. The major limitation was the challenge of gaining access to the targeted women's shelters in the Twin Cities area. A total of twenty women's shelters were targeted through letters, emails, and phone calls. Only three shelters allowed the study to be conducted. Another identifiable limitation was the attendance at the sessions. After gaining access to the sites, mandatory attendance was not required by the facility. Another limitation was having the participants take the posttest immediately after the educational session. This did not allow

for a longitudinal component in the study to see if folic acid knowledge was retained over time. There also was no follow up with the participants to see if their behavior towards folic acid had changed.

Implications and Recommendations for Further Research

Regarding future research in women of lower socioeconomic status, we have several observations. It would be beneficial to have a larger sample size from more areas of the country. Asking if the participants sees a primary care provider on a regular basis would also be beneficial. This would allow for the results to be more generalized. It is also recommended that information be obtained on prior education regarding folic acid and how women received that information. This would be important to determine other methods that have been successful in educating women of childbearing age on folic acid. Often, women of lower socioeconomic status are less likely to attend in health care practices and thus may have had no prior education on folic acid in pregnancy.

Another area for future research would be nutrition and supplementation knowledge of women in the target population. Distribution of age and education level should be further studied to see if age and education level makes a difference in folic acid knowledge.

Finally, with respect to the awareness, knowledge and/or consumption of folic acid, this study lacked longevity. Retention of knowledge was not assessed. Folic acid campaigns are seen to be an essential tool to gain insight and understanding into the perceived notions of women and to educate women of childbearing age on the importance of folic acid. It has been shown that folic acid decreases the incidence of

neural tube defects and congenital anomalies. However, the issue yet to be addressed is how best to present the information regarding folic acid and all of its noted benefits.

Future research on folic acid knowledge and application of that knowledge should be assessed longitudinally. Additionally, it would be beneficial to study whether education on folic acid results and compliance in subsequent pregnancies.

Implications and Recommendations for Future Practice

It is important to train healthcare workers in the community to recommend folic acid before conception. It would be helpful for primary care providers to encourage a preconception examination in which counseling and recommendations for folic acid supplementation would be provided. The education of women of childbearing age on the importance of adequate nutrition for the improvement of pregnancy outcomes should also be a priority of healthcare professionals. Proper advice regarding the use of folic acid supplements and the elimination of fears and myths regarding their use should be considered.

Conclusion

In conclusion, education provided to women of childbearing age and low socioeconomic status led to increased knowledge of folic acid benefits. In previous literature, there is a correlation between minimal knowledge of folic acid in women of childbearing age who also identify as low socioeconomic status. The current study showed statistical significance in supporting the hypothesis, that women of lower socioeconomic status did gain knowledge about the importance of folic acid after an educational information session. The evidence strongly suggests that within the

population set, an educational session increases participants' knowledge regarding the benefits of folic acid during pregnancy.

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APPENDIX A: EDUCATIONAL SESSION QUESTIONNAIRES

Educational Session Questionnaire Pretest

No._____

Folic Acid Educational Session Questionnaire Pretest

Please complete the form in its entirety and circle the appropriate response:

Section I: Demographic Information

Age:

17 and under
18-24
25-31
32-38
39 +

Race:

American Indian or Alaskan Native
African American or Black
Asian
Caucasian
Hispanic
Native Hawaiian or Pacific Islander
Other

Education:

Less than High School Diploma
High School Diploma
Some College
Vocational/Associate Degree
Bachelors or Graduate Degree

Annual Income (2013-2014):

$0-$24,999
$25,000-$49,999
$50,000-$99,999
$100,000+

Section II: Attitudes Towards Folic Acid

Have you had children or are you currently pregnant? Yes/No

If yes, did you take folic acid? Yes/No

If yes, when did you take folic acid? Circle all that apply.

a. Prior to becoming pregnant
b. 1st trimester
c. 2nd trimester
d. 3rd trimester

Section III: Knowledge about Folic Acid

When should women of childbearing age begin taking folic acid?

a. Never
b. Prior to becoming pregnant
c. Third trimester
d. After child is born

How much folic acid should be taken in the first trimester?

a. 2 micrograms
b. 400 micrograms
c. 5,000 micrograms
d. None

What does folic acid prevent when taken during pregnancy?

a. Autism
b. Fetal alcohol syndrome
c. Neural tube defects
d. Premature birth

Educational Session Questionnaire Posttest

No._____

Folic Acid Educational Session Questionnaire Posttest

Please complete the form in its entirety and circle the appropriate response:

Section I: Attitudes Towards Folic Acid

Have you had children or are you currently pregnant? Yes/No
If yes, did you take folic acid? Yes/No
If yes, when did you take folic acid? Circle all that apply.

a. Prior to becoming pregnant
b. 1st trimester
c. 2nd trimester
d. 3rd trimester

Section II: Knowledge about Folic Acid

When should you start taking folic acid?

a. Never
b. Prior to becoming pregnant
c. Third trimester
d. After child is born

How much folic acid should be taken in the first trimester?

a. 2 micrograms
b. 400 micrograms

c. 5,000 micrograms
d. None

What does folic acid prevent when taken during pregnancy?

a. Autism
b. Fetal alcohol syndrome
c. Neural tube defects
d. Premature birth

Section III: Qualitative Questions

Did you find this information session beneficial? Yes/No. If yes what did you find to be beneficial. If no, please explain why.

How did this educational session persuade you to take folic acid for future pregnancies?

APPENDIX B: CONSENT FORM

You are invited to participate in a study of folic acid education. The purpose of the study is to investigate the effectiveness and the need of folic acid education in low-income women of childbearing age. You were selected as a possible participant in this study because you may be of childbearing age and low-income status. The information collected will be used for thesis research in affiliation with Bethel University's Physician Assistant Masters Program.

If you decide to participate, we will provide an educational session regarding folic acid supplementation before and during pregnancy. The presentation will last approximately twenty minutes. Before the presentation participants will be asked to complete a pre-test and following the presentation participants will be asked to complete a post-test. The pretest will consist of demographic questions as well as questions regarding folic acid and the information presented in the educational session. The posttest will not include demographic information. Additionally, two open-ended questions regarding the educational session will be included within the post-test. The risks to you as a participant are minimal; it is possible you may misinterpret and/or misuse the information provided about folic acid. You may benefit from participating by gaining knowledge about folic acid that may potentially prevent birth defects in your future children. There are no incentives for participation in the study.

In addition, at the conclusion of the educational session, educational brochures will be available to each participant.

Data collection documents you complete will not include your name and will be coded so that you cannot be identified. In any written reports or publications, you will not be identified or identifiable and only aggregate data will be presented.

Your decision whether or not to participate will not affect your future relations with Bethel University in any way. If you decide to participate, you are free to discontinue participation at any time without affecting such relationships.

This research project has been reviewed and approved in accordance with Bethel's Levels of Review for Research with Humans. If you have any questions about the research and/or research participants' rights or wish to report a research- related injury, please call Macey Bentley PA-S, 218.849.2757. Courtney Perpich PA-S, 763.213.9099. Anna Goetsch PA-S, 218.232.0617. Ann Holland PhD, RN 651.638.6482.

You will be offered a copy of this form to keep.

You are making a decision whether or not to participate. Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw at any time without prejudice after signing this form should you choose to discontinue participation in this study.

_____

Signature Date

_____

Signature of Investigator Date

APPENDIX C: EDUCATIONAL SESSION MATERIALS

What is Folic Acid
Folic acid is an essential nutrient needed throughout a pregnancy. It is required for DNA replication. It aids in production of genetic material and ultimately development of the baby. Folic acid can be found naturally in many foods or it can be taken in the form of a vitamin. Folic acid is typically used for preventing and treating bowel abnormalities and reduces the risk of heart disease, but during pregnancy it is needed to prevent miscarriage and neural tube defects.

Why is Folic Acid Needed
Demands for folic acid increase during pregnancy because it is required for the growth and development of the unborn baby. Increasing intake of folic acid before becoming pregnant and during pregnancy has been know to reduce the risk of neural tube defects. Folic acid aids in closure of the neural tube, which is required for growth and development of the baby. If the tube does not close it can lead to many birth defects of the child. Folic acid also helps prevent preterm deliveries, low birth weights and may help with newborn health and wellness. It also can decrease the death rate of the mother in complicated pregnancies.

Where is Folic Acid Found
Folic acid can be found in many different sources. It is found in leafy green vegetables and many types of cereals. Folic acid can also be found in drug stores in a vitamin form for less than four dollars! The recommended folic acid amount depends on the pregnancy status of the woman. If the woman is not pregnant but is thinking of becoming pregnant she should consume 400 micrograms of folic acid each day. If the woman is pregnant she should take 600 micrograms of folic acid each day. If the woman is breastfeeding she should take 500 micrograms of folic acid daily.

Sources of Folic Acid
Brussel sprouts
Leafy green vegetables
Oranges
Potatoes
Spinach
Turnip greens

Cereal Brand that Contain 100% of Recommended Daily Dose of Folic Acid in One Serving
General Mills Total Raisin Bran
Kellogg's Special K Original
Quaker Oats Maple & Brown Sugar Life

Dosage of Folic Acid Recommended
400 micrograms per day is recommended for all women of childbearing age.

500 micrograms per day for women who are lactating
600 micrograms per day for women who are pregnant.

Supplementation Prices
CVS Pharmacy: $3.59
Walgreens: $3.79
Wal-Mart: $2.00

When to take Folic Acid
Taking folic acid should begin before becoming pregnant or when planning a pregnancy. Folic acid should be taken daily starting at least one month before becoming pregnant and should continue until the end of the first trimester during pregnancy. The first trimester lasts from your first week in pregnancy to the twelfth week of pregnancy so around 3 months.
Some believe that if you are able to become pregnant but not planning it is wise to take folic acid so that in the instance a pregnancy occurs folic acid will be onboard. Sometimes it is difficult to plan taking folic acid especially when an unplanned pregnancy occurs, in this case as soon as you know that you are pregnant you should begin taking folic acid.

Effects of not taking Folic Acid
Folic acid deficiency can have effects on both the mother and the unborn baby.
Folic acid deficiency in a mother is known to lead to anemia, an illness of the blood. How I understand anemia is that our blood vessels are a network of tracks for a freight train that carries around needed nutrients to our body, in anemia the train is missing a few boxcars or red blood cells and the body is not getting all of the oxygen it needs because the missing boxcars cannot transport the needed oxygen our body needs.

- Early symptoms of anemia may include: tiredness, irritability or loss of appetite. Which may be hard to determine if this symptom is from the pregnancy or the anemia.
- Late symptoms of anemia may include: fatigue, shortness of breath, headache, stomach upset and a racing heart and can be fatal if left untreated.

Maternal folic acid deficiency has been associated with newborn defects, specifically neural tube defects. The two main neural tube defects are, anencephaly and spina bifida.

- Anencephaly is a condition where part of the brain is not developed
- Spina bifida is a condition where part of the spinal cord is not developed

Other newborn defects due to maternal folic acid deficiency may include: cleft lip, cleft palate, certain heart defects, and limb malformations. These defects are not as well supported by research, however it has been clearly established that folic acid aids in development of baby when in your belly.

In conclusion, folic acid is an important nutrient that when taken before and during a pregnancy can help to prevent neural tube defects in the baby and help in the health of the mother as well. We wanted to thank you for your attention and hope that you found our

presentation useful and are able to benefit from the information. Does anyone have any questions or comments?

APPENDIX D: LETTER TO SHELTERS SEEKING APPROVAL

Date:
Address:
Dear To Whom It May Concern:

We are writing to request permission to conduct a research study at (Shelter Site). We are currently enrolled in the Physician Assistant program at Bethel University in Saint Paul, MN and are in the process of writing our Master's Thesis. The study is entitled The Effectiveness of Education on Folic Acid in Women of Childbearing Age and Low Socioeconomic Status.

We are seeking permission to invite residents or patients to participate in the study. Participation will include attendance at an educational session provided at your site and completion of a pre- and post-test (copy enclosed). Our study is slated to occur this spring at a mutually selected day and time. Interested residents will be given a consent form to be signed and returned to the primary researchers at the beginning of the informational session (copy enclosed).

If approval is granted, participants will complete a pre- and post-test like mentioned above with an information session provided regarding folic acid usage before and during pregnancy as well as benefits of folic acid and how to increase folic acid intake. This will benefit the participants in having better knowledge of folic acid and preventing possible folic acid related complications in future pregnancies. The results will be aggregated for the thesis project and individual results of the study will remain absolutely confidential and anonymous. Should this study be published, only aggregated results will be reported. No costs will be incurred by either your shelter or the individual participants of the study.

Your approval to conduct this study will be greatly appreciated. We will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. You may contact us at ang34649@bethel.edu.

If you agree, kindly sign below and return the signed form in the enclosed self-addressed envelope. Or a scanned signed copy may be sent to the above listed email address.

Sincerely,

Macey Bentley, PA-S
Courtney Perpich, PA-S
Anna Goetsch, PA-S
Project Chair: Ann Holland, PhD, RN
ann-holland@bethel.edu

Approved by:

_____	_____	_____
Print your name and title here	Signature	Date

APPENDIX E: IRB APPROVAL

BETHEL UNIVERSITY

Institutional Review Board
3900 Bethel Drive
PO2322
St. Paul, MN 55112

July 28, 2014

Macey Bentley
Bethel University
St. Paul, MN 55112

Re: Project SP-19-14 The Effect of Education on Folic Acid in Women of Childbearing Age and Low Socioeconomic Status

Dear Macey,

On July 28, 2014, the Bethel University Institutional Review Board completed the review of your proposed study and approved the above referenced study with no qualifications.

Please note that this approval is limited to the project as described on the most recent Human Subjects Review Form. Also, please be reminded that it is the responsibility of the investigator(s) to bring to the attention of the IRB any proposed changes in the project or activity plans, and to report to the IRB any unanticipated problems that may affect the welfare of human subjects. Last, the approval is valid until July 27, 2015.

Sincerely,

Peter Jankowski, Ph.D.
Chairperson Bethel University IRB