EFFECTS OF NUTRITION EDUCATION ON NUTRITION BELIEFS AND KNOWLEDGE, DIETARY INTAKE, MATERNAL WEIGHT GAIN AND BIRTH OUTCOMES OF PREGNANT TEENAGERS

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Bachelor of Science

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1996

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
December, 1998

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CHAPTER I

INTRODUCTION

Teenage pregnancy is a major public health problem in the United States (Gutierrez and King, 1993). In 1997, 13% of US infants were born to teens (Peter, Martin, Ventura, and Maurer, 1997). The live births to adolescents under 20 years old was 17% of all births in Oklahoma in 1992 (MCH/OSDH, 1992). In Oklahoma, the teen birth rate for 15 to 19 year olds was ranked 14th in the nation in 1994 (MCH/OSDH, 1997a). Many of the adolescent mothers were not married and their pregnancies were unintended (Ventura, Curtin and Mathews, 1998; Centers for Disease Control and Prevention, 1997). In addition, they were more likely to live in poverty than adult mothers (MCH/OSDH, 1997c).

Pregnant teens are at greater risk for poor pregnancy outcome than pregnant adults. Nationally, nine percent of teenage moms have low-birth weight babies (under 5.5 lb) compared to seven percent of all mothers. Teen mothers are also at greater risk of pregnancy complications, such as premature or prolonged labor, anemia and high blood pressure (Worthington-Roberts and Williams, 1997). Risk factors for poor pregnancy outcome include young maternal age (15 years or younger), low prepregnancy weight, poor weight gain during pregnancy, preexisting anemia, lack of social support, poverty,

repeat pregnancy, and lack of appropriate prenatal care (Mulchahey, 1990; Mitchell-Rees and Worthington-Roberts, 1994; Amini, Catalano, Dierker and Mann, 1996).

The nutrient needs are high in pregnant adolescents because they are in a stage of rapid growth and development (Endres, Poell-Odenwald, Sawicki and Welch, 1985). Teens very often have poor eating habits, and use of cigarettes, alcohol, and other drugs during pregnancy is common (Scheck, Sideras, Fox, and Dupuis, 1990; Gutierrez and King, 1993; Dunn, Kolasa, Dunn, and Ogle, 1994). Nutrition education is important to pregnant adolescents to improve their diet quality and pregnancy outcomes (Blackhurst et al. 1996; Dubois, Coulombe, Pencharz, Pinsonneault, and Duquette, 1997). However, education does not always change the dietary intake of adolescents since food preferences influence food consumption (Story and Resnick, 1986).

Research Objectives

The purpose of the present study was to evaluate the influence of a nutrition education program, Have A Healthy Baby (HAHB), on pregnant adolescents' nutrition beliefs and knowledge, dietary intake, maternal weight gain, and infant's birth weight. The research objectives include the following.

1. To determine the difference between nutrient, HEI, knowledge, and belief factor scores of pregnant adolescents before and after the nutrition education program.
2. To determine the effects of socioeconomic variables such as age, grade in school, community size, type of medical care received, and employment status on the nutrient, healthy eating index (HEI), knowledge, and belief factor scores of

pregnant adolescents.

3. To determine the relationship between dietary intake and nutrition belief and knowledge of pregnant adolescents.
4. To determine the effects of maternal age and prepregnancy body mass index (BMI) on pregnancy weight gain and infant's birth weight.
5. To determine the relationship between pregnancy weight gain and infant's birth weight and nutrient, HEI, knowledge, and belief factor scores of pregnant adolescents.
6. To determine the difference in pregnancy outcomes and dietary intake due to pregnant adolescents cigarette smoking status.
7. To determine the difference in pregnancy outcomes and dietary intake due to pregnant adolescents use of vitamin-mineral supplements.

Definition of Terms

The following terms were used in this study.

Cooperative State Research, Education, and Extension Service (CSREES) - is a national educational network designed to meet the need for research, knowledge and educational programs that enable people to make practical decisions by combining the expertise and resources of federal, state, and local governments (Cooperative Extension System, 1998).

Expanded Food and Nutrition Education Program (EFNEP) - is part of the CSREES, U.S. Department of Agriculture. The objective of EFNEP is to assist low-

income families and youth to gain the knowledge, skill, attitudes, and necessary behavior change in order to achieve nutritionally sound diets for themselves and family, and to increase self esteem (Leidenfrost, 1987).

Knowledge score - was calculated from 22 knowledge questions in the nutrition beliefs and knowledge instrument. One point is given for correct response to each knowledge question. The minimum and maximum knowledge score was 0 and 22, respectively.

Dietary Recommended Intakes (DRIs) - are reference values that are quantitative estimates of nutrient intakes to be used for planning and assessing diets for healthy people (Yates, Schlicker, and Suitor, 1998).

Adequate Intake (AI) - is one of the DRIs. It is used when a Recommended Dietary Allowance (RDA) is not available. AI is based on observed or experimentally determined estimates of nutrient intake by a group (or groups) of healthy people (Yates, Schlicker, and Suitor, 1998).

Estimated Average Requirement (EAR) - is one of the DRIs. EAR is a nutrient intake value that is estimated to meet the requirements of half the healthy individuals in a group (Yates, Schlicker, and Suitor, 1998).

Nutrient score - was calculated based on nine nutrients (calorie, protein, vitamin A, vitamin B6, vitamin C, folate, calcium, iron, and zinc). One point was given when 83% of RDAs (calorie, protein, vitamin A, iron, and zinc) and AI (calcium), and 100% of the EAR nutrients were consumed. The minimum and maximum nutrient score was 0 and 9, respectively.

Total Healthy Eating Index (HEI) score - was calculated using five components of the U.S. Department of Agriculture (USDA)'s Food Guide Pyramid food groups (grains, vegetables, fruit, milk, and meat) based on 2500 kcal for pregnant adolescents. The minimum and maximum total HEI score was 0 and 50, respectively. Low score indicated low consumption of recommended number of servings and a high score indicated consumption close to the recommended number of servings.

Assumptions

The following assumptions were made for this study.

1. The information obtained by the subjects was accurate.
2. The knowledge, beliefs and dietary assessment forms completed by subjects were reliable and valid.
3. The training of the paraprofessionals to implement the nutrition education program was consistent, accurate and complete.

Limitations

The following were the limitations of this study.

1. Prepregnancy weight, pregnancy weight gain, maternal height, baby's birth weight were reported by the participants.
2. Subjects were limited to the pregnant adolescents who participated in the study.

3. Only one 24-hour dietary recall was used for pre and post measurement of food intake.
4. Five components of HEI were used in this study instead of ten components.
5. Subjects were not beginning and ending the education program at the same time in their pregnancy.
6. An assessment of individual maturation stages was not included in this study.
7. Most participants of the study were white.
8. No control group was used to compared with the education group.

CHAPTER II

REVIEW OF THE LITERATURE

Adolescent Pregnancy Trends

About 500,000 teenagers under age 20 give birth each year in America (Ventura, Curtin and Mathews, 1998). Recently, the teen birth rate has declined. The birth rate of teenagers 15-19 years old declined 12% from 62.1 per 1000 women in 1991 to 54.7 per 1000 women in 1996. There was a 14% decline in birth rate among 10-14 years old teenagers from 1991 to 1996. In teens 15-19 years old, the rate for black teens has the declined the most. This was a reversal of the 24% rise in teenage birth rate from 1986 to 1991 (Ventura, Curtin and Mathews, 1998). Despite the decline, the teen birth rate (age of 15-19) for 1996 was still higher than in 1986 (50.2 per 1000 women) when the rate was at its lowest point (Ventura, Taffel, Masher, Wilson and Henshaw, 1995; Ventura, Curtin and Mathews, 1998).

Most teenage mothers today were not married compared with teens who gave birth prior to 1980 (Ventura, Curtin and Mathews, 1998). The percent of unmarried 15-17 year old mothers and 18-19 year old mothers in 1996 was 84% and 71%, respectively. This percent of unmarried teen mothers was more than three times higher in the younger

teens and eight times higher in the older teens compared to teen mothers in the 1950s (Ventura, Curtin and Mathews, 1998).

Every year close to 6,000 teens aged 19 and younger give birth for the first time in Oklahoma (MCH/OSDH, 1995a). The birth rate of 15-19 year old teenagers was 72.1 and 64.0 per 1000 women in 1991 and 1995, respectively (Ventura, Curtin and Mathews, 1998). It dropped 11.2% from 1991 to 1995, but was still higher than the national birth rate of 56.8 per 1000 women in 1995. Oklahoma's teenage birth rate for 15-19 year olds ranked 14th in the nation in 1994 (MCH/OSDH, 1997a). It was estimated that in Oklahoma more than 20% of teen mothers will give birth at least two times before they were 20 years old (MCH/OSDH, 1997a).

Concerns Associated with Adolescent Pregnancy

Problems of Adolescent Pregnancy

Pregnant adolescents were less likely than older women to receive early prenatal care, more likely to be poor, less educated, and more likely to be unmarried (Fraser, Brockert and Ward, 1995; The Annie E. Casey Foundation, 1997). Women less than 20 years old and unmarried were more likely to receive inadequate care (Covington, Churchill and Wright, 1994). Pregnant adolescents less than 18 years old who received care after the twelfth week of gestation were younger, less educated, more likely to be unemployed, more likely to have an abortion, and more likely to already have a child (Wiemann, Berenson, Pino and McCombs, 1997). Nearly half of the adolescents from

the study population did not have the initial prenatal care visit until the second or third trimester. In Oklahoma, less than 60% of teens under 18 years old received prenatal care in the first trimester compared to 90% of women aged 30-34 (MCH/OSDH, 1995b).

Two-thirds of all teen births in 1996 were unintended (Centers for Disease Control and Prevention, 1997). Teens with an unintended pregnancy were at higher risk for not receiving prenatal care in the first trimester than teens whose pregnancies were planned (MCH/OSDH, 1995b). Inadequate prenatal care was related to poor pregnancy outcomes (Mahfouz, El-Said, Al-Erian and Hamid, 1995). When teens under 20 years of age and women aged 20-35 received early and adequate prenatal care, both groups had a similar risk of developing anemia and hypertension and having an abnormal delivery (Mahfouz, El-Said, Al-Erian and Hamid, 1995).

Prenatal care was delayed or nonexistent for teens because of the adolescent's failure to recognize the early signs of pregnancy, not realizing the importance of early care, and emotional reactions such as denial, embarrassment, guilt, and fear (Bluestein and Starling, 1994). Other barriers to early prenatal care were services not available, accessible, and affordable (Bluestein and Starling, 1994; MCH/OSDH, 1995b). Kinsman and Slap (1992) interviewed 101 adolescent mothers who gave birth at 17 years and younger. Thirty-seven of the teens (36.6%) received inadequate care because they did not recognize the pregnancy, were confused about service availability and medical coverage, felt negative toward physicians, did not value the importance of prenatal care, and stated they were tired and feeling "down" (Kinsman and Slap, 1992).

Poverty thresholds are used to classify persons by poverty status by determining the income and size of the household (U.S. Bureau of the Census, 1994). In 1988, 42%

of mothers younger than 18 years of age had incomes below the poverty level (in 1988: $12,092 for a family of four), only 30% had income above the poverty level (Centers for Disease Control and Prevention, 1995), and the rest of them did not response. In Oklahoma, approximately one-third (32%) of all women with a live birth between 1988 and 1995 had incomes below 100% of the Federal Poverty Level but over 60% of adolescents, 19 years or younger, who delivered a live birth lived below 100% of the Federal Poverty Level (MCH/OSDH, 1997c).

Weight Gain During Adolescent Pregnancy

Pregnancy weight gain was strongly related to infant birth weight, length of gestation, and fetal growth (Dunn, Kolasa, Dunn, and Ogle, 1994; Scholl and Hediger, 1993; Story and Alton, 1995). The National Academy of Sciences, National Institute of Medicine recommended that women with normal prepregnancy body mass index (BMI) gain between 25 and 35 lb (11.4 to 15.9 kg) during pregnancy (Institute of Medicine, 1990). For underweight women and overweight women a range of 28 to 40 lb (12.7 to 18.2 kg) and 15 to 25 lb (6.8 to 11.4 kg) was recommended, respectively. For obese women it was recommended to gain at least 15 lb (6.8 kg). Adolescents were encouraged to gain the upper range of the recommendation, especially for very young girls (<15 years of age) or those who conceived within two years after menarche. Adult BMI recommendations may be used to classify pregnant adolescents as underweight (BMI <19.8), normal weight (BMI 19.8 to 26), overweight (BMI >26.0 to 29.0), and obese (BMI >29) (Institute of Medicine, 1990).

Adolescents needed to gain the highest recommended weight during pregnancy to achieve an optimal birth weight for their infants (Story and Alton, 1995). When adolescent mothers gained less than 25 lb during pregnancy, regardless of the gestational age of baby, their infants weighed significantly less than infants whose teen mothers gained more than 25 lb (Schneck, Sideras, Fox and Dupuis, 1990). Infants born to still-growing adolescents weighed less than infants of non-growing adolescents (Scholl and Hediger, 1993; Hediger, Scholl, Ances, Belsky and Salmon, 1990).

Weight gain was more likely to measure the nutrition support during a pregnancy (Institute of Medicine, 1990; Mitchell-Rees and Worthington-Roberts, 1994). Early inadequate weight gain increased the risk of small-for-gestational age infants despite adequate total gains and inadequate gains after 24 weeks of gestation increased the risk of preterm delivery (Story and Alton, 1995; Worthington-Roberts and Williams, 1997). A group of 30 pregnant teenagers from a rural community had a wide range of pregnancy weight gain (4 to 63 lb), but most gained between 18 to 48 lb (Dunn, Kolasa, Dunn and Ogle, 1994). A group of low income pregnant adolescents had an average maternal weight gain of 14 kg (Schneck, Sideras, Fox and Dupuis, 1990).

Adolescents were concerned about their appearance and may have controlled their weight gain (Johnson, Johnson, Wang, Smiciklas-Wright and Guthrie, 1994; Sargent, Schulken, Kemper and Hussey, 1994). Adolescents were more likely than older women to be classified by BMI as being underweight at the beginning of their pregnancy (Johnson, Johnson, Wang, Smiciklas-Wright and Guthrie, 1994; Sargent, Schulken, Kemper and Hussey, 1994). Weight gain during pregnancy was strongly related to infant birth weight as mentioned earlier Hediger, Scholl, Ances, Belsky, and Salmon (1990)

found that increased prepregnancy BMI was associated with higher birth weight when maternal weight gain was low.

Adolescent Pregnancy - Risk to Infants

When an adolescent female conceived less than two years after menarche, she was at highest risk of associated pregnancy problems such as low birth weight and very low birth weight baby (Dunn, Kolasa, Dunn and Ogle, 1994). Infants of adolescent mothers were at greater risk of premature birth (birth before the 37th week of gestation), low birth weight, or death than infants of adult mothers (Bluestein and Starling, 1994; Story and Alton, 1995; Ventura, Curtin and Mathews, 1998). Low birth weight (<5 lb 8 oz) increased the risk of perinatal mortality, poor infant development, and impaired growth (Institute of Medicine, 1990).

When pregnant adolescents had iron deficiency anemia during early gestation, their infants were at greater risk for premature birth and low birth weight (Worthington-Roberts and Williams, 1997). Preterm and low-birth weight infants, because of the lower iron stores, were at greater risk for iron deficiency than full-term infants with normal birth weight (Centers for Disease Control and Prevention, 1998).

Infants born to mothers younger than 16 years of age were three times more likely to die within the first month compared to infants born to older mothers (McAnarney, 1987). In addition, infants born to mothers who lived in poverty also had higher infant mortality and postneonatal death (death occurs 28-364 days after birth) (Geronimus and Korenman, 1993; Centers for Disease Control and Prevention, 1995).

Adolescent Pregnancy - Risks to Mothers

Childbearing teenagers are 1.3 times more likely to face maternal mortality compared to adults (Bluestein and Starling, 1994). Adolescent behaviors such as inadequate prenatal care, poor nutrition, substance abuse, in addition to their physical immaturity, put the teen at a higher risk of toxemia, hemorrhage, cervical trauma, cephalopelvic disproportion, and premature labor than adult mothers (Mitchell-Rees and Worthington-Roberts, 1994; Amini, Catalano, Dierker and Mann, 1996; Bluestein and Starling, 1994; Worthington-Roberts and Williams, 1997). For pregnant teenagers under 16 years of age problems such as pregnancy-induced hypertension, and sexually transmitted disease were most commonly found (Mitchell-Rees and Worthington-Roberts, 1994).

Iron deficiency remained a problem for women of childbearing age (Mitchell-Rees and Worthington-Roberts, 1994; Centers for Disease Control and Prevention, 1998). Female adolescents were at risk of developing iron deficiency anemia because iron needs were high at the growth spurt, in addition to their low intake of dietary iron (Institute of Medicine, 1990; Heald and Jacobson, 1980; Sargent, Schulken, Kemper and Hussey, 1994). Anemia during pregnancy decreased well-being of the adolescent (Story and Alton, 1995). Pregnant adolescents may have higher prevalence of inadequate weight gain since iron deficiency anemia was associated with low energy and iron intakes early in pregnancy (Worthington-Roberts and Williams, 1997)

Adolescents were at high risk for repeated pregnancies and one in five adolescents will have more than one child before 20 years of age (Covington, Churchill and Wright,

1994; MCH/OSDH, 1997a; Montessoro and Blixen, 1996). Rapid repeated birth was defined as becoming pregnant again within 18 months of the first birth (Spencer and White, 1997). One-quarter of the teen mothers were at risk of becoming pregnant again six months after delivering the first child due to not using any birth control method or inappropriate use of birth control pills (Berenson and Wiemann, 1997). Closely spaced births among adolescent mothers increased the rates of low birth weight, mortality, and morbidity in second pregnancy compared with the first pregnancies (Story and Alton, 1995).

Substance Use and Risks to Pregnancy

Use of cigarettes, alcohol and other drugs during pregnancy by adolescents were common (Kokotailo, Langhough, Smith-Cox, Davidson and Fleming, 1994). Cornelius et al. (1994) studied 124 adolescents and more than half of the adolescents reported use of alcohol and tobacco during the first trimester of pregnancy, 14% reported use of marijuana, and 3% reported use of cocaine during the first trimester of pregnancy. Another study reported use of tobacco in half of the pregnant adolescents and 9% of participants reported use of alcohol in the 30 days before the visit (Kokotailo, Langhough, Smith-Cox, Davidson and Fleming, 1994).

Prenatal complications and adverse birth outcomes such as preterm delivery, low birth weight (less than 5lb 8oz) and Sudden Infant Death Syndrome were related to smoking during pregnancy (MCH/OSDH, 1997b). Stopping cigarette smoking during pregnancy may be one of the most important behaviors pregnant women can change to

improve birth outcome (Alexander and Korenbrot, 1995).

Alcohol has a direct and toxic effect on placenta and fetal cells (Alton, 1990). Alcohol affected transportation, metabolism and absorption of nutrients in mothers and adversely affected fetal nutrition (Institute of Medicine, 1990). Avoiding alcohol during pregnancy can prevent spontaneous abortion, still birth, brain damage, mental retardation and fetal alcohol syndrome in unborn infants (MCH/OSDH, 1995c).

Problems of Adolescent Mothers

Mothers under the age of 18 face many challenges (The Annie E. Casey Foundation, 1997). Many teenage mothers were unmarried (Ventura, Curtin and Mathews, 1998; Alexander and Guyer, 1993). More than four out of five adolescent females were unmarried at delivery and teens accounted for 52% of births to unmarried Caucasian mothers (Montessoro and Blixen, 1996). Only 6 out of 10 pregnant teenagers graduated from high school, compared with 9 out of 10 of their non pregnant peers (Story and Alton, 1995; Montessoro and Blixen, 1996). In Oklahoma, almost half of women aged 17 or younger at the birth of their first child had not yet graduated from high school, as compared to 8.4% of those age 20 or older at the birth of their first child (MCH/OSDH, 1995a). These women had a relatively low probability of obtaining the emotional and financial resources they needed to develop into independent, productive, and well-adjusted adults (Ventura, Curtin and Mathews, 1998; The Annie E. Casey Foundation, 1997). Unfortunately, this may lead to the persistence of poverty, welfare dependence, educational deficits, joblessness, and a lack of hope for the future that may

persist for generations (Alexander and Guyer, 1993; Montessoro and Blixen, 1996).

Cost of public assistance to pregnant adolescents and neonatal intensive care was high (Montessoro and Blixen, 1996; Worthington-Roberts and Williams, 1997). Teenage mothers were disproportionately poor and dependent on public assistance for their economic support (Alan Guttmacher Institute, 1993). In 1989, national figures estimated the expense of Aid to Families with Dependent Children (AFDC), food stamps and Medicaid to teenage mothers was $21 billion while in Oklahoma the cost was $164 million (MCH/OSDH, 1992). It was estimated 6% of all live births from adolescents were admitted to neonatal intensive care units and the average length of stay was 13 days. The average estimated cost per patient was $8,000 in 1978 dollars and it would be higher in 1998 dollars (Worthington-Roberts and Williams, 1997).

Children born to teenage mothers tended to live in poverty, have a low level of education, bear children early, and to be single parents (Alexander and Guyer, 1993). A child born to an unmarried teenage high school drop out was 10 times as likely to be living in poverty as a child born to a mother with none of these three characteristics (The Annie E. Casey Foundation, 1997). The teen mother's children were also at risk for emotional, behavioral and learning problems at school (Montesoro and Blizen, 1996).

Food and Nutrient Intake of Adolescents and Pregnant Adolescents

Adolescent dietary habits were poor (Schneck, Sideras, Fox and Dupuis, 1990; Gutierrez and King, 1993). Adolescents frequently skipped meals, were too busy to eat, and depended mostly on fast-food restaurants and convenience stores for their meals

(Truswell and Darnton-Hill, 1981; Johnson, Johnson, Wang, Smiciklas-Wright and Guthrie, 1994; Mitchell-Rees and Worthington-Roberts, 1994). Many teenagers liked to be slim and tried to control their weight by eating less food (Heald, 1992; Mitchell-Rees and Worthington-Roberts, 1994).

Consumption of fruit by teenage girls was low. In 1996 CFSII data, more than half of the women aged 12-19 years consumed less than 1 serving of fruit a day and averaged 1.2 servings per day. The consumption of vegetables was higher, with 2.8 servings per day, 1.1 servings consumed as potatoes (USDA, 1997a). Female adolescents seldom drank milk (Truswell and Darnton-Hill, 1981). Soft drinks were chosen more often by female adolescents than milk when they ate convenience foods (Worthington-Roberts and Williams, 1997). Women aged 12-19 years, consumed an averaged of 1 serving of milk a day (USDA, 1997a).

Snacks were often eaten by female adolescents. Snacks selected were low in nutrients and high in calories (Dunn, Kolasa, Dunn and Ogle, 1994; Worthington-Roberts and Williams,1997). Seventy-four percent of females age 12 to 19 snacked and snacks contributed 20% of total caloric intake (USDA, 1997b). However, Bigler-Doughten and Jenkins (1987) found that snacks contributed the same amount of calcium, magnesium, and vitamin C per 100 kilocalories as meals by female adolescents.

The consumption of fat and saturated fat was high in most female adolescents' diet (Johnson, Johnson, Wang, Smiciklas-Wright and Guthrie, 1994). High intake of fat in female adolescents was positively correlated with fast food consumption (Heald, 1992; Cusatis and Shannon, 1996). Diets of female adolescents were low in vitamin A, D, B-6, riboflavin, folate, calcium, iron, zinc, and total energy (Mitchell-Rees and Worthington-

Roberts, 1994; Sargent, Schulken, Kemper and Hussey, 1994) which are necessary for growth and development. Most female adolescents have adequate intake of protein (Sargent, Schulken, Kemper and Hussey, 1994). Mean calcium intake was 62% of RDA (744 mg) and only 13% of girls met 100% of 1989 RDA (1200 mg) for calcium (USDA, 1997b). Calcium intake was much lower when compared with the current recommendation for calcium intake (1300 mg, Adequate Intake (AI)) for both pregnant and non-pregnant adolescents (Institute of Medicine, 1997).

Pregnant adolescents' dietary intake may change due to the pregnancy. Schneck, Sideras, Fox, and Dupuis (1990) reported that 60% of the 99 low-income pregnant adolescents had positive changes in their diet after they became pregnant. Sixteen percent of the participants decreased consumption of non-nutrient-dense foods, 8% increased consumption of milk, and 12% increased consumption of fruits and vegetables. The motivation to increase food intake during pregnancy included change in appetite, craving for specific food, and concern for the baby (Pope, Skinner and Carruth, 1992). Skinner and Carruth (1991) reported 82% of 34 pregnant teens increased their consumption of milk and dairy products, 77% increased their consumption of citrus fruits and juices, and 40% increased consumption of breads and cereals, candy, chocolate, desserts, potatoes, and vegetables. Most cravings resulted in increased intake of calcium and energy (National Research Council, 1982).

Individuals may avoid certain foods during pregnancy. Coffee and alcohol were most commonly avoided by pregnant adolescents (Skinner and Carruth, 1991; Pope, Skinner and Carruth, 1992). Most frequently reported craved foods in pregnant adolescents were sweets, fruit and fruit juices, high-protein main dish, pickles, ice cream,

and pizza (Pope, Skinner and Carruth, 1992). Ice consumption was frequently reported by pregnant adolescents (Schneck, Sideras, Fox and Dupuis, 1990). Eating non-food items such as clay, dirt, burned matches, hair spray, cigarette butts, and ashes were reported in the low-income pregnant adolescents (Schneck, Sideras, Fox and Dupuis, 1990).

Pregnant adolescents have similar food intake as non-pregnant adolescents (Story and Alton, 1995). Drinking soda and substituting chips, candy, and soda for a meal was frequently reported by low-income pregnant adolescents (Schneck, Sideras, Fox and Dupuis, 1990). Most pregnant teens did not meet the recommended number of servings of fruits, vegetables and dairy (Dunn, Kolasa, Dunn and Ogle, 1994). Ninety-nine low-income pregnant adolescents consumed 2.8 servings of milk and half of them did not consume the recommended intake for milk (Schneck, Sideras, Fox and Dupuis, 1990).

Dietary practices of pregnant adolescents did not provide sufficient nourishment to support growth of themselves and the fetus (Schneck, Sideras, Fox and Dupuis, 1990; Mitchell-Rees and Worthington-Roberts, 1994). Nutrient density of pregnant adolescents' diets may be higher than the non-pregnant adolescents', but it still did not meet their needs (Dunn, Kolasa, Dunn, and Ogle, 1994). Most of the pregnant adolescents participating in WIC had less than 100% RDA for energy, calcium, iron, vitamin B6, folacin, and vitamin D (Endres, Poell-Odenwald, Sawicki and Welch, 1985). Recent studies found that pregnant adolescents consumed an adequate diet (≥100% RDA) with respect to energy, protein and calcium but intake of iron, zinc, folate, vitamin A, vitamin D, vitamin B6 were below the RDA (Skinner, Carruth, Pope, Varner and Goldberg, 1992; Dunn, Kolasa, Dunn and Ogle, 1994).

Nutrient Requirements of Pregnant Adolescents

When adolescents conceived less than four years post-menarche, they were considered to be at high nutritional risk. Female adolescents were not physically mature until four years after menarche, which happened at a average age of seventeen years (Dunn, Kolasa, Dunn, and Ogle, 1994). A pregnant adolescent is in a stage of rapid growth and development (Endres, Poell-Odenwald, Sawicki and Welch, 1985) and nutritional demands are greatest (Worthington-Roberts and Williams, 1997). Nutrient needs are high, especially for protein, iron, calcium, and zinc (Dunn, Kolasa, Dunn, and Ogle, 1994).

Energy

Energy needs depended on body composition, stage of growth, stage of pregnancy, and physical activity of individual adolescents (King, Bronstein, Fitch and Weininger, 1987; Worthington-Roberts and Williams, 1997). Using prepregnancy weight and height of the adolescent were the best values to use to estimate the energy needs of the pregnant adolescent (Worthington-Roberts and Williams, 1997).

It was not necessary to increase energy intake in the first trimester unless the adolescent enters pregnancy underweight (Story and Alton, 1995). The RDA for non-pregnant adolescents age 11 to 19 was 2200 kcal (Food and Nutrition Board, 1989). For pregnant adolescents during the second and third trimester, an additional 300 kcal/day was recommended. Very young adolescents (younger than 15 years of age) should

consume an additional 200 kcal per day to bring their total added increment to 500 kcal per day (Gutierrez and King, 1993).

Protein

The additional need for protein during pregnancy was because of the expansion of blood volume and growth of both maternal and fetal tissue (Institute of Medicine, 1990). The need is higher during late pregnancy than early pregnancy. An additional 10 grams of high quality protein per day or a total of 60 grams protein per day throughout pregnancy was recommended (Gutierrez and King, 1993). An inadequate energy intake may cause a secondary protein deficiency if there is compensatory catabolism of protein and amino acids to meet energy needs (Heald and Jacobson, 1980; Gutierrez and King, 1993).

Folic Acid

Folic acid is important in nucleic acid synthesis, especially during pregnancy (Scholl, Hediger, Schall, Khoo and Fischer, 1996). The 1998 Recommended Dietary Allowance (RDA) for folate is 600 mcg during pregnancy for all ages. It was recommended all women of childbearing age consume 400 mcg folate and increased to 600 mcg during pregnancy (Institute of Medicine, 1998). Adequate intake of folate was assessed with Estimated Average Requirement (EAR). Folate intake was considered adequate when consuming to the level of 520 mcg folate during pregnancy (Institute of

Medicine, 1998; Murphy, 1998).

Evidence suggested an increased maternal intake of folic acid around the time of conception and in early pregnancy can prevent neural tube defect such as anencephaly and spina bifida (Bower, 1995; Scholl, Hediger, Schall, Khoo and Fischer, 1996). Ways to increase folic acid were taking a folic acid supplement, eating more folate rich foods, and eating foods that are fortified with folic acid (Bower, 1995).

Iron

The need for iron increased during pregnancy in order to supply the growing fetus and placenta and to increase the maternal red cell mass (Sargent, Schulken, Kemper and Hussey, 1994). Poor diet, recent rapid growth, or heavy menstrual blood losses resulted in low iron stores in many adolescents (Worthington-Roberts and Williams, 1997). Iron needs are the highest in the second and third trimester because maternal expansion and fetal blood formation occur primarily in the second trimester and the third trimester respectively (Heald and Jacobson, 1980). It is recommended that 30 mg of iron be supplemented each day (Worthington-Roberts and Williams, 1997).

Calcium

The need for extra calcium during pregnancy was related to the development of the fetal skeletal system (Worthington-Roberts and Williams, 1997). If calcium intake of pregnant adolescents was inadequate, fetal skeletal development and maternal skeletal

integrity was compromised (Worthington-Roberts and Williams, 1997).

The recommended Average Intake (AI) for calcium is 1300 mg for pregnant adolescents (Institute of Medicine, 1997). Calcium supplements may need to be administered to those pregnant young women who are lactose intolerant and those who have low calcium intake (Institute of Medicine, 1990). Adequate calcium intake is needed to insure higher peak bone mass since around 50% of maximum bone mass is accumulated during the adolescent years (Story and Alton, 1995; Worthington-Roberts and Williams, 1997).

Vitamin-mineral Supplement Recommendation

A daily multivitamin-mineral supplement should be recommended to pregnant adolescents if their nutrient needs cannot be met by food alone (Institute of Medicine, 1990). The nutrient needs of pregnant adolescents may be above the ordinary demands of pregnancy due to their young maternal age, use of cigarettes (more than 20 cigarettes per day), and poor nutritional status (Institute of Medicine, 1990). Iron supplementation during the second and third trimesters was recommended for adolescents (Institute of Medicine, 1990). Supplementation of calcium, vitamin B6, vitamin C, and folate was recommended only for pregnant adolescents at risk for inadequate food consumption (Mitchell-Rees and Worthington-Roberts, 1994).

Nutrition Beliefs and Knowledge in Relation to Dietary Behavior of Pregnant Adolescent

Literature suggests that cultural beliefs and traditions were present in all cultures during pregnancy (Kruger and Maetzold, 1983). Belief was defined as perceptions of factual matters, of what is true, or false or simply the cognitive aspect of attitudes (Crider, Geothals, Kavanaugh and Solomon, 1989; Parraga, 1990). Concern about health seemed to be the main motivation behind the health beliefs (Parraga, 1990). Kruger and Maetzold (1983) classified practices of tradition related to pregnant women as practices that may affect the fetus negatively or positively, insure healthy baby and a safe delivery, and determined the gender of a baby. A large number of these practices were related to food restrictions or food-related actions. A food restriction example was pregnant woman should eat a moderate amount of foods so the fetus would remain small for an easier delivery. Examples of food-related practices were eating prunes during pregnancy could cause the baby's face to be wrinkled, eating too many oranges could cause allergies in the infant, and eating carrots could cause the baby's hair to be red.

Actual dietary habits may reflect food and nutrition beliefs of pregnant women (Cassidy, 1982; Parraga, 1990). Carruth and Skinner (1991) developed a belief inventory about nutrition during pregnancy. The belief inventory was categorized into four groups (cravings and aversions, general nutrition, special foods and their effect on the mother, and special foods and their effect on the baby). Most of the belief statements from the belief inventory were erroneous and folkloric. If pregnant women changed their food intake according to these beliefs, it may harm their health. Few of the belief statements

such as drink milk to obtain calcium and drink plenty of water during pregnancy were true and were recommended during pregnancy. Carruth and Skinner (1992) used the belief inventory to study the relationship between beliefs and dietary intake of pregnant adolescents. The pregnant adolescents that agreed the statement "drinking milk was needed during pregnancy to obtain calcium" exceeded the RDA for calcium. The pregnant adolescents that disagreed with the statement "pregnancy was a good time to lose weight" had adequate maternal weight gain and calorie intake during pregnancy.

Adolescents usually increased their nutrition knowledge after education and dietary change may follow (Havas, Anliker, Damron, Langenberg, Ballesteros and Feldman, 1998). Nicklas, Johnson, Myers, Farris and Cunningham (1998) developed a multicomponent (media-marketing campaign, classroom activities, school meal modification, and parental involvement), school-based nutrition intervention (Gimme 5) to increase high school students' fruit and vegetable consumption. Knowledge about fruit and vegetable nutrition was assessed and number of servings of fruits and vegetable were obtain from the high school students. Students from the intervention group had knowledge scores significantly higher than the control group. The intervention group increased fruit and vegetable consumption from 2.63 servings at baseline to 3.00 servings two years later while the control group did not.

However, increased nutrition knowledge did not necessarily improve dietary practices of adolescents (Parraga, 1990; Skinner and Carruth, 1991; Harel, Riggs, Vaz, White and Menzies, 1998; Merron and Lock, 1998). Harel, Riggs, Vaz, White and Menzies (1998) assessed the calcium intake and knowledge about calcium of a group of adolescents. The adolescents knew about the health benefits of calcium, but calcium

consumption was only 45% of the RDA in females. The authors concluded that lack of specific information about daily requirements and calcium content of the various dietary sources were the reasons why adolescents had low calcium intake.

Food preferences seemed to have more impact on food consumption of adolescents (Story and Resnick, 1986). Eating habit of adolescents were influenced by health consciousness, taste, habits, peers, and exposure to the message of mass media (Contento, Michela and Goldberg, 1988; Worthington-Roberts and Williams, 1997). Adolescents may have nutrition knowledge but do not act upon their knowledge (Story and Resnick, 1986).

Nutrition Education for Pregnant Adolescents

Nutrition education of pregnant adolescents was designed to promote adequate maternal weight gain, normal baby birth weight, and decrease the incidence of anemia and preeclampsia (Owen, 1996). A study by Blackhurst et al. (1996) observed that nutrition education of pregnant adolescents resulted in babies with better Apgar score, fewer low birth weight babies, and fewer babies admitted to neonatal intensive care units (NICU). Pregnant adolescents who received nutrition education from the Higgins Nutrition Intervention Program had significantly fewer low birth weight and preterm babies than the nonintervention group (Dubois, Coulombe, Pencharz, Pinsonneault and Duquette, 1997). Beard (1994) showed that nutrition education targeting pregnant adolescents improved the compliance of taking prenatal supplements.

Educators can increase the effectiveness of nutrition education by knowing the perceptions of adolescents toward food and nutrition along with factors that influence adolescent food behavior (Story and Resnick, 1986). Education programs for pregnant adolescents should include the importance of maternal weight gain and the hazards of tobacco, alcohol and other drugs to the infant during pregnancy (Story and Alton, 1995). To improve the dietary intake of pregnant adolescents, they should be educated about nutrient rich foods appropriate for positive pregnancy outcomes and focus on foods rather than nutrients (Beard, 1994; Story and Alton, 1995).

CHAPTER III

METHODOLOGY

This project was funded by the Extension Service/Women Infant and Children (ES/WIC) non-competitive fund. This research was designed to study the effects of a nutrition education program on nutrition beliefs and knowledge, dietary intake, and pregnancy weight gain of pregnant adolescents and birth weights of their infants. The following describes the subject selection, experimental design, study instruments, education materials, and the statistical analysis for the research objectives and hypothesis.

Subjects

The recruiting criteria for participating in Have A Healthy Baby (HAHB) education program was being a pregnant adolescent between the ages of 11 to 19 years. Subjects were recruited by the Creek County Oklahoma Cooperative Extension Service (OCES) program between 1993 to 1996. OCES worked with three middle schools, eight public high schools, and two vo-tech schools in Creek County. These school made referrals to the HAHB program being offered by OCES in Creek county. Counselors, home economics teachers, school secretaries, and other pregnant teens participating in the

HAHB program provided the verbal referrals. One high school in Creek County required all pregnant students to participate in the HAHB program. When pregnant teens completed the course, they were given storybook suitable for reading to infants and toddlers by the Creek County Family and Community Education Council.

All participants completed a consent (Appendix A) form at the enrollment of the HAHB program. The subjects for this study were a continuation of the Hunt study (1996) and was approved by the Institutional Review Board (IRB) at Oklahoma State University (Appendix B).

Design

All subjects received HAHB education program intervention between pretest and posttest. The design of this study was a one group pretest and posttest design with one follow-up. The project data form questionnaire, nutrition questionnaire, 24-hour dietary recall, nutrition belief and knowledge scales, and follow up data were collected and entered into a computer database by personnel of the Oklahoma Cooperative Extension Service.

Education Materials for Pregnant Adolescents

Have A Healthy Baby (HAHB) curriculum was designed for pregnant adolescents 11 to 19 years by the Expanded Food and Nutrition Education Program, Purdue University Cooperative Extension Service. The purpose of the program was to assist the

pregnant adolescent to have a healthy baby through nutrition and health education. The curriculum was pilot tested for use in Chickasaw Nation Native American WIC Program through the Oklahoma Expanded Food and Nutrition Education Program (EFNEP). Hunt (1996) observed pregnant adolescents who received the HAHB education intervention had mean maternal weight gain of 15 kg, which was within the normal recommendation for pregnant adolescents. The mean baby birth weight was 3.5 kg which was also within normal birth weight. There was also a significant increase in iron intake after the nutrition program.

The goals for the HAHB program were for the participants to understand the physiological body changes during pregnancy, the effect of diet and lifestyle on the fetus, and the importance of the food groups and the number of servings that are needed daily. The format of the teaching included instructor outlines with activities as well as a workbook for participants. The nutrition education program was taught in eight one-hour lessons, once per week for eight weeks. The schools provided time during the day for the girls to participate in the HAHB program.

Topics of the HAHB curriculum included the importance of early prenatal care, prenatal weight gain, prenatal and infant nutrition and substances use (alcohol, cigarette, drugs) during pregnancy. Additional topics included meal planning and shopping, and nutrition related problems during pregnancy (e.g., anemia, gestational diabetes and hypertension). In addition, the HAHB supplement was used and consisted of videos, activities, visuals, handouts, and fact sheets. Topics of HAHB supplements included health habits, weight gain, nutrition during pregnancy, substance abuse (alcohol, cigarette, and drugs), breast and bottle feeding. Fact sheets (Teen Age Parents and Feeding Your

Baby) that were developed by Oklahoma Cooperative Extension Service were also included in the education program.

Instrument Development

All instruments were pilot tested and used in Hunt's study (1996).

Project Data Form Questionnaire

Project data form questionnaire (Appendix C) was adapted from the "Have A Healthy Baby" program (Konzelmann, Vandergraff, Wood, Barkman and Roepke, 1991). The questionnaire had two parts. Part one included demographic questions and part two collected the health history information about the pregnant adolescents.

Nutrition Belief and Nutrition Knowledge Instrument

The nutrition belief and knowledge instrument was adapted from a published belief inventory (Carruth and Skinner, 1991) by Hunt (1996). Part I consisted of 43 belief statements and was related to food and folklore, nutrition practices, cravings, and health-medical issues during pregnancy. Teens agreement with the belief statements utilized a Likert-type scale with 1 strongly agree to 5 strongly disagree. Hunt (1996) administered the belief instrument to a group of pregnant adolescents and conducted principal component analysis to generate five belief factors (food cravings: likes and dislikes,

Paraprofessional also used explicit probes to obtain detailed food intake of the pregnant adolescents.

The advantages of using a 24-hour dietary recall were requiring only short term memory and ability to provide detailed information on types of food consumed (Lee and Nieman, 1996; Institute of Medicine, 1990). However, since the 24-hour dietary recall relied on the memory of the participants, one disadvantage of using 24-hour dietary recall was participants may under-report or over-report the amount recalled. Twenty-four-hour dietary recalls can be used to estimate the nutrient intake of a group of individuals but it cannot represent a person's usual intake (Lee and Nieman, 1996; Institute of Medicine, 1990).

Follow-up Data Form

The follow-up data form was also adapted from the HAHB program. The follow-up data included the recording of maternal weight gain and baby's birth weight. This was self-reported by the adolescent mothers. Other information such as sex of infant, number of days in the hospital, WIC enrollment for mother and infant, and method of feeding infant were also obtained (Appendix G). Information on sex and birth weight of infants was obtained from local newspaper for some of the participants.

Data Collection

The EFNEP paraprofessional was responsible for administering all the study instruments to the pregnant adolescents. The project data form questionnaire, nutrition questionnaire, nutrition belief and knowledge instrument, and 24-hour dietary recall were completed on the day prior to the eight-week class for each pregnant adolescent. Posttest measurements included the nutrition belief and knowledge and 24-hour dietary recall and were collected the day following the eighth lesson. Because of school absences and other conflicts, some of the posttest measurements were collected from six to ten weeks after the pretest measurement. The follow up data form was completed approximately one month after the babies were born.

Data Analysis

Belief Factor Scores

Belief factor scores were generated from the 43 belief statements of the nutrition beliefs and knowledge instrument using the Likert-type scale ranging from strongly agree to strongly disagree (Appendix D). Belief statements responses were coded with 1 strongly agree and 5 strongly disagree. For the belief statements with correct concept, the response coding was reversed.

Principal components analysis was used to generate the belief factors (Borg and Gall, 1989). Varimax rotation was used to interpret the factor. Each factor included

statements that had factor loading over 0.5 to compute scores for that factor. The extracting criteria used to retain factors was eigenvalues over one. Cronbach's alpha was determined for each factor to test the internal reliability of the items that made up the factor (Borg and Gall, 1989). Three belief factors (cravings and folklore; child's likes and dislikes and nutrition; and weight gain and health) were generated from the pretest administration (Table 1) and it was used to analyze post belief assessment of pregnant adolescents. The belief factor scores were the sum of the belief statement responses for each item on each factor. A high belief factor score meant the pregnant adolescent had a more positive and accurate belief about nutrition and pregnancy and a low belief factor score meant the adolescent had a more erroneous belief about nutrition and pregnancy. The eigenvalues, percent of variance, and Cronbach's alpha are presented in Table 2.

Knowledge Score

The 22 knowledge questions from the nutrition beliefs and knowledge instrument (Appendix D) were in a true or false format. The knowledge score was calculated by assigning one point for a correct response for each knowledge question. The minimum and maximum knowledge score was 0 and 22, respectively. The internal reliability of the knowledge questions was tested with Cronbach's alpha for the pretest and posttest knowledge scores (Borg and Gall, 1989) and is presented in Table 2.

Table 1. Belief factors identified from pretest administration of the 43 belief statements from the pregnant adolescents.

Factors/belief statements	Factor loadings[1]
Factor 1: Cravings and folklore	
Pregnant women who crave sweets will have a girl (19)[2].	0.635
Pregnant women crave non-food items such as laundry starch, clay and dirt (23).	0.661
If a woman doesn't eat what she craves during pregnancy, when her baby is born it will smack and lick its' lips until given that food (25).	0.651
Birth defects are mostly the fault of the mother (29).	0.553
Gaining lots of weight during pregnancy makes a healthy baby (37).	0.744
A smaller weight gain during pregnancy allows for an easier delivery (39).	0.791
A woman should give into her cravings or she will mark the baby (40).	0.714
If a pregnant woman craves a food, her baby will like that food (43).	0.607
Factor 2: Child's likes and dislikes and nutrition	
The child of a mother who dislikes meat during pregnancy will also dislike meat (11).	0.604
Food cravings during pregnancy will determine the child's likes and dislikes in later life (13).	0.659
A woman who eats alot of oranges during pregnancy will have a baby who likes oranges later in life (20).	0.598
A pregnant woman should eat as much as she wants because she is eating for two (32).	0.701
Beets add iron to a pregnant woman's diet (42).	0.583
Factor 3: Weight gain and health	
A women should avoid "excessive" weight gain during pregnancy (4).	0.652
A woman needs double portions during pregnancy since she is now eating for two (18).	0.677
A pregnant woman who eats lots of ice, lacks iron in her blood (21).	0.727
"High blood" (high blood pressure) is caused by excess heat during pregnancy (26).	0.641

[1] Each factors includes statements that loaded >0.50 and is named for the dominant concept.

[2] The parenthesis is the number of the belief statement from the nutrition belief and knowledge instrument.

Table 2. Percent of variance and Cronbach's Coefficient alpha of belief factors and knowledge score.

Factors	**Number of statements**	**Eigenvalues**	**% of variance**	**Cronbach's alpha**	
			Pre-	Pre-	Post-
Belief factor 1	8	5.03	11.69	0.87	0.84
Belief factor 2	5	2.89	6.71	0.78	0.83
Belief factor 3	4	2.64	6.13	0.70	0.71
Knowledge score	22	--	--	0.47	0.26

Dietary Assessment

Dietary Reference Intakes (DRIs) were used to determine if subjects consumed adequate amounts of nutrients (Yates, Schlicker and Suitor, 1998). DRIs consist of three different criteria to measure nutrient adequacy and include the Recommended Dietary Allowance (RDA), Adequate Intake (AI), and Estimated Average Requirement (EAR). The RDA was used to measure adequacy of intake for energy, protein, vitamin A, vitamin C, iron, and zinc; AI was used to measure adequacy intake for calcium; EAR was used to measure adequacy intake for vitamin B6 and folate (Institute of Medicine, 1997; Institute of Medicine, 1998; Murphy, 1998). Adequate intake for each nutrient was defined as consuming at least 83% of the AI or RDA or 100% of the EAR (Murphy, 1998).

The 24-hour dietary recalls (Appendix F) were analyzed for nutrient intake using Food Processor (Version 6.11, ESHA Research, Salem, OR). If a food was recorded using a more general term, a more specific food was coded and coded consistently across all participants. For example, when the paraprofessional put down cereal and did not specify the kind of cereal, rice crispy cereal was coded for all unknown cereal. Rice crispy cereal was selected because the majority of the pregnant adolescents participated in WIC and one of the WIC approved cereals was rice crispy cereal. Other examples were whole milk was coded when the type of milk was not mentioned, whole chicken was coded when the cut of chicken was not specified, and hamburger with condiment was coded when condiment in hamburger was not mentioned unless it was specified by paraprofessional that the participant did not have condiments. When serving size was not specified, the place the food was eaten (school, fast food restaurant) was used to estimate

the serving size. When foods were eaten at home, one serving of foods were coded. Some foods eaten by pregnant adolescents were not in the Food Processor data base. The nutrient information from fast food restaurants and food nutrition labels were obtained and entered in the Food Processor database.

Nutrient Score

The nutrients examined were those important during pregnancy and were those usually low in pregnant teenagers (Institute of Medicine, 1990; Skinner, Carruth, Pope, Varner, and Goldberg, 1992; Dunn, Kolasa, Dunn, and Ogle, 1994). The nutrient score was generated by adding points assigned to calorie, protein, vitamin A, vitamin B6, vitamin C, folate, calcium, iron, and zinc. One point was given for each nutrient when the pregnant adolescents consumed 83% and over for the AI and the RDA nutrients, and 100% for the EAR nutrients. The minimum and maximum of nutrient score was 0 and 9, respectively.

Food Guide Pyramid (FGP) Servings

The food guide pyramid guidelines define the daily recommendation of number of servings for each of the five food groups to ensure adequate intake of energy, protein, vitamins and minerals (grain, vegetable, fruit, milk and meat) (Cleveland, Cook, Krebs-Smith and Friday, 1997; Krebs-Smith, Cleveland, Ballard-Barbash, Cook and Kahle, 1997). Adult men and women who met the five food group recommendations for

minimum number of servings, met or exceeded the RDA for vitamin A, vitamin B6, vitamin C, folate, calcium, iron, and zinc and their fat intake was 30% of total calorie (Krebs-Smith, Cleveland, Ballard-Barbash, Cook and Kahle, 1997).

Food intake as recorded in the 24-hour recall was calculated based on serving size and food groups of food guide pyramid servings. All foods were assigned to one of the five food groups in the food guide pyramid and serving size for each food group was based on the USDA Food Guide Pyramid servings (USDA, 1992; Pennington, 1994). Combination foods were disaggregated before being categorized into a food guide pyramid group.

Discretionary Fat and Added Sugar

Discretionary fat and added sugar were calculated with the food guide pyramid servings. Discretionary fat was defined as fat consumed in addition to the lowest amount of fat in each food groups (USDA, 1992; Cleveland, Cook, Krebs-Smith and Friday, 1997). The allowable fat for each food group was the following.

- Grain: 1.010 g per serving
- Vegetable: 0.218 g per serving
- Fruit: 0.280 g per serving
- Dairy: 0.441 g per serving
- Meat: 2.651 g per ounce cooked lean meat

To calculate discretionary fat, the following formula was used.

Discretionary fat (g) = total fat (g) - (grain servings x 1.010)

- (vegetable servings x 0.218) - (fruit servings x 0.280)

- (dairy servings x 0.441) - (lean meat ounces x 2.655)

Added sugars were all sugars that were used as ingredients in processed and prepared foods (e.g. bread and ice cream) and were not naturally found in foods (eg. fructose in juices and lactose in milk) (Cleveland, Cook, Krebs-Smith and Friday, 1997; Krebs-Smith, Cleveland, Ballard-Barbash, Cook and Kahle, 1997). Added sugar was generated for most of the foods by Food Processor. Added sugar not calculated for foods by the Food Processor, were hand calculated using the food composition tables based on the natural sugar contained in foods (Pennington, 1994).

Total Healthy Eating Index Score

The Healthy Eating Index (HEI) was developed by U.S. Department of Agriculture's (USDA) Center for Nutrition Policy and Promotion (CNPP) to assess the quality of the diet (Bowman, Lino, Gerrior and Basiotis, 1998). The HEI is composed of ten components, but in this study five components consisting of the USDA Food Guide Pyramid food group servings were used to calculate the total HEI score.

In order to generate the total HEI score, individual HEI scores of five food groups (grain HEI, vegetable HEI, fruit HEI, milk HEI, and meat HEI scores) were first calculated. Each food group HEI score was computed using the number of servings consumed per group and divided by the number of recommended servings. This number

was then multiplied by 10. The following formula was used to calculate each HEI score for five food groups.

$$\text{HEI score} = \frac{\text{Servings consumed}}{\text{Recommended servings}} \times 10$$

Number of recommended servings for the five food group components of the HEI (grains, 9.9; vegetables, 4.5; fruits, 3.5; milk, 4; and lean meat, 5.2 ounces) was based on the 2500 kcal recommended calorie level for pregnant adolescents (Bowman, Lino, Gerrior and Basiotis, 1998). A score of zero was assigned when no servings were consumed for a food group and a maximum score of 10 for each food group HEI score was assigned when a participant met or exceeded the recommended number of servings for a food group.

The total HEI score was the sum of each food group HEI score. The minimum and maximum of the total HEI score was 0 and 50, respectively. The higher the total HEI score the closer consumption of the subject was to the recommended number of servings for the food group.

Meeting the Recommended Weight Gain

Body mass index (BMI) was used to assess the prepregnancy weight status of pregnant adolescents (Institute of Medicine, 1990). The prepregnancy weight was obtained from the nutrition questionnaire form (Appendix E) and the height was obtained from the follow-up data (Appendix G). The BMI was calculated using the Quetelet's index (Lee and Nieman, 1996). The Quetelet's index formula is the following.

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

The prepregnancy BMI was used to determine the adequacy of the weight gain during pregnancy. The subjects were either categorized as did not gained enough, gained enough or gained too much. If the adolescent had weight gain between the recommended range for her prepregnancy weight status, she gained enough; if her weight gain was less than the recommended, she was categorized as under gained; and if weight gain exceeded the recommended, she was categorized as over gained. Table 3 shows the categories of BMI and the recommended weight gain for each category.

Table 3. Categories of weight status and recommended weight gain during pregnancy.

Prepregnancy weight status (BMI)	Recommended weight gain (lb)
Underweight (BMI < 19.8)	28 - 40
Normal weight (BMI = 19.8 - 26)	25 - 35
Overweight (BMI > 26 - 29)	15 - 25
Obese (BMI > 29)	15

Statistical Analysis

The following hypotheses were developed for this study.

1. There will be no significant difference between (healthy eating index) HEI, nutrient, knowledge, and belief factor scores of pregnant adolescents before and after the nutrition education program.
2. There will be no significant effect of socioeconomic variables (age, grade in school, community size, type of medical care received, or employment status) on the HEI, nutrient, knowledge, and belief factor scores of pregnant adolescents.
3. There will be no significant relationship between dietary intake and nutrition belief and knowledge of pregnant adolescents.
4. There will be no significant effect of maternal age and prepregnancy body mass index (BMI) on pregnancy weight gain and infant's birth weight.
5. There will be no significant relationship between pregnancy weight gain and infant's birth weight, and HEI, nutrient, nutrition belief and knowledge scores of pregnant adolescents.
6. There will be no significant difference in pregnancy outcomes and dietary intake of pregnant adolescents due to cigarette smoking status.
7. There will be no significant difference in pregnancy outcomes and dietary intake of pregnant adolescents due to use of vitamin-mineral supplements.

All data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 7.5 for Window (SPSS Inc., Chicago, IL). Descriptive statistics were used to summarize the demographic, health history, eating habits, anthropometric, and follow-up variables. Belief statements from the nutrition beliefs and knowledge instrument underwent a data reduction step using principal component factor analysis. Analysis of variance was used to test hypotheses 1, 4, 6, and 7. LSD was used as the Post Hoc test to determine the significant differences. Pearson's correlation coefficient was used to test the hypotheses 3 and 5. Paired *t* tests were used to evaluate the effect of the nutrition education program on dietary, nutrition beliefs and knowledge. Analyses of covariance were used to analyze the effect of education program on the dietary intake, and nutrition beliefs and knowledge by socioeconomic variables (age, grade in school, community size of residence, type of medical care received, and employment status).

Total HEI score, nutrient score, belief factor scores, knowledge scores, maternal weight gain, and baby's birth weight were the dependent variables. Independent variables included the socioeconomic variables (age, grade in school, community size, type of medical care received, and employment status), prepregnancy BMI, categories of meeting the recommended weight gain, use of cigarette, and use of vitamin-mineral supplements. The level of significance for this study was $p<0.05$.

CHAPTER IV

RESULTS

Demographic Data of Pregnant Adolescents

One hundred and seventy-six pregnant adolescents enrolled in the HAHB education program from 1993 to 1996 (Table 4). Three participants were older than 19 and therefore were excluded from the data set. Not all of 176 pregnant adolescents that originally enrolled completed all phases of the study. Only 46 completed all instruments at the pretest, posttest and follow-up.

The demographic data are shown in Table 5. The variables age, grade in school, and community type were grouped. There were only 6 teens aged 13 and 14, so they were grouped with the 15 year old teens. Similarly, fourteen 19 year old teens were grouped with the 18 year old teens. Also, seven teens in the 7^{th} and 8^{th} grade were grouped with the 9^{th} grade teens. Seven teens lived in a city with a population over 50,000 and they were grouped with the teens in city of over 10,000.

The majority of pregnant adolescents were 17 years old or older. Pregnant adolescents were in their second month to eighth month of pregnancy at the time of enrollment in the program. The majority of pregnant adolescents were white and the

highest number of minority were Native American. Most of the pregnant adolescents were enrolled in school and a small number of them were working. Sixty-two percent of them participated in WIC prior to the education intervention. Most of them did not know their family income. Pregnant adolescents received most of the social and financial support from parents and their boyfriends. No direct question was asked on marital status, however, from their answers regarding sources of social and financial support, only a few (11%) reported husband was one of their source. Although this may not mean those who did not report husband support were not married, it is reasonable to assume the majority of the pregnant adolescents were not married. The pregnant adolescents were evenly distributed among rural, town and city areas.

Health History of Pregnant Adolescents

Pregnant adolescents received medical care from either a health clinic or private physician (Table 6). A majority of pregnant adolescents had their initial doctor's visit during the first, second or third month of pregnancy and most of them continued to have their visit once a month or two times a month. Diabetes and high blood pressure were not a health problem for most of the pregnant adolescents. However, cigarette smoking was practiced by a small percentage of the pregnant adolescents. The majority of pregnant adolescents had no other children as this was a first pregnancy.

Eating Habits of Pregnant Adolescents

Table 7 presents the eating habits information of the pregnant adolescents. The majority had a moderate or hearty appetite. Most of the pregnant adolescents experienced nausea, vomiting, or increased appetite during pregnancy. A few pregnant adolescents experienced pregnancy related problems such as constipation, diarrhea, heartburn, and leg cramps. The majority reported use of vitamin and mineral supplements. Most of the pregnant adolescents were not on special diet. Ice was craved by a quarter of the pregnant adolescents. Other food cravings included ice cream, chocolate candy, pickles and high protein foods (data not shown). None of the adolescents reported cravings for nonfood item such as cornstarch, plaster, dirt or clay. The most common food assistance received by the pregnant adolescents was WIC voucher. About one-tenth of the pregnant adolescents experienced not enough food during the past month.

Dietary Intake of Pregnant Adolescents

Nutrient intake of pregnant adolescents is shown in Table 8. The mean pre and post calorie intake was 2351 kcal and 2388 kcal, respectively. Distribution of calories from protein, carbohydrate, and fat are presented in Table 9. Percent calories from carbohydrate was approximately 50% of total calories prior and after the nutrition education. Fat contributed more than 35% of total calorie.

Table 10 presents the percent Dietary Recommended Intakes (DRIs) for each nutrients. The percent of RDA for calories was close to 100%. The mean intake of

protein, vitamin A, vitamin B6, and vitamin C of the pregnant adolescent exceeded 100% of the DRIs in both of the pretest and posttest measurements. The mean folate and iron intake were around 50% of the EAR and RDA, respectively. Pregnant adolescents had a mean calcium intake close to 90% of the Adequate Intake (AI). The mean nutrient score of the pregnant adolescents was 4.0 (0-9, minimum and maximum, respectively) prior to and after the nutrition education. The higher the nutrient score the better the nutrient intake of the pregnant adolescent.

Table 11 presents the number of participants who had adequate intake of each nutrient. The majority of teens consumed an adequate intake of protein (≥ 83% of RDA). One half or more of the pregnant adolescents had an adequate intake for calories, protein, vitamin A, vitamin C (≥ 83% of RDA) and vitamin B6 (≥ 100% of EAR). Most of the pregnant adolescents did not consume an adequate amount of folate (≤ 100% of EAR), calcium (≤ 83% of AI), iron, and zinc (≤ 83% of RDA).

The food guide pyramid servings consumed by the pregnant adolescents based on the 24-hour dietary recall are presented in Table 12. The posttest mean intake of vegetable and fruit was 2.8 and 1.9 servings, respectively. The consumption of milk was 2.9 servings before and after the intervention. Table 13 presents the five food group HEI scores and the total HEI score. The pregnant adolescents scored lowest on the fruit HEI score and highest on the lean meat HEI score. The mean total HEI score was 30.0 and 30.7 at pretest and posttest, respectively. The higher the total HEI score the closer consumption of the participants was to the recommended number of servings for the food group.

Anthropometric Measures of Adolescents Prior to Pregnancy

Prepregnancy anthropometric data are presented in Table 14. Half of the adolescents were categorized to the normal weight range using BMI. More than one-third of the pregnant adolescents were categorized as being underweight. The average prepregnancy weight of pregnant adolescents was 57 kg and their BMI was 22 kg/m^2.

Follow-Up Data

Table 15 presents the follow-up data after the baby was born. The average prenatal weight gain was 17.25 kg. The mean infant birth weight was 3304 g. The average days of stay in hospital for mother and infant were 2.2 and 2.7 days, respectively. It ranged from one to seven days stay for the infant, with one infant staying in the hospital for 51 days (data not shown). Eighty percent of the adolescent mothers who delivered, met or exceeded the recommended weight gain. There were six low birth weight babies and one was from a twin pregnancy. Five babies were born premature and four participants had a miscarriage. The most frequent way of feeding the infant was with a bottle and formula.

Nutrition Belief Factors

Three belief factors were generated using the principle component analysis. Belief factor 1: cravings and folklore, consisted of eight belief statements, belief factor 2:

child's likes and dislikes and nutrition, consisted of five belief statements, and belief factor 3: weight gain and health, consisted of four belief statements (Table 1). The Cronbach's alpha for each belief factor was 0.70 or greater (Table 2).

Effect of Nutrition Education Program on Dietary Intake, Nutrition Belief and Knowledge

Paired *t* tests were used to evaluate the effect of the program on dietary intake, nutrition beliefs and knowledge.

Dietary Intake

The nutrition intervention had no significant effect on nutrient intake or food guide pyramid servings of the pregnant adolescents (Table 8, Table 12). The mean posttest intake of folate, calcium, iron, and zinc tended to be higher than the pretest intake although not significantly (Table 8). The pregnant adolescents tended to consume more vegetable servings after the nutrition education. The teens consumed the same number of servings of fruit and milk after the nutrition education as before (Table 12). The consumption of sugar from processed and prepared foods (added sugar) tended to decrease after the nutrition education.

Nutrition Belief Factors and Knowledge

The nutrition intervention had no significant effect on the knowledge score (Table 16). However, the pregnant adolescents improved their belief factor 1 score (cravings and folklore) and belief factor 2 score (child's likes and dislikes and nutrition) after the intervention ($p<0.02$). This meant that participants had more positive and accurate beliefs.

The average response of the belief statements from each belief factor can be calculated by dividing the total score by the number of the statements in each belief factor. The participants disagreed with the belief statements in belief factor 1 and 2 pretest and posttest. The pre and post belief factor 1 average response was 3.78 and 3.89, respectively (data not shown). The pre and post belief factor 2 average response was 3.57 and 3.72, respectively. Belief factor 3 score remained at no opinion to the participants after the nutrition education. The pre and post belief factor 3 average response was 3.2 and 3.18, respectively.

Effect of Socioeconomic Variables on Total HEI, Nutrient, Nutrition Knowledge and Belief Factor Scores

The effects of age, grade in school, type of medical care received, and type of community residence on the scores were determined using analysis of variance. Independent *t* tests were used to determine the relationship of employment status and the scores.

Age

The pre and post total HEI, nutrient, knowledge, and belief factor scores were not significantly different due to age (Table 17, Table 18, Table 19, Table 20).

Grade in School

The pre and post total HEI, nutrient, and knowledge scores were not significantly different due to grade in school (Table 17, Table 19). The pre-belief factor 3 score (weight gain and health) was significantly lower in 7-9th graders then 11th or 12th graders and not in school teens ($p<0.02$) (Table 18). The 7-9th graders had more erroneous belief regarding pregnancy weight gain and health than the 11th or 12th graders. Post-belief factor scores were not significantly different due to grade in school (Table 20).

Medical Care Received

Type of medical care received did not significantly influence the pre and post-total HEI, nutrient, and belief factor scores (Table 17, Table 18, Table 19, Table 20). The pregnant adolescents who received medical care from health clinics had a significantly lower pre-knowledge score than other who sought care from physicians ($p<0.03$) (Table 17). The post-knowledge score was not significantly different due to type of medical care received (Table 19).

Community Size of Residence

Community size of residence had no significant effect on pre and post total HEI, nutrient, and knowledge score (Table 17, Table 19). Pre-belief factor scores were not significantly different due to community size of residence (Table 18). Pregnant adolescents living in rural areas had a significantly lower (more erroneous) post-belief factor 1 score (cravings and folklore) than those living in a town under 10,000 or city of 10,000 and above ($p<0.05$) (Table 20).

Employment Status

The pre and post total HEI, nutrient, and knowledge scores were not significantly different due to employment status (Table 17, Table 19). Pregnant adolescents who were employed had more positive and accurate beliefs on weight gain and health (pre-belief factor 3 score) ($p<0.03$) (Table 18). There was no significant difference found in post-belief factor scores due to employment status (Table 20).

Intervention Effect by Socioeconomic

Analysis of covariance was used to determine the effect of education on the total HEI score, nutrient score, nutrition knowledge score and belief factor scores by socioeconomic variables (Table 21, Table 22). Pretest measures were used as the covariates. Nutrient score was significantly different due to intervention and grade in

school. The pregnant adolescents who were in the 12th grade had a significantly higher nutrient score than all others, except the 10th graders ($p<0.05$). Although there was no significant effect of intervention and grade in school on the total HEI score, the pregnant adolescents who were in the 12th grade tended to have a higher total HEI score than others. Nutrient score was not significantly different due to intervention and age, but the younger pregnant teens (age 13-15) seemed to have lower nutrient score than the older teens. Higher total HEI and nutrient scores represent better dietary intake of the pregnant adolescents.

Relationships Among Nutrition Belief, Knowledge, and Dietary Intake

Pearson's correlation coefficient was used to evaluate the relationships among nutrition belief factor scores, knowledge score, total HEI score and nutrient score.

Nutrition Belief Factors and Knowledge

There were no significant correlations between belief factor scores and knowledge prior to the education intervention (Table 23). Positive and significant correlations were found between the post-belief factor 1 (cravings and folklore) and 2 (child's likes and dislikes and nutrition) scores and the post-knowledge score ($p<0.01$) (Table 24).

Nutrition Belief Factors and Dietary Intake

There were no significant relationships between pre-belief factor scores and pre-total HEI, and nutrient scores (Table 23). The post-belief factor 1 (cravings and folklore) and 3 (weight gain and health) scores of the pregnant adolescents were positively correlated with post-nutrient score ($p<0.05$) (Table 24).

A positive and significant correlation was found between pre-belief factor 1 score (cravings and folklore) and pre-vitamin C intake ($p<0.05$) (Table 25). The post-belief factor 1 score (cravings and folklore) was positively correlated with post-folate and vitamin C intake; the post-belief factor 2 score (child's likes and dislikes and nutrition) was positively correlated with post-folate intake ($p<0.05$); and post-belief factor 3 score (weight gain and health) was positively correlated with post-calcium intake ($p<0.05$) (Table 26).

No significant relationships were found between pre-belief factor scores and the five food group HEI scores (Table 27). Post belief factor 2 score (child's likes and dislikes and nutrition) was negatively correlated with lean meat HEI score ($p<0.05$); and post-belief factor 3 score (weight gain and health) was positively correlated with milk HEI score ($p<0.01$) (Table 28).

Nutrition Knowledge and Dietary Intake

The pre-knowledge score of the pregnant adolescents was positively and significantly correlated with pre-calorie, protein, carbohydrates, fat, vitamin A, vitamin

B6, and calcium intake, and number of milk serving ($p<0.05$) (Table 29). There was no significant correlations between post-knowledge score and the nutrient intake and food guide pyramid servings of pregnant adolescents (Table 29).

Effect of Age and Prepregnancy Weight Status on Pregnancy Outcomes

Analysis of variance was used to analyze the effect of maternal age and prepregnancy weight status (BMI) on the maternal weight gain and infant's birth weight. Maternal weight gain and infant's birth weight were not significantly different due to age and prepregnancy weight status of the pregnant adolescents (Table 30). The youngest age group (13-15 year of age) tended to have the lowest maternal weight gain and smaller infant's birth weight. The pregnant adolescents who were categorized as underweight (with BMI < 19.78) tended to gain the most weight during pregnancy and their infants tended to weigh less than the infants of mothers who were normal or overweight prior the pregnancy.

Relationship Between Maternal Weight Gain and Infant Birth Weight and Dietary Intake, Nutrition Belief and Knowledge

Pearson's correlation was conducted and analysis of variance was used to evaluate the relationship between maternal weight gain and infant's birth weight and total HEI score, HEI scores of each food group, knowledge score, and belief factor scores of the pregnant adolescents.

Maternal Weight Gain

Maternal weight gain was positively and significantly correlated with the post-total HEI score and post-calorie intake using Pearson correlation ($p<0.05$) but was not significantly correlated with post-nutrient, knowledge, and belief factor scores (Table 31). Post-total HEI, nutrient, knowledge, and belief factor scores were not significantly different if the teen gained not enough, gained enough or gained too much of the recommended weight using analysis of variance (Table 32 and Table 33). Although calorie intake of the pregnant adolescents was not significantly different in meeting recommended weight gain, the participants who under gained during the pregnancy had a similar mean calorie intake compared to those who gained too much during pregnancy.

Infant Birth Weight

Post total HEI, nutrient, and knowledge scores were not significantly correlated with the infant birth weight (Table 34). The post-belief factor 3 score (weight gain and health) was positively and significantly correlated with the infant's birth weight ($p<0.05$). Analysis of variance was not performed to evaluate the relationship of infant birth weight and scores since only two adolescent mothers of the low birth weight infants completed the pretest and posttest dietary and nutrition belief and knowledge measurement.

Effect of Cigarette Smoking on Pregnancy Outcomes and Dietary Intake

Analysis of variance was used to determine the effect of cigarette smoking on maternal weight gain of the pregnant adolescents and infant's birth weight. Maternal weight gain, infant's birth weight, and dietary intake were not significantly different due to cigarette smoking status of the pregnant adolescents (Table 35). The participants who smoked during the pregnancy tended to gain less and their infants also tended to weigh less although the effect was not significant. Adolescents who smoked during the pregnancy had similar nutrient and total HEI scores compared to adolescents who did not smoke.

Effect of Supplement Use on Pregnancy Outcomes and Dietary Intake

Analysis of variance was used to evaluate the effect of vitamin and mineral supplement use on maternal weight gain of the pregnant adolescents and infant's birth weight. Maternal weight gain, infant's birth weight and dietary intake were not significantly different due to reported use of vitamin and mineral supplements during pregnancy (Table 36).

Table 4. Number of pregnant adolescents completed the HAHB education program.

HAHB Education Program	**N**
Enrolled in the education program	176
Completed pre/post nutrition belief instrument (Part 1)	111
Completed pre/post nutrition knowledge instrument (Part 2)	99
Completed pre/post 24-hour dietary recall	109
Completed Follow-up data form	117
Completed all instruments	46

Table 5. Demographic characteristics of pregnant adolescents prior to the nutrition education program.

Demographic characteristics	N	%
Age (y) (n=169) [1]		
13-15	33	19.5
16	41	24.3
17	50	29.6
18-19	45	26.6
Ethnic group (n=168)		
White	129	76.8
Black	10	6.0
Native American	28	16.7
Hispanic	1	0.6
Grade in school (n=165)		
7-9th Grade	21	12.7
10th Grade	37	22.4
11th Grade	47	28.5
12th Grade	37	22.4
Not in school	23	13.9
WIC enrollment (n=169)		
Yes	104	61.5
No	65	38.5
Employment status (n=169)		
Yes	39	23.1
No	130	76.9
Monthly family income (n=165)		
Under $438	14	8.5
$439-588	10	6.1
$589-738	3	1.8
$739-888	6	3.6
$889-1038	5	3.0
$1039-1188	2	1.2
$1189-1338	2	1.2
$1339 and over	8	4.8
Don't know	115	69.7
Social support received (n=169)		
Parents	108	63.9
Grandparents	16	9.5
Other relatives	22	13.0
Husband	19	11.2
Boyfriend	67	39.6
Other friends	28	16.6
Social service	2	1.2

Table 5. Continued.

Source of financial support (n=169)		
Parents	111	65.7
Grandparents	10	5.9
Self	11	6.5
Other relatives	9	5.3
Husband	19	11.2
Boyfriend	35	20.7
Other friends	5	3.0
Social service	7	4.1
Community type (n=168)		
Rural	56	33.3
Town under 10,000	57	33.9
City of 10,000 and above	55	32.7

[1] Total n was below 176 due to missing data.

Table 6. Healthy history summary of pregnant adolescent participants prior to the nutrition education program.

Healthy history variables	N	%
Type of medical care received for pregnancy (n=166) [1]		
Health clinic	73	44.0
Physician	79	47.6
No medical care	14	8.4
Month of pregnancy when first doctor's visit made (n=134)		
Have not visited doctor	9	6.7
1	37	27.6
2	54	40.3
3	22	16.4
4	9	6.7
5	3	2.2
Frequency of doctor's visit since pregnant (n=137)		
Visit when needed	8	5.8
Once a month	95	69.3
Every two weeks	31	22.6
Three times a month	3	2.2
Health history (n=169)		
Diabetes		
Yes	3	1.8
No	166	98.2
High blood pressure		
Yes	5	3.0
No	164	97.0
Medication for medical condition		
Yes	11	6.5
No	158	93.5
Alcohol use		
Yes	0	0.0
No	169	100.0
Cigarette use		
Yes	26	15.4
No	143	84.6
Has been pregnant before (n=169)		
Yes	32	18.9
No	137	81.1
Has other children (n=168)		
Yes	9	5.4
No	159	94.6

[1] Total n was below 176 due to missing data.

Table 7. Eating habits of pregnant adolescent participants at baseline.

Eating habit variables	**N**	**%**
Description of appetite (n=170) [1]		
Hearty	57	33.5
Moderate	100	58.8
Poor	13	7.6
Experienced the following during pregnancy (n=170)		
Nausea	107	62.9
Vomiting	96	56.5
Increased appetite	106	62.4
Decreased appetite	50	29.4
Problems during pregnancy (n=170)		
Constipation	23	13.5
Diarrhea	5	2.9
Heartburn	53	31.2
Leg cramps	44	25.9
Regularity of eating habits (n=167)		
Regular	130	77.8
Irregular	37	22.2
Vitamin mineral supplements use (n=169)		
Yes	134	79.3
No	35	20.7
Pills for weight loss used (n=169)		
Yes	1	0.6
No	168	99.4
Use of diuretic pills (n=169)		
Yes	1	0.6
No	168	99.4
Following a weight loss diet (n=169)		
Yes	1	0.6
No	168	99.4
Following a special diet (n=169)		
No	159	94.1
Diabetics	1	0.6
Low fat & low salt	1	0.6
Low salt	6	3.6
No sugar & low salt	1	0.6
2000 calorie for weight gain	1	0.6
Can't eat some foods (n=169)		
Yes	39	23.1
No	130	76.9

Table 7. Continued.

Cravings (n=170)		
Cornstarch	0	0
Plaster	0	0
Dirt or clay	0	0
Ice	44	25.9
Other	42	24.7
Food assistance received (n=170)		
Food stamps	21	12.4
WIC voucher	100	58.8
School lunch	41	24.1
Food shelves	2	1.2
commodities	7	4.1
Experienced not enough food during the last month (n=168)		
Yes	19	11.3
No	149	88.7
Plans to feed infant (n=169)		
Breastfeed	59	34.9
Evaporated milk formula	7	4.1
Commercial formula	34	20.1
Breast-feed & commercial formula	5	3.0
Undecided	64	37.9

[1] Total n was below 176 due to missing data.

Table 8. Mean pre and post nutrient intakes of pregnant adolescents (n = 109 pairs) [1].

Nutrient	Pre-nutrition education	Post-nutrition education	p
	← Mean ± St.Dev. →		
Calorie (Kcal)	2350.81 ± 756.83	2387.80 ± 807.13	0.687 [a]
Protein (g)	84.43 ± 33.94	89.53 ± 31.32	0.191
Carbohydrate (g)	302.79 ± 109.19	300.28 ± 113.92	0.854
Fiber (g)	15.22 ± 8.45	16.39 ± 10.37	0.296
Total fat (g)	93.47 ± 35.83	97.86 ± 42.02	0.334
Saturated fat (g)	36.80 ± 17.04	38.69 ± 17.57	0.359
Polyunsaturated fat (g)	11.64 ± 7.52	12.53 ± 8.77	0.366
Vitamin A (RE) [2]	934.06 ± 732.55	1028.79 ± 1394.36	0.486
Vitamin B6 (mg)	1.77 ± 1.10	1.80 ± 0.98	0.797
Vitamin C (mg)	116.02 ± 108.12	125.85 ± 135.27	0.519
Folate (μg)	228.98 ± 178.22	264.25 ± 178.78	0.107
Calcium (mg)	1151.10 ± 667.14	1165.84 ± 631.89	0.834
Iron (mg)	14.96 ± 6.90	16.64 ± 9.09	0.118
Zinc (mg)	10.13 ± 5.43	10.75 ± 4.77	0.348

[1] Total n was below 176 due to missing data.

[2] RE = retinol equivalents

[a] Means were significant at $p<0.05$ using paired *t* test.

Table 9. Mean percent of calories from protein, carbohydrate, and fat (n = 109 pairs)[1].

Food compositions	Pre-nutrition education	Post-nutrition education	p
	% of calories (Mean ± St.Dev.)		
Protein	14.50 ± 4.00	15.37 ± 3.38	0.045[a]
Carbohydrate	51.42 ± 8.89	49.99 ± 9.43	0.213
Fat	35.68 ± 6.77	36.77 ± 7.43	0.243

[1] Total n was below 176 due to missing data.

[a] Means were significant at $p<0.05$ using paired *t* test.

Table 10. Mean pre and post nutrient intake data as percent DRI [1] and the nutrient scores [2] (n = 109 pairs) [3].

Nutrient	Pre-nutrition education % DRI	Post-nutrition education % DRI	p [a]
	← Mean ± St.Dev. →		
Calorie	94.03 ± 30.27	95.51 ± 32.29	0.687
Protein	140.72 ± 56.57	149.21 ± 52.20	0.191
Vitamin A	116.76 ± 91.57	128.60 ±174.29	0.486
Vitamin B6	110.60 ± 68.60	112.69 ± 61.40	0.797
Vitamin C	165.74 ± 154.45	179.79 ±193.25	0.519
Folate	44.04 ± 34.27	50.82 ± 34.38	0.107
Calcium	88.55 ± 51.32	89.68 ± 48.61	0.834
Iron	49.85 ± 23.00	55.47 ± 30.29	0.118
Zinc	67.56 ± 36.20	71.65 ± 31.83	0.348
Nutrient score	4.01 ± 2.26	4.09 ± 2.26	0.837

[1] Calories, protein, vitamin A, vitamin C, iron, and zinc intake of the pregnant adolescents were compared with 1989 Recommended Dietary Allowance (RDA). Calcium was compared with 1997 Average Intake (AI). Vitamin B-6 and folate were compared with 1998 Estimate Average Requirement (EAR). The recommended value of calorie for pregnant adolescent is 2500 kcal (in average), protein is 60g, vitamin A is 800 RE, vitamin B6 is 1.6mg, vitamin C is 70mg, folate is 520mcg, calcium is 1300mg, iron is 30mg, and zinc is 15mg.

[2] Nutrient score is based on calories, protein, vitamin A, vitamin B-6, vitamin C, folate, calcium, iron, and zinc intakes being ≥ 83% of the DRI = 1. Minimum and maximum nutrient score is 0 and 9, respectively.

[3] Total n was below 176 due to missing data.

[a] Means were significantly different at $p<0.05$ using *t* test.

Table 11. Dietary intake data as the distribution of subjects who consumed adequate intake (≥83% DRI) [1] and who had inadequate intake (<83% of DRI).

Nutrient	Pre-nutrition education (n=155) [2]		Post-nutrition education (n=111) [2]	
	Had inadequate intake (< 83% DRI)	Adequate intake (≥83% DRI)	Had inadequate intake (< 83% DRI)	Adequate intake (≥83% DRI)
	N (%)	N (%)	N (%)	N (%)
Calorie	58 (37.4%)	97 (62.6%)	39 (35.1%)	72 (64.9%)
Protein	15 (9.7%)	140 (90.3%)	7 (6.3%)	104 (93.7%)
Vitamin A	67 (43.2%)	88 (56.8%)	53 (47.7%)	58 (52.3%)
Vitamin B6	74 (47.7%)	81 (52.3%)	56 (50.5%)	55 (49.5%)
Vitamin C	59 (38.1%)	96 (61.9%)	46 (41.4%)	65 (58.6%)
Folate	144 (92.9%)	11 (7.1%)	102 (91.9%)	9 (8.1%)
Calcium	82 (52.9%)	73 (47.1%)	61 (55.0%)	50 (45.0%)
Iron	138 (89.0%)	17 (11.0%)	100 (90.1%)	11 (9.9%)
Zinc	107 (69.0%)	48 (31.0%)	80 (72.1%)	31 (27.9%)

[1] Eighty-three percent RDA for calorie, protein, vitamin A, vitamin C, iron, and zinc and AI for calcium were used to calculate the adequacy of intake. One hundred percent EAR for folate and vitamin B6 were used to calculate the adequacy of intake.

[2] Total n was below 176 due to missing data.

Table 12. Mean pre and post food guide pyramid servings (n=109) [1].

Food groups	Pre-nutrition education Food guide pyramid servings	Post-nutrition education Food guide pyramid servings
	← Mean ± St.Dev. →	
Grain (serving)	7.16 ± 3.20 [a]	7.28 ± 3.30 [a]
Vegetable (serving)	2.48 ± 1.75	2.75 ± 2.44
Fruit (serving)	1.87 ± 2.41	1.86 ± 2.32
Milk (serving)	2.93 ± 2.21	2.90 ± 1.94
Lean meat (ounce)	5.15 ± 2.92	5.31 ± 2.67
Added sugar (g)	101.60 ± 67.39	87.33 ± 64.72
Discretionary fat (g)	71.19 ± 30.41	74.53 ± 36.15

[1] Total n was below 176 due to missing data.

[a] Means were not significantly different at $p<0.05$ using paired *t* test.

Table 13. Mean pre and post HEI score [1] for each food groups and total HEI score [2] (n=109) [3].

Food groups	Pre-nutrition education HEI score	Post-nutrition education HEI score
	← Mean ± St.Dev. →	
Grain	6.81 ± 2.46 [a]	6.89 ± 2.58 [a]
Vegetable	5.10 ± 2.90	5.18 ± 3.16
Fruit	3.95 ± 3.96	4.13 ± 3.91
Milk	6.16 ± 3.16	6.31 ± 3.09
Lean meat	7.99 ± 2.38	8.17 ± 2.49
Total HEI score	30.01 ± 7.99	30.68 ± 7.57

[1] HEI score was calculated proportionately to the number of servings consumed with the recommended number of servings based on 2500 kcal. The recommended number of servings are 9.9 for Grain, 4.5 for vegetable, 3.5 for fruit, 4 for milk, and 5.2 ounces for lean mean. Minimum and maximum HEI score for each food group is 0 and 10, respectively.

[2] Total HEI score is sum of the HEI score of the five food groups. Minimum and maximum total HEI score is 0 and 50, respectively.

[3] Total n was below 176 due to missing data.

[a] Means were not significantly different at $p<0.05$ using paired *t* test.

Table 14. Anthropometric variables of pregnant adolescents before being pregnant.

Anthropometric variables	**N**	**(%)**
Prepregnant weight categories (n=78) [1]		
Underweight (BMI<19.8)	28	35.9%
Normal weight (BMI=19.8-26)	39	50.0%
Overweight (BMI>26-29)	8	10.3%
Obese (BMI>29)	3	3.8%
Usual weight (kg) (n=161)	57.45 ± 10.93 [2]	
Height (cm) (n=91)	164.44 ± 9.45	
Body mass index (Prepregnancy) [3] (n=78)	21.67 ± 3.62	

[1] The total n was below 176 due to missing data.

[2] Mean ± Standard Deviation

[3] Calculated as (kg/m^2)

Table 15. Follow-up data of pregnant adolescent participants collected one month post delivery.

Follow-up variables	**Mean ± St.Dev.**	
Prenatal weight gain (kg) (n=95) [1]	17.25 ± 5.50	
Birth weight (g) (n=118)	3304.86 ± 551.27	
Infant's weight at one month (g) (n=60)	4041.68 ± 698.68	
Infant length at birth (cm)	50.85 ± 3.35	
Number of days in hospital		
Mother	2.24 ± 1.47	
Infant	2.68 ± 4.85	
	N	**%**
Adequacy of pregnancy weight gain [2] (n=71)		
gained not enough	14	19.7
gained enough	24	33.8
gained too much	33	46.5
Sex of infant [3] (n=118)		
Boys	66	55.9
Girls	52	44.1
Birth weight (n=118)		
Low birth weight (<2500 g)	6	5.1
Normal birth weight (≥2500 g)	112	94.9
Incomplete pregnancy (n=122)		
Miscarriage	4	3.3
Premature birth	5	4.1
Normal birth	113	92.6
Method of feeding infant (n=108)		
Breastfeed	24	22.2
Bottle	74	68.5
Combination	10	9.3
WIC enrollment (n=105)		
Yes	88	83.9
No	17	16.2

[1] The total n was below 176 due to missing data.

[2] Adequacy of pregnancy weight gain was calculated with body mass index.

[3] One participant delivered twins.

Table 16. Mean pre and post knowledge score and belief factor scores of pregnant adolescents.

	Pairs [1]	Pre-nutrition education	Post-nutrition education	p
	N	← Mean ± St.Dev. →		
Knowledge score [2]	99	17.35 ± 1.72	17.73 ± 1.69	0.056
Belief factor 1 score [3] - cravings and folklore	111	30.25 ± 4.31	31.14 ± 4.14	0.018 [a]
Belief factor 2 score [4] - child's likes and dislikes and nutrition	111	17.86 ± 2.58	18.59 ± 2.54	0.003 [a]
Belief factor 3 score [5] - weight gain and health	110	12.80 ± 3.37	12.72 ± 3.38	0.746

[1] Number of pairs was not 176 due to missing data.
[2] Minimum and maximum knowledge score is 0 and 22, respectively.
[3] There is 8 statements in belief factor 1. Minimum and maximum score of belief factor 1 is 8 and 40, respectively.
[4] There is 5 statements in belief factor 2. Minimum and maximum score of belief factor 2 is 5 and 25, respectively.
[5] There is 4 statements in belief factor 3. Minimum and maximum score of belief factor 3 is 4 and 20, respectively.
[a] Means were significantly different at $p<0.05$ using paired *t* test.

Table 17. Differences in mean pre-HEI [1], nutrient [2], and knowledge [3] score by age, grade in school, type of medical care received, community type, and employment status.

Demographic variables	N	Pre-total HEI score	N	Pre-nutrient score	N	Pre-knowledge score
		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.
Age (y)						
13-15	28	30.66 ± 7.17 [a]	28	4.50 ± 2.65 [a]	26	17.15 ± 1.87 [a]
16	38	30.32 ± 9.84	38	4.32 ± 2.58	35	17.54 ± 1.80
17	44	30.37 ± 8.12	44	4.07 ± 2.02	41	17.61 ± 1.46
18-19	38	30.16 ± 6.69	38	4.08 ± 1.91	36	16.69 ± 2.23
Grade in school						
7-9th Grade	18	29.98 ± 8.33 [a]	18	4.17 ± 2.50 [a]	17	17.12 ± 1.76 [a]
10th Grade	33	29.32 ± 8.74	33	4.42 ± 2.61	30	17.00 ± 1.76
11th Grade	44	31.14 ± 8.67	44	4.34 ± 2.17	42	17.69 ± 1.52
12th Grade	30	30.36 ± 7.22	30	4.13 ± 1.93	24	17.17 ± 1.95
Not in school	20	30.97 ± 6.70	20	4.00 ± 2.20	21	17.67 ± 1.56
Medical care received						
Health clinic	64	30.61 ± 8.25 [a]	64	4.30 ± 2.29 [a]	62	16.77 ± 2.08 [c]
Physician	72	29.98 ± 7.74	72	4.18 ± 2.33	65	17.68 ± 1.64 [d]
No medical care	10	33.50 ± 5.74	10	4.30 ± 1.57	9	17.56 ± 1.24 [c, d]
Community type						
Rural	49	31.43 ± 6.79 [a]	49	4.29 ± 2.06 [a]	44	17.32 ± 1.36 [a]
Town under 10,000	51	30.30 ± 8.39	51	4.35 ± 2.46	50	17.22 ± 2.09
City of 10,000 and above	47	29.69 ± 8.48	47	4.09 ± 2.20	43	17.33 ± 2.06
Employment status						
Yes	36	30.74 ± 8.13 [b]	36	4.08 ± 2.01 [b]	35	17.20 ± 2.23 [b]
No	112	30.23 ± 8.02	112	4.26 ± 2.34	103	17.29 ± 1.74

[1] Minimum and maximum total HEI score is 0 and 50, respectively.
[2] Minimum and maximum nutrient score is 0 and 9, respectively.
[3] Minimum and maximum knowledge score is 0 and 22, respectively.
[a] Means were not significantly different at $p<0.05$ using analysis of variance.
[b] Means were not significantly different at $p<0.05$ using independent *t* test.
[c, d] Means with different superscripts were significantly different.

Table 18. Differences in mean pre-belief factor scores by age, grade in school, type of medical care received, community type and employment status.

Demographic variables	N	Pre-belief factor 1 score cravings and folklore [1]	N	Pre-belief factor 2 score child's likes and dislikes and nutrition [2]	N	Pre-belief factor 3 score weight gain and health [3]
Age (y)		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.
13-15	27	29.52 ± 4.39 [a]	27	17.15 ± 3.01 [a]	28	11.57 ± 2.90 [a]
16	38	30.74 ± 4.00	39	17.90 ± 1.94	39	12.46 ± 3.97
17	43	30.12 ± 4.64	42	18.05 ± 2.83	43	13.09 ± 3.26
18-19	39	31.03 ± 4.17	39	18.44 ± 3.27	38	13.26 ± 3.61
Grade in school						
7-9th Grade	17	29.29 ± 4.71 [a]	17	17.35 ± 3.46 [a]	18	10.72 ± 3.10 [c]
10th Grade	32	29.88 ± 4.27	33	17.45 ± 2.39	33	11.64 ± 3.56 [c, d]
11th Grade	43	30.40 ± 4.92	43	17.70 ± 2.94	43	13.56 ± 3.86 [d]
12th Grade	30	31.10 ± 3.82	29	18.55 ± 2.61	29	13.03 ± 3.08 [d]
Not in school	21	31.33 ± 3.48	21	18.90 ± 2.68	21	13.57 ± 3.08 [d]
Medical care received						
Health clinic	62	30.76 ± 4.26 [a]	62	18.00 ± 2.88 [a]	63	12.75 ± 3.52 [a]
Physician	73	30.32 ± 4.09	73	17.88 ± 2.61	74	12.65 ± 3.46
No medical care	10	28.40 ± 5.32	10	17.90 ± 3.45	9	12.56 ± 3.68
Community type						
Rural	47	29.21 ± 4.12 [a]	47	17.70 ± 2.51 [a]	47	13.11 ± 3.13 [a]
Town under 10,000	52	31.12 ± 3.67	52	17.87 ± 2.79	53	12.60 ± 3.58
City of 10,000 and above	47	30.87 ± 4.94	47	18.26 ± 3.11	47	12.36 ± 3.85
Employment status						
Yes	35	30.83 ± 4.04 [b]	35	18.51 ± 2.17 [b]	36	13.83 ± 2.40 [g]
No	112	30.28 ± 4.39	112	17.77 ± 2.95	112	12.31 ± 3.73 [h]

[1] Minimum and maximum score of belief factor 1 is 8 and 40, respectively.
[2] Minimum and maximum score of belief factor 2 is 5 and 25, respectively.
[3] Minimum and maximum score of belief factor 3 is 4 and 20, respectively.
[a] Means were not significantly different at $p<0.05$ using analysis of variance.
[b] Means were not significantly different at $p<0.05$ using independent *t* test.
[c, d] Means with different superscripts are significantly different at $p<0.05$ using analysis of variance and LSD as the post hoc test.

Table 19. Differences in mean post-HEI [1], nutrient [2], and knowledge [3] scores by age, grade in school, type of medical care received, community type and employment status.

Demographic variables	N	Post-total HEI score	N	Post-nutrient score	N	Post-knowledge score
		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.
Age (y)						
13-15	18	31.10 ± 5.76 [a]	18	3.72 ± 1.67 [a]	16	17.25 ± 1.48 [a]
16	32	31.41 ± 7.41	32	4.34 ± 2.27	30	17.67 ± 1.88
17	31	30.15 ± 9.25	31	4.19 ± 2.74	28	18.11 ± 1.71
18-19	25	29.92 ± 7.88	25	4.00 ± 2.27	27	17.96 ± 1.58
Grade in school						
7-9th Grade	12	30.15 ± 6.59 [a]	12	3.42 ± 1.88 [a]	12	17.25 ± 1.60 [a]
10th Grade	21	30.27 ± 8.18	21	4.29 ± 2.28	18	17.17 ± 2.04
11th Grade	33	30.24 ± 7.69	33	3.85 ± 2.12	32	18.00 ± 1.65
12th Grade	24	33.74 ± 8.56	24	5.13 ± 2.64	22	17.95 ± 1.70
Not in school	14	27.78 ± 6.63	14	3.57 ± 2.24	15	18.27 ± 1.28
Medical care received						
Health clinic	46	30.85 ± 7.36 [a]	46	4.33 ± 2.15 [a]	47	17.55 ± 1.65 [a]
Physician	55	30.24 ± 8.11	55	3.82 ± 2.47	49	18.14 ± 1.66
No medical care	5	33.05 ± 9.09	5	5.40 ± 1.34	5	16.80 ± 2.05
Community type						
Rural	37	30.33 ± 8.56 [a]	37	4.19 ± 2.22 [a]	37	17.84 ± 1.54 [a]
Town under 10,000	36	31.13 ± 7.71	36	4.42 ± 2.66	31	17.81 ± 1.68
City of 10,000 and above	33	30.44 ± 7.14	33	3.70 ± 1.99	33	17.76 ± 1.92
Employment status						
Yes	26	31.22 ± 5.96 [b]	26	4.15 ± 1.95 [b]	27	18.00 ± 1.64 [b]
No	80	30.45 ± 8.32	80	4.10 ± 2.43	74	17.73 ± 1.72

[1] Minimum and maximum total HEI score is 0 and 50, respectively.
[2] Minimum and maximum nutrient score is 0 and 9, respectively.
[3] Minimum and maximum knowledge score is 0 and 22, respectively.
[a] Means were not significantly different at $p<0.05$ using analysis of variance.
[b] Means were not significantly different at $p<0.05$ using independent t test.

Table 20. Differences in mean post-belief factor scores by age, grade in school, type of medical care received, community type and employment status.

Demographic variables	N	Post-belief factor 1 score cravings and folklore [1]	Post-belief factor 2 score child's likes and dislikes and nutrition [2]	Post-belief factor 3 score weight gain and health [3]
Age (y)		← Mean ± St.Dev. →		
13-15	18	29.72 ± 4.40 [a]	18.78 ± 2.94 [a]	11.67 ± 3.03 [a]
16	33	31.85 ± 3.99	18.45 ± 2.02	12.94 ± 3.61
17	32	31.88 ± 3.78	19.19 ± 2.28	12.94 ± 2.82
18-19	27	31.37 ± 3.96	18.37 ± 3.19	13.26 ± 3.55
Grade in school				
7-9th Grade	13	28.77 ± 5.00 [a]	17.85 ± 2.85 [a]	11.31 ± 3.15 [a]
10th Grade	21	31.14 ± 3.53	19.10 ± 2.41	12.48 ± 3.03
11th Grade	33	31.58 ± 4.40	18.24 ± 2.53	12.88 ± 3.97
12th Grade	26	31.96 ± 3.29	19.12 ± 2.49	13.08 ± 2.38
Not in school	15	32.80 ± 3.59	19.27 ± 2.82	13.60 ± 3.48
Medical care received				
Health clinic	48	31.63 ± 3.72 [a]	18.75 ± 2.28 [a]	13.17 ± 2.82 [a]
Physician	57	31.42 ± 4.32	18.68 ± 2.89	12.47 ± 3.67
No medical care	5	28.80 ± 2.39	18.40 ± 0.89	13.20 ± 2.95
Community type				
Rural	39	30.13 ± 3.73 [c]	18.51 ± 2.49 [a]	12.92 ± 3.12 [a]
Town under 10,000	36	31.97 ± 3.00 [d]	18.72 ± 2.69	12.75 ± 3.54
City of 10,000 and above	35	32.20 ± 4.89 [d]	18.89 ± 2.56	12.74 ± 3.29
Employment status				
Yes	27	30.85 ± 3.80 [b]	18.59 ± 2.21 [b]	13.81 ± 2.66 [b]
No	83	31.57 ± 4.09	18.73 ± 2.68	12.48 ± 3.42

[1] Minimum and maximum score of belief factor 1 is 8 and 40, respectively.
[2] Minimum and maximum score of belief factor 2 is 5 and 25, respectively.
[3] Minimum and maximum score of belief factor 3 is 4 and 20, respectively.
[a] Means were not significantly different at $p<0.05$ using analysis of variance.
[b] Means were not significantly different at $p<0.05$ using independent t test.
[c, d] Means with different superscripts were significantly different at $p<0.05$ using analysis of variance and LSD as the post hoc test.

Table 21. Differences in mean post-HEI [1], nutrient [2], and knowledge [3] scores with pre-score as a covariate by age, grade in school, type of medical care received and community type.

Demographic variables	N	Total HEI score	N	Nutrient score	N	Knowledge score
		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.
Age (y)						
13-15	18	31.10 ± 5.76 [a]	18	3.72 ± 1.67 [a]	15	17.20 ± 1.52 [a]
16	31	31.21 ± 7.45	31	4.23 ± 2.20	29	17.66 ± 1.91
17	30	30.65 ± 8.98	30	4.30 ± 2.72	25	18.00 ± 1.76
18-19	25	29.92 ± 7.88	25	4.00 ± 2.27	26	17.85 ± 1.49
Grade in school						
7-9th Grade	12	30.15 ± 6.59 [a]	12	3.42 ± 1.88 [c, d]	11	17.18 ± 1.66 [a]
10th Grade	21	30.27 ± 8.18	21	4.29 ± 2.28 [b, c, d]	18	17.17 ± 2.04
11th Grade	33	30.24 ± 7.69	33	3.85 ± 2.12 [c, d]	30	17.97 ± 1.69
12th Grade	24	33.74 ± 8.56	23	5.30 ± 2.55 [b]	19	17.68 ± 1.60
Not in school	14	27.78 ± 6.63	13	3.23 ± 1.92 [c, d]	15	18.27 ± 1.28
Medical care received						
Health clinic	45	30.70 ± 7.38 [a]	45	4.24 ± 2.10 [a]	43	17.42 ± 1.62 [a]
Physician	54	30.52 ± 7.92	54	3.87 ± 2.47	47	18.11 ± 1.67
No medical care	5	33.05 ± 9.09	5	5.40 ± 1.34	5	16.80 ± 2.05
Community type						
Rural	37	30.33 ± 8.56 [a]	37	4.19 ± 2.22 [a]	33	17.70 ± 1.51 [a]
Town under 10,000	35	30.95 ± 7.75	35	4.31 ± 2.62	30	17.80 ± 1.71
City of 10,000 and above	32	30.92 ± 6.71	32	3.78 ± 1.96	32	17.69 ± 1.91

[1] Minimum and maximum total HEI score is 0 and 50, respectively.

[2] Minimum and maximum nutrient score is 0 and 9, respectively.

[3] Minimum and maximum knowledge score is 0 and 22, respectively.

[a] Means were not significantly different at $p<0.05$ using analysis of covariance with GLM.

[b, c, d] Means with different superscripts are significantly different at $p<0.05$ using analysis of covariance with GLM, and LSD as the post hoc test.

Table 22. Differences in mean post-belief factor scores with pre-belief factor score as a covariate by age, grade in school, type of medical care received and community type.

Demographic variables	N	Belief factor 1 score cravings and folklore[1]	N	Belief factor 2 score child's likes and dislikes and nutrition [2]	N	Belief factor 3 score weight gain and health [3]
Age (y)		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.
13-15	18	29.72 ± 4.40 [a]	18	18.78 ± 2.94 [a]	18	11.67 ± 3.03 [a]
16	32	31.94 ± 4.02	33	18.45 ± 2.02	33	12.94 ± 3.61
17	29	31.79 ± 3.93	28	19.00 ± 2.31	28	13.21 ± 2.85
18-19	27	31.37 ± 3.96	27	18.37 ± 3.19	26	13.19 ± 3.60
Grade in school						
7-9th Grade	13	28.77 ± 5.00 [a]	13	17.85 ± 2.85 [a]	13	11.31 ± 3.15 [a]
10th Grade	20	31.25 ± 3.58	21	19.10 ± 2.41	21	12.48 ± 3.03
11th Grade	32	31.46 ± 4.43	32	18.19 ± 2.55	31	13.10 ± 4.00
12th Grade	24	32.00 ± 3.43	23	18.91 ± 2.50	23	13.04 ± 2.50
Not in school	15	32.80 ± 3.59	15	19.27 ± 2.81	15	13.60 ± 3.48
Medical care received						
Health clinic	46	31.57 ± 3.76 [a]	46	18.72 ± 2.32 [a]	45	13.20 ± 2.86 [a]
Physician	55	31.45 ± 4.39	55	18.58 ± 2.88	56	12.48 ± 3.71
No medical care	5	28.80 ± 2.39	5	18.40 ± 0.89	4	14.25 ± 2.06
Community type						
Rural	37	29.97 ± 3.74 [a]	37	18.46 ± 2.55 [a]	36	12.94 ± 3.19 [a]
Town under 10,000	36	31.97 ± 3.00	36	18.72 ± 2.69	36	12.75 ± 3.54
City of 10,000 and above	33	32.30 ± 5.01	33	18.73 ± 2.53	33	12.88 ± 3.32

[1] Minimum and maximum score of belief factor 1 is 8 and 40, respectively.
[2] Minimum and maximum score of belief factor 2 is 5 and 25, respectively.
[3] Minimum and maximum score of belief factor 3 is 4 and 20, respectively.
[a] Means were not significantly different at $p<0.05$ using analysis of covariance with GLM.

Table 23. Correlations between pre-total HEI, nutrient, knowledge, and belief factor scores.

	Pre-total HEI score	Pre-Nutrient score	Pre-Knowledge score	Pre-belief factor 1 score cravings and folklore	Pre-belief factor 2 score child's likes and dislikes and nutrition	Pre-belief factor 3 score weight gain and health
			← r →			
Pre-total HEI score	1.000	0.773 [a]	0.132	0.000	-0.025	0.106
Pre-Nutrient score	0.773 [a]	1.000	0.164	0.081	0.028	0.010
Pre-Knowledge score	0.132	0.164	1.000	0.081	0.071	0.096

[a] Correlations were significant at $p<0.01$ level (2-tailed).

Table 24. Correlations between post-total HEI, nutrient, knowledge, and belief factor scores.

	Post-total HEI score	Post-Nutrient score	Post-Knowledge score	Post-belief factor 1 score cravings and folklore	Post-belief factor 2 score child's likes and dislikes and nutrition	Post-belief factor 3 score weight gain and health
			← r →			
Post-total HEI score	1.000	0.764 [a]	0.175	0.088	0.041	0.084
Post-Nutrient score	0.764 [a]	1.000	0.096	0.199 [b]	0.121	0.231 [b]
Post-Knowledge score	0.175	0.096	1.000	0.277 [a]	0.340 [a]	0.167

[a] Correlation was significant at $p<0.01$ level (2-tailed).

[b] Correlation was significant at $p<0.05$ level (2-tailed).

Table 25. Correlation of pre-belief factor scores with pre-nutrients intake.

Pre-nutrients (n = 150) [1]	**Pre-belief factor 1 score cravings and folklore**	**Pre-belief factor 2 score child's likes and dislikes and nutrition**	**Pre-belief factor 3 score weight gain and health**
	← r →		
Calorie/kcal	0.035	-0.017	-0.001
Fiber/g	0.003	-0.036	-0.018
Protein/g	-0.071	-0.073	0.037
CHO/g	0.103	0.019	0.002
Total fat/g	-0.029	-0.034	-0.020
Calcium/mg	-0.001	-0.058	0.082
Folate/mcg	0.004	-0.004	-0.056
Iron/mg	0.044	0.002	-0.031
Vit. A/RE	0.004	-0.041	-0.040
Vit. B6/mg	0.030	-0.017	-0.067
Vit. C/mg	0.194 [a]	-0.006	0.124
Zinc/mg	-0.020	0.003	0.003

[1] The total n was below 176 due to missing data.

[a] Correlation was significant at $p<0.05$ (2-tailed).

Table 26. Correlation of post-belief factor scores with post-nutrients intake.

Post-nutrients (n = 111) [1]	**Post-belief factor 1 score cravings and folklore**	**Post-belief factor 2 score child's likes and dislikes and nutrition**	**Post-belief factor 3 score weight gain and health**
	← r →		
Calorie/kcal	0.092	0.036	0.158
Fiber/g	0.109	0.042	0.104
Protein/g	0.010	-0.043	0.153
CHO/g	0.120	0.043	0.161
Total fat/g	0.072	0.021	0.109
Calcium/mg	0.111	0.086	0.214 [a]
Folate/mcg	0.277 [a]	0.267 [a]	0.089
Iron/mg	0.151	0.108	0.096
Vit. A/RE	0.167	0.096	-0.008
Vit. B6/mg	0.156	0.119	0.132
Vit. C/mg	0.201 [a]	0.054	0.067
Zinc/mg	0.126	0.166	0.175

[1] The total n was below 176 due to missing data.

[a] Correlations were significant at $p<0.05$ (2-tailed).

Table 27. Correlation of pre-belief factors with the pre-HEI scores of five food groups.

Pre-HEI (n = 150) [1]	**Pre-belief factor 1 score Cravings and Folklore**	**Pre-belief factor 2 score Child's Likes and Dislikes and Nutrition**	**Pre-belief factor 3 score Weight Gain and Health**
	← r [a] →		
Bread HEI score	0.094	-0.048	-0.004
Vegetable HEI score	-0.128	0.003	-0.032
Fruit HEI score	0.122	0.080	0.098
Milk HEI score	-0.031	-0.051	0.098
Lean meat HEI score	-0.092	-0.100	0.102

[1] The total n was below 176 due to missing data.

[a] Pre belief factor scores were not correlate with all HEI scores at $p<0.05$.

Table 28. Correlation of post-belief factor scores with the post-HEI scores of five food groups.

Post-HEI (n = 111) [1]	Post-belief factor 1 score cravings and folklore	Post-belief factor 2 score child's likes and dislikes and nutrition	Post-belief factor 3 score weight gain and health
	← r →		
Grain HEI score	0.047	0.129	0.064
Vegetable HEI score	0.089	0.052	0.046
Fruit HEI score	0.098	0.025	-0.029
Milk HEI score	0.098	0.068	0.256 [a]
Lean meat HEI score	-0.164	-0.192 [b]	-0.139

[1] The total n was below 176 due to missing data.
[a] Correlation was significant at $p<0.01$ (2-tailed).
[b] Correlation was significant at $p<0.05$ (2-tailed).

Table 29. Correlation of knowledge score with nutrient and food guide pyramid servings.

Knowledge score	Pre-	Post-
	← r →	
Nutrients		
Calorie/kcal	0.210 [b]	0.119
Fiber/g	0.149	0.175
Protein/g	0.214 [b]	0.127
CHO/g	0.175 [b]	0.076
Total fat/g	0.169 [b]	0.114
Calcium/mg	0.521 [a]	0.052
Folate/mcg	0.138	0.171
Iron/mg	0.126	0.141
Vit. A/RE	0.211 [b]	0.065
Vit. B6/mg	0.188 [b]	0.086
Vit. C/mg	0.021	0.127
Zinc/mg	0.152	0.137
Food Guide Pyramid servings		
Grain	0.084	0.131
Vegetable	0.004	0.023
Fruit	0.051	0.156
Milk	0.249 [a]	0.000
Lean meat	0.031	0.162
Discretionary fat / g	0.162	0.094
Added sugar /g	0.074	-0.038

[a] Correlation was significant at $p<0.01$ (2-tailed).

[b] Correlation was significant at $p<0.05$ (2-tailed).

Table 30. Maternal weight gain of participants and infant's birth weight compared to age and prepregnancy BMI of mothers.

	N	Maternal weight gain (kg)	N	Infant's birth weight (g)
Age groups		Mean ± St.Dev.		Mean ± St.Dev.
13-15	16	16.68 ± 4.43 [a]	18	3145.45 ± 463.64 [a]
16	20	18.05 ± 4.87	29	3327.27 ± 454.55
17	27	16.82 ± 5.55	29	3450.00 ± 527.27
18-19	27	17.85 ± 6.55	32	3304.55 ± 618.18
BMI groups				
< 19.78 (underweight)	28	18.12 ± 5.28 [a]	28	3218.18 ± 568.18 [a]
19.8-26 (normal weight)	35	16.57 ± 4.91	39	3250.00 ± 518.18
> 26.01 (overweight)	8	17.33 ± 6.50	9	3572.73 ± 650.00

[a] Means were not significantly different at $p<0.05$ using analysis of variance.

Table 31. Correlations between pregnancy weight gain and post-total HEI, nutrient, knowledge, and belief factor scores.

Pregnancy weight gain in lb.	**N** [1]	**r**
Post-total HEI score	76	0.265 [a]
Post-nutrient score	76	0.177
Post-calorie/kcal	76	0.231 [a]
Post-knowledge score	72	0.161
Post-belief factor 1 score - cravings and folklore	79	-0.037
Post-belief factor 2 score - child's likes and dislikes and nutrition	79	-0.120
Post-belief factor 3 score - weight gain and health	79	0.098

[1] The total n was below 176 due to missing data.

[a] Correlation was significant at $p<0.05$ (2-tailed).

Table 32. Differences in mean post-total HEI score [1], nutrient score [2], calorie intake, and knowledge score [3] compared to meeting the recommended pregnancy weight gain.

Meeting recommended weight gain [4]	**N**	**Post-total HEI score**	**N**	**Post-nutrient score**	**N**	**Post-calorie**	**N**	**Post-knowledge score**
		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.		Mean ± St.Dev.
Gained not enough	11	31.05 ± 5.45 [a]	11	4.64 ± 2.77 [a]	11	2473.19 ± 822.45	10	18.30 ± 1.42 [a]
Gained enough	21	28.95 ± 8.43	21	3.62 ± 2.29	21	2217.00 ± 817.53	18	17.72 ± 1.49
Gained too much	26	32.93 ± 6.81	26	4.42 ±1.96	26	2473.49 ± 651.75	26	18.35 ± 1.60

[1] Minimum and maximum total HEI score is 0 and 50, respectively.

[2] Minimum and maximum nutrient score is 0 and 9, respectively.

[3] Minimum and maximum knowledge score is 0 and 22, respectively.

[4] Recommended weight gain were determined by pre-pregnancy body mass index.

[a] Means were not significantly different at $p<0.05$ using analysis of variance.

Table 34. Correlations between infant's birth weight and post-total HEI, nutrient, knowledge, and belief factor scores.

Infant's birth weight in lb.	**N** [1]	**r**
Post-total HEI score	93	0.060
Post-nutrient score	93	0.168
Post-knowledge score	89	-0.147
Post-belief factor 1 score - cravings and folklore	97	0.025
Post-belief factor 2 score - child's likes and dislikes and nutrition	97	-0.005
Post-belief factor 3 score - weight gain and health	97	0.206 [a]

[1] The total n was below 176 due to missing data.

[a] Correlations was significant at $p<0.05$.

Table 35. Pregnancy outcomes and dietary intake of pregnant adolescents who smoked during the pregnancy and who did not.

Pregnancy outcomes	Smoke cigarette	N	Mean ± St.Dev.
Total pregnancy weight gain (kg)	Yes	12	16.10 ± 5.15 [a]
	No	78	17.57 ± 5.56
Infant's birth weight (g)	Yes	13	3163.64 ± 450.0
	No	95	3345.45 ± 536.4
Dietary intake			
Post-nutrient score [1]	Yes	15	4.20 ± 2.83 [a]
	No	91	4.10 ± 2.23
Post-total HEI score [2]	Yes	15	30.85 ± 8.17
	No	91	30.60 ± 7.77

[a] Means were not significantly different at $p<0.05$ using analysis of variance.
[1] Minimum and maximum nutrient score is 0 and 9, respectively.
[2] Minimum and maximum total HEI score is 0 and 50, respectively.

Table 36. Pregnancy outcomes and dietary intake scores of pregnant adolescents who took vitamin/mineral supplement during the pregnancy and who did not.

Pregnancy outcomes	**Take vitamin/mineral supplement**	**N**	**Mean ± St.Dev.**
Total pregnancy weight gain (kg)	Yes	74	17.49 ± 5.60 [a]
	No	15	16.76 ± 5.35
Infant's birth weight (g)	Yes	91	3327.27 ± 500.0
	No	16	3272.73 ± 700.0
Dietary intake			
Post-nutrient score [1]	Yes	87	4.02 ± 2.24 [a]
	No	18	4.56 ± 2.71
Post-total HEI score [2]	Yes	87	30.44 ± 7.54
	No	18	31.12 ± 9.07

[a] Means were not significantly different at $p<0.05$ using independent *t* test.

[1] Minimum and maximum nutrient score is 0 and 9, respectively.

[2] Minimum and maximum total HEI score is 0 and 50, respectively.

CHAPTER V

DISCUSSION

Characteristics of Pregnant Adolescents

Teens in this study as in other studies were not married (Schneck, Sideras, Fox and Dupuis, 1990; Fraser, Brockert and Ward, 1995) and were unaware of family income (Cornelius et al. 1994).

Some practices of the pregnant adolescent in this study were different from other studies. Most of the pregnant adolescents in this study reported that their first doctor visit was within the first three months of pregnancy (Table 6). However, Cornelius et al. (1994) and Wiemann, Berenson, Pino, and McCombs (1997) both found that the majority of the pregnant adolescents entered prenatal care after the third month (14 weeks) of the pregnancy.

Many previous studies found cigarette smoking and alcohol consumption common among pregnant adolescents. Half of the pregnant adolescents from the studies of Cornelius et al. (1994) and Kokotailo, Langhough, Smith-Cox, Davidson, and Fleming (1994) reported use of cigarettes. Alcohol consumption was also found in 15% and 7% of the participants from the Cornelius et al. (1994) and the Kokotailo, Langhough, Smith-

Cox, Davidson and Fleming (1994) study, respectively. In this study, however, cigarette smoking was reported by only 15% of the participants (Table 6). Moreover, alcohol consumption was not reported by any of the participants in the present study. A possible reason for this finding could be that this information was self-reported in the present study. Some participants may not want to tell if they were using cigarettes or alcohol, or they may have decreased the use of cigarettes and alcohol after they became pregnant (Kokotailo, Langhough, Smith-Cox, Davidson and Fleming, 1994).

Many pregnant adolescents are likely to enter pregnancy being underweight (Sargent, Schulken, Kemper and Hussey, 1994). However, this was not the case in the pregnant teens of the present study. Only 36% of the pregnant teens in this study were classified as underweight (Table 14) compared to 43% from a study by Sargent, Schulken, Kemper, and Hussey (1994).

Ice consumption was frequent among the pregnant adolescents in the present study (Table 7). This behavior was consistent with the findings reported by Schneck, Sideras, Fox, and Dupuis (1990). Craving for non-food items, however, was not reported in this study. Studies by Schneck, Sideras, Fox, and Dupuis (1990) and Pope, Skinner, and Carruth (1992) found some pregnant adolescents consumed dirt, ashes, and cigarette butts during pregnancy.

Dietary Intake of Pregnant Adolescents

The diet of pregnant adolescents in the present study was high in fat and overall poor in nutrient intake (Table 9, Table 10). This finding is consistent with other studies,

which found the mean nutrient intake of folate, iron, and zinc by pregnant adolescents below the adequacy level (Skinner, Carruth, Pope, Varner and Goldberg, 1992; Dunn, Kolasa, Dunn and Ogle, 1994). The present study also found that the pregnant adolescents had adequate intake of energy, protein, vitamin A, vitamin B6, vitamin C, and calcium. Adequate intake of calories, protein, and vitamin C were also found in other studies (Skinner, Carruth, Pope, Varner and Goldberg, 1992; Dunn, Kolasa, Dunn and Ogle, 1994). In addition, Skinner, Carruth, Pope, Varner, and Goldberg (1992) found that pregnant teens had an adequate intake of vitamin B6 and calcium while results of Dunn, Kolasa, Dunn, and Ogle's (1994) indicated otherwise.

One point worth mentioning is that the teens in the present study, as a group, seemed to have adequate mean nutrient intake of vitamin A, vitamin B6, vitamin C, and calcium (Table 10). However, two-fifths of the pregnant adolescents did not meet their individual recommendation for vitamin A, vitamin B6, and vitamin C (Table 11). In addition, more than half of them did not meet the calcium recommendation and a majority of them failed to meet the recommendations for folate, iron and zinc. Therefore, it was reasonable to conclude that the nutrient intake was poor in many of the pregnant adolescents.

Pregnant adolescents in the present study also had low consumption of fruit, vegetable, and milk (Table 12). These results were similar to the findings of Skinner, Carruth, Pope, Varner, and Goldberg (1992) and Dunn, Kolasa, Dunn, and Ogle (1994). HEI score was used to assess the diet quality (Krebs-Smith, Cleveland, Ballard-Barbash, Cook and Kahle, 1997). The HEI score for the five food groups, was the comparison of the actual servings of food groups intake of the participants and the minimum

recommended number of servings of food guide pyramid based on the calorie level of 2,500 kcal. The pregnant adolescents' intake of the five food groups was below the recommended number of servings since their mean HEI scores did not reach the maximum score of 10 (Table 13). The mean five food group HEI scores ranged from a low of 4.1 for fruits to a high of 8.2 for lean meat. The pregnant adolescents appeared to have better intake of grain, milk, and lean meat than vegetable and fruit.

Birth Outcomes of Pregnant Adolescents

From this study, the mean pregnancy weight gain of the pregnant adolescents was 17 kg and most teens met or exceeded the recommended weight gain based on their prepregnancy weight status (Table 15). This finding is in disagreement with other studies. The mean maternal weight gain of pregnant adolescents from the study of Cornelius et al. (1994) and Schneck, Sideras, Fox, and Dupuis (1990) was 13 kg and 14 kg, respectively. The percentage of the participants who did not have adequate weight gain in those study was double the present study (20% and 40%, respectively). A possible explanation for the high weight gain in the present study is that the weight gain was self-reported, and could have been overestimated. The high percentage of participants who met the recommended weight gain may be due to a underestimation of the prepregnancy weight and therefore causing an overestimated weight gain.

This study also had fewer low birth weight infants compared to a study by Fraser, Brockert, and Ward (1995). A possible explanation could be that adequate prenatal care may have made significant impacts on the birth outcomes as Geronimus and Korenman

(1993) had suggested in their study. Although this study did not define the adequate care, the pregnant teens seemed to have early and frequent prenatal care. However, Fraser, Brockert, and Ward (1995) argued that adolescent mothers were at higher risk of delivering low birth weight and premature infants even when teens were married, had age appropriate educational levels, and received adequate prenatal care.

Nutrition Belief Factors

Three belief factors were extracted from the 43 belief statements that made up the nutrition belief and knowledge instrument (Table 1). Hunt (1996) generated 5 belief factors using the same instrument, they were 1) Food cravings: likes and dislikes; 2) Folklore; 3) Prenatal weight gain; 4) Nutrition and cravings; and 5) Health. The three belief factors generated in this study had similar dominant concepts as Hunt (1996). In the present study, the factor of cravings and folklore from Hunt was combined into belief factor 1; child's likes and dislikes was the belief factor 2; and prenatal weight gain was grouped with health to form belief factor 3.

The belief factors generated from the nutrition belief instrument in this study had high internal reliability (Cronbach's alpha value was 0.70 or greater) (Table 2). Also, the belief factors in this study was generated based on data from 141 participants, which was a greater number than the Hunt study (43 pregnant adolescents).

Effect of Nutrition Education Program on Dietary Intake,

Nutrition Beliefs and Knowledge

Nutrition education had a significant effect on belief factors but did not have a significant effect on total HEI, nutrient, or knowledge scores (Table 16). This was inconsistent with the results by Hunt (1996), who found that iron and zinc intake, and the nutrition knowledge score were significantly increased after the HAHB education.

The possible explanation for no change in nutrient intake in the present study could be that protein, vitamin A, vitamin B6, and vitamin C intake of the pregnant adolescents were above 100% of the DRIs before the intervention and remained high after the intervention (Table 10). The present study also found that the folate, iron, and zinc intake of the participants was slightly higher after the education, but was not significant. In addition, the added sugar consumption of the pregnant adolescents tended to be lower after the nutrition education. Since mean intake of added sugar decreased and energy did not, adolescents may have selected foods with less empty calories such as carbonated beverages and replaced them with more nutritious foods.

Lastly, pre-knowledge score of the participants was relatively high and the posttest score remained high. A possible explanation for this result was that the participants may have already possessed sufficient nutritional knowledge when they entered the education program.

The participants, however, changed their beliefs after the nutrition education and developed more positive and accurate beliefs on belief factor 1 (cravings and folklore) and 2 (child's likes/dislikes and nutrition). The change of these beliefs may be due to the

correct information about nutrition that the participants learned from the HAHB. Nonetheless, most participants remained unsure about the beliefs about weight gain and health after the nutrition education. This indicated that they may be waiting for a convincing argument to agree or disagree with the beliefs (Pope, Skinner and Carruth, 1992). Therefore, it may be beneficial for HAHB to provide extra counseling sessions to help them form the correct beliefs about weight gain and health.

Effect of Socioeconomic Variables on Total HEI, Nutrient, Nutrition Knowledge and Belief Factor Scores

The dietary intake was not significantly different due to the socioeconomic variables of age, grade in school, type of medical care received, community size of residence, and employment status (Table 17, Table 19). The present study found nutrition knowledge was significantly different by type of medical care received but not by other socioeconomic variables. Hunt (1996) stated that education had a significant effect on nutrition knowledge. Specifically, Hunt (1996) found that after nutrition education, the pregnant adolescents in the 10^{th} grade scored substantially higher in nutrition knowledge than those in other grade levels.

The present study found that nutrition beliefs were significantly different due to grade in school, community size of residence, and employment status (Table 18, Table 20). The significant effect of grade in school on the pre-belief factor 3 (weight gain and health), and community size on the post-belief factor 1 (cravings and folklore) from the present study agrees with by Hunt (1996). Hunt (1996) also found that type of medical

care received had a significant effect on beliefs about folklore and prenatal weight gain while this study did not. Age had no effect on beliefs in the present study and this is consistent with other research (Pope, Skinner and Carruth, 1992; Hunt, 1996).

Relationship of Nutrition Belief and Knowledge and Dietary Intake

Nutrition Belief and Knowledge

This study found a positive and significant correlation between nutrition beliefs and knowledge after the nutrition education (Table 24). Participants who had positive beliefs on belief factor 1 (cravings and folklore) and belief factor 2 (child's likes/dislikes and nutrition) also had higher nutrition knowledge. Parraga (1990) suggested that health concerns were the main motivation behind the health beliefs. Normally, pregnant woman were motivated to learn about necessary nutritional intake adjustments because they were concerned about their infants health and their own health. Therefore, before entering HAHB, the pregnant teens probably motivated to absorb related information from all sources, sometimes overlooking its correctness and validity. It was a possible explanation for the lack of significant correlation between nutrition belief and knowledge prior nutrition education. Enrolling in HAHB gave the girls a good opportunity to learn and to correct their nutritional knowledge and beliefs. This positive impact from HAHB was reflected in the significant and positive correlation between nutrition beliefs and knowledge after the nutrition education.

Nutrition Belief and Dietary Intake

Contento, Michela, and Goldberg (1988) suggested that adolescents' food choices were influenced by beliefs about the consequences of eating specific foods. Their findings were consistent with that of this study. The post-nutrient score was positively and significantly correlated with belief factor 1 (cravings and folklore), and belief factor 3 (weight gain and health) (Table 24). This correlation suggested that the more accurate beliefs the teens had about cravings and folklore and weight gain and health, the more likely they were to adjust their food intake accordingly.

There was also a positive and significant relationship between belief factor 3 (weight gain and health) and calcium intake and milk HEI score (Table 26, Table 28). Although belief factor 3 did not contain a belief statement about milk, teens who had positive beliefs about weight gain and health made adjustments to increase calcium intake. The results of the present study on nutrition belief and dietary intake was similar to the study conducted by Carruth and Skinner (1992). Carruth and Skinner (1992) used specific belief statements to assess the relationship of nutrition belief and dietary intake of pregnant adolescents. Carruth and Skinner (1992) found that the calcium intake of the pregnant adolescents in their study was above the calcium RDA (1317 mg). The same group of teens also agreed with the statement "drinking milk was needed during pregnancy to obtain calcium." Moreover, pregnant adolescents exceeded the recommendation for the calorie intake (2503 kcal) and disagreed with the belief statements "pregnancy is a good time to lose weight" and "limit weight gain to 20 lb"

(Carruth and Skinner, 1992). However, Carruth and Skinner (1992) did not use any statistical test to support the above relationship.

However, it was interesting to note that Pope, Skinner, and Carruth (1992) found an inconsistent relationship between beliefs about food cravings and the actual craving of specific foods. Teens who had a belief about a specific food item did not crave that food. For example, not all of the pregnant adolescents who agreed with the statement "when you are pregnant, you will crave pickles and ice cream," actually reported craving pickles or ice cream (Pope, Skinner, and Carruth, 1992).

Nutrition Knowledge and Dietary Intake

There was a significant relationship between pre-knowledge scores and pretest nutrient intake but the relationship was not found between the post-knowledge and posttest nutrient intake (Table 29). The possible explanation for this is that only one 24-hour dietary recall was used to assess and analyze the nutrient intake. The nutrient intake of the participants during the measurement periods may not accurately represent their normal daily intake.

The internal reliability of the knowledge instrument was low (Table 2). Knowledge questions were related to food and nutrition, complications, weight issues and substance use during pregnancy. Conducting the Cronbach's alpha on all of the 22 knowledge question may have lowered the internal reliability of the total nutrition knowledge scale.

In the present study, maternal weight gain and infant birth weight were not significantly different due to maternal age or prepregnancy weight status (Table 30). Hediger, Scholl, Ances, Belsky, and Salmon (1990) found that the prepregnancy weight for height was not correlated with maternal weight gain during pregnancy. The suggestion that infant birth weight was not significantly different due to age was also supported by the findings of Schneck, Sideras, Fox, and Dupuis (1990). However, Amini, Catalano, Dierker, and Mann (1996) reported that younger adolescents (12-15 years of age) had significantly lower infant birth weights than older teens (16-19 years of age), thereby suggesting that maternal age was a factor in infant birth weight.

The youngest age group (13-15 years of age) in the present study tended to have lower infant birth weights and the lowest maternal weight gain when compared to the older teens. However, the difference between the two was not significant. This trend explained why some researchers recommend adolescents to gain the upper range of the weight gain recommendation to achieve an optimal birth weight for their infants (Institute of Medicine, 1990; Story and Alton, 1995). The underweight group tended to gain the most weight during pregnancy and their infants tended to weigh less than the infants whose mothers were normal or overweight prior to pregnancy. Overall, however, pregnant adolescents in all three of the prepregnancy weight categories (underweight, normal weight, and overweight) had weight gain within the recommendations and their infants were at normal birth weight.

Relationship Between Maternal Weight Gain and Infant Birth Weight and Dietary Intake, and Nutrition Belief and Knowledge

As expected, there was a positive and significant relationship between maternal weight gain and both total HEI score and calorie intake (Table 31). The pregnant adolescents had greater weight gain in parallel with higher amounts of food and energy intake. However, nutrition belief and knowledge had no significant effect on maternal weight gain of the pregnant adolescents in the present study. Carruth and Skinner (1992) found that pregnant adolescents who disagreed with the belief statements of "pregnancy is a good time to lose weight" and "limit weight gain to 20 lb" had weight gains of 16.5 kg (36 lb).

In addition, pregnant adolescents who missed, met, or exceeded the recommended weight gain did not have significantly different energy intake (Table 32). However, the intake of those who did not meet the recommended weight gain had a tendency to be higher than those who met the recommended weight gain. This suggested that inadequate calorie intake was not the only reason for the pregnant adolescents to not meet the recommended weight gain in this study. Other contributing factors for their failure to meet the recommended weight gain could be underweight status prior to pregnancy or being younger in age and were shown in the study by Schneck, Sideras, Fox, and Dupuis (1990) and Amini, Catalano, Dierker, and Mann (1996).

The present study also found that neither dietary intake nor nutrition knowledge were significantly correlated with infant birth weight (Table 34). However, belief factor 3 (weight gain and health) score was positively and significantly correlated with infant birth

weight. Pregnant adolescents with a positive beliefs about weight gain may be more open to weight gain during pregnancy and subsequently improved the infant birth weight although maternal weight gain of the participants did not correlate with beliefs in the present study. The possible reason for the insignificant relationship between birth weight and dietary intake was that there was a small number of low birth weight infants (6 infants) in this study. In the present study, birth weight was positively and significantly correlated with maternal weight gain which is consistent with other studies (Hediger, Scholl, Ances, Belsky and Salmon, 1990; Dunn, Kolasa, Dunn and Ogle, 1994).

Effect of Cigarette Smoking on Pregnancy Outcomes and Dietary Intake

Cigarette smoking had no significant effect on maternal weight gain, infant's birth weight, and dietary intake (Table 35). It was thought that cigarette smoking may have some effect on the infant birth weight due to adverse effects mentioned in the literature (MCH/OSDH, 1997b). Schneck, Sideras, Fox, and Dupuis (1990) reported infants of the teens who smoked had significantly lower birth weight than the infants of the non-smoker. The infant's birth weight of the pregnant adolescents who smoked tended to be lower than the non-smokers. The possible explanation for the lack of significant relationship could be the small number of pregnant adolescents who smoked during pregnancy.

Effect of Supplement Use on Pregnancy Outcomes and Dietary Intake

There was no significant effect of supplement use on maternal weight gain, infant's birth weight, and dietary intake (nutrient score and total HEI score) (Table 36). Although the result was not significant, pregnant adolescents who took supplements tended to have higher maternal weight gain. Also, their infants tended to weigh more and their dietary intake tended to be poorer than the participants who did not take supplements. The additional vitamins and minerals from the supplements may help fulfill the nutrient needs for the growth of fetus. Also, participants who took supplements may think it is okay to eat whatever they want and not to worry about the consequences of poorer dietary intake.

Summary

The pregnant adolescents in the present study were similar to other pregnant adolescents in that most of them were not married and did not know the family income. The major character differences between the pregnant adolescents in the present study and those in other studies were that the participants in this study had: earlier start of prenatal care, smaller number of cigarette smokers, and absence of alcohol use. Adequate intake was found in energy, protein, vitamin A, vitamin B6, vitamin C, and calcium. The diet was low in fruit, vegetable, and milk group. Most of the participants had adequate weight gain and normal birth weight infants.

Three belief factors were identified. The belief factors were factor 1: cravings and folklore, factor 2: child's likes/dislikes and nutrition, and factor 3: weight gain and health. Education, community size of residence, and employment status had a significant effect on nutrition beliefs. The nutrition education program had a significant effect on the nutrition beliefs but no significant effect on nutrition knowledge nor the dietary intake of the pregnant adolescents. Relationships were found between nutrition belief and knowledge and dietary intake but no such relationship were present between knowledge and dietary intake.

Maternal age and prepregnancy weight status did not affect the maternal weight gain nor the infant's birth weight. Calorie intake and the total HEI score of the pregnant adolescents had positive and significant relationships with the maternal weight gain. The cigarette smoking status and vitamin/mineral supplement usage did not affect the maternal weight gain and infant birth weight, nor did it affect the dietary intake of the pregnant adolescents.

CHAPTER IV

CONCLUSION, IMPLICATION, AND RECOMMENDATIONS

Conclusion

The objectives of the study were to evaluate the impact of the HAHB on pregnant adolescents nutrition beliefs and knowledge, dietary intake, maternal weight gain, and infant's birth weight. Conclusions were made for each of the hypotheses.

Hypothesis One

There will be no significant difference between HEI, nutrient, knowledge, and belief factor scores of pregnant adolescents before and after the nutrition education program. Hypothesis one was rejected for the effects of nutrition education on the belief factor 1 and 2 scores. However, there were no significant effect of nutrition education on knowledge, nutrient and food intake.

Hypothesis Two

There will be no significant effect of socioeconomic variables (age, grade in school, community size, type of medical care received, and employment status) on the healthy eating index (HEI), nutrient, knowledge, and belief factor scores of pregnant adolescents. Hypothesis two was rejected for the effects of grade in school, community size, or employment status on nutrition beliefs. In addition, type of medical care received had significant effect on nutrition knowledge. However, there were no significant effect of socioeconomic variables on the nutrient and food intake.

Hypothesis Three

There will be no significant relationship between dietary intake and nutrition belief and knowledge of pregnant adolescents. Hypothesis three was rejected because post-belief factor 1 (cravings and folklore) and 3 (weight gain and health) correlated positively with nutrient score. In addition, post-belief factor 1 and 2 (child's likes/dislikes and nutrition) correlated positively with knowledge score. However, nutrition knowledge was not correlated with dietary intake.

Hypothesis Four

There will be no significant effect of maternal age and prepregnancy body mass index (BMI) on pregnancy weight gain and infant's birth weight. Hypothesis four was

not rejected because there was no significant effect of maternal age or prepregnancy BMI on pregnancy weight gain and infant's birth weight.

Hypothesis Five

There will be no significant relationship between pregnancy weight gain and infant's birth weight, and HEI, nutrient, nutrition belief and knowledge scores of pregnant adolescents. Hypothesis five was rejected because total HEI score or calorie intake correlated positively with pregnancy weight gain. In addition, nutrition belief factor 3 (weight gain and health) correlated positively with infant's birth weight. However, knowledge score was not correlated with pregnancy weight gain or infant's birth weight.

Hypothesis Six

There will be no significant difference in pregnancy outcomes and dietary intake of pregnancy adolescents due to cigarette smoking status. Hypothesis six was not rejected because there was no significant effect of cigarette smoking status on maternal weight gain and infant's birth weight.

Hypothesis Seven

There will be no significant difference in pregnancy outcomes and dietary intake of pregnant adolescents due to use of vitamin-mineral supplements. Hypothesis seven

was not rejected because use of vitamin-mineral supplements had no significant effect on maternal weight gain and infant's birth weight.

Implication

Conclusions based on the hypotheses of this study can be summarized as the following, knowledge and dietary intake were not significantly improved after the nutrition education. Although the HAHB education materials were not designed to change beliefs of pregnant adolescents, the belief scores were more positive after the nutrition education. Since nutrition beliefs were found to be related to dietary intake of the pregnant adolescents, nutrition education materials that target positive belief change may further improve nutrition beliefs and dietary intake.

Recommendations

The population in the present study seemed to have lower risk for the problems associated with pregnant adolescents suggested from the literature, such as delayed prenatal care, inadequate prenatal weight gain, or delivery of low birth weight infants. Further studies should be conducted with a high-risk group of pregnant adolescents to further investigate the association between nutrition beliefs, nutrition education, nutrient intake and birth outcomes.

To further study the effectiveness of HAHB on improving nutrient intake and birth outcome, a design utilizing a comparison or control group should be used.

A shortened version of the nutrition belief instrument may be more helpful to assess the nutrition beliefs of the pregnant adolescents and will need further validation. Also, it might be beneficial to develop a curriculum with a health belief model to help change teens' beliefs about food and nutrition during pregnancy.

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APPENDIX A

CONSENT FORM FOR PREGNANT ADOLESCENTS

CONSENT FORM B

"I", _____ , agree to participate in the Have a Healthy Baby Program.

OSU Creek County personnel has explained the program and I understand the following:

1. The Have a Healthy Baby Education Program with 8 learning sessions is optional.

2. Participation in the program is not required to receive WIC benefits.

3. Participation will not effect the WIC services to which I may be entitled.

4. My decision to participate is a confidential matter and may name and information will not be used publicly.

5. I have seen the enrollment form; the beliefs and knowledge checksheet; and eating habits checklist. I understand that filling out these forms is a part of participation in the project.

6. I may contact Lavena Rager, Creek County Extension Home Economist, at (918) 224-2192 if I decide to withdraw from the program at any time. I may also contact Terry Maciula, University Research Services, 001 Life Service East, Oklahoma State University, Stillwater, Oklahoma, 74078; Telephone: (405) 744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Signed: _____
Signature of Participant

Date: _____

APPENDIX B

IRB APPROVAL FORM FROM HUNT STUDY

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS RESEARCH

Date: 1-28-93 **IRB#:** HES-93-015

Proposal Title: EFFECTS OF NUTRITION EDUCATION PROGRAM ON NUTRITION KNOWLEDGE, DIETARY INTAKE, ATTITUDES AND SELECTED HEALTH PARAMETERS FOR EFNEP AND NATIVE AMERICAN PREGNANT ADOLESCENTS

Principal Investigator(s): Barbara Stoecker, Donna-Jean Hunt

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL. ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Modifications received and approved

Signature: Marcia K. Tilley
Chair of Institutional Review Board

Date: January 28, 1993

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS RESEARCH

Date: 03-15-93 **IRB#:** HES-93-023

Proposal Title: ASSESSMENT OF NUTRITION KNOWLEDGE OF OKLAHOMA COOPERATIVE EXTENSION SERVICE (OCES) EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM (EFNEP) PARAPROFESSIONALS AND FOOD BELIEFS OF THEIR PREGNANT ADOLESCENT CLIENTS (RURAL, URBAN OR NATIVE AMERICAN)

Principal Investigator(s): Barbara Stoecker, Donna-Jean Hunt

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL. ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Signature: Marcia K. Tilley Date: March 17, 1993
Chair of Institutional Review Board

APPENDIX C

DATA PROJECT FORM

Name: _____

Date: _____
County: _____
Program: _____

Participant No: _____
OFFICE USE ONLY

HAVE A HEALTHY BABY PROJECT-DATA FORM A

Please answer the following questions. This information will help us to provide you with the best nutritional care. All information is confidential.

General Information

1. Name _____
2. Name you would like to be called _____
3. Birthday _____ Age: _____
4. Ethnic Group _____
5. Are you in school? _____
6. When is your due date? _____
7. Are you enrolled in WIC? Yes _____ No _____
8. What grade are you in? _____
9. Do you have a job? ___ No ___ Yes If so, where? _____
10. Total family income last month was:

___ Under $438	___ $889-1038
___ $439-588	___ $1039-1188
___ $589-738	___ $1189-1338
___ $739-888	___ $1339 and over
	___ don't know

11. From which of the following individuals do you receive most of your social support? (CHECK ONE)

___ mother	___ girlfriend
___ father	___ boyfriend
___ both parents	___ husband
___ one or both grandparents	___ other person, adult, not related
___ sister or brother	___ social services
___ other relative, (aunt or uncle)	

12. From which of the following individuals do you receive most of your financial support? (CHECK ONE)

___ one or both parents	___ girlfriend
___ one or both grandparents	___ boyfriend
___ self	___ husband
___ sister or brother	___ other person, adult, not related
___ other relative,	___ social services
___ (aunt or uncle)	

13. In which type of community do you live? (CHECK ONE)

___	rural	_____	suburb of a city over 50,000
___	town under 10,000	_____	metro city over 50,000
___	city 10,000-50,000		

14. Where do you receive medical care? (CHECK ONE)

___	health clinic	____	no medical care
___	physician		

Health History

1. Do you take any medication daily? (include vitamins)
   Yes _____ No _____
   If yes, explain _____
   _____
2. Have you been pregnant before? Yes_____ No_____
3. Any problems with previous pregnancies? (CHECK ALL THAT APPLY)
   _____ Baby less than 5 1/2 pounds.
   _____ Mom was anemic.
   _____ Baby stayed in hospital after mom was released. If so, why?_____
   _____
   Other, specify _____
4. When in your current pregnancy did you first see a doctor?_____
5. How often do you see a doctor?_____
6. Do you have any children? Yes_____ No_____
7. If you are enrolled in WIC when did you enroll? _____
   What other types of food assistance are you participating in?_____
   _____
8. Are you:
   _____diabetic
   _____on medication for medical condition

   Do you:
   ____ have high blood pressure
   ____ use drugs? How much? _____
   ____ use alcohol? How much? _____
   ____ smoke cigarettes? How much?_____

Adapted with permission from Have A Healthy Baby, part of the Expanded Food and Nutrition Education Program, Purdue University Cooperative Extension Service, West Lafayette, IN, 1991.
Reference: Nutrition Management of the Pregnant Adolescent by Mary Story, 1990, National Clearinghouse, Washington, DC.

APPENDIX D

NUTRITION BELIEFS AND KNOWLEDGE INSTRUMENTS

Name: _____

Date: _____
County: _____
Program: _____
Pre / Post (Circle One)

Participant No. _____

OFFICE USE ONLY

BELIEFS AND KNOWLEDGE ABOUT HEALTH AND NUTRITION DURING PREGNANCY (FORM C)

Section I: Belief Statements

Directions: Please read each statement and check (√) what you believe is true about health and nutrition during pregnancy. For example, do you agree with the statement "A pregnant woman will lose a tooth with every baby if she doesn't drink milk." If so, check the column, "agree". After reading each statement select the appropriate response.

Belief Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
A pregnant woman will lose a tooth with every baby if she doesn't drink milk.					
Pregnant women crave foods they need in their diet.					
Beets build red blood during pregnancy.					
A woman should avoid "excessive" weight gain during pregnancy.					
A pregnant woman craves ice because she is not getting enough of certain nutrients in her diet.					
A father who is a drug addict is more likely to produce birth defects.					
Women will crave pickles and ice cream during pregnancy.					
A woman should not eat fish and milk at the same meal during pregnancy.					

Belief Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Pregnant women crave dirt when their diets are low in minerals.					
A father with high cholesterol levels is likely to produce a child with heart disease.					
The child of a mother who dislikes meat during pregnancy will also dislike meat.					
Pregnant women need a balance of hot and cold foods in their diet.					
Food cravings during pregnancy will determine the child's likes and dislikes in later life.					
Pregnant women need a balance of fattening and low calorie foods in their diet.					
Whatever a pregnant woman craves, she should eat.					
A pregnant woman should eat more sodium-rich foods and less meats and high-calorie foods to decrease high blood pressure.					
Women eat better when they become pregnant.					
A woman needs double portions during pregnancy since she is now eating for two.					
Pregnant women who crave sweets will have a girl.					
A woman who eats alot of oranges during pregnancy will have a baby who likes oranges later in life.					

Belief Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
A pregnant woman who eats lots of ice, lacks iron in her blood.					
The baby gets what he/she needs first, the rest goes to the mother.					
Pregnant women crave non-food items such as laundry starch, clay and dirt.					
It doesn't completely matter how much or how little weight is gained during pregnancy.					
If a woman doesn't eat what she craves during pregnancy, when her baby is born it will smack and lick its' lips until given that food.					
"High blood" (high blood pressure) is caused by excess heat during pregnancy.					
Eating strawberries during pregnancy will cause birthmarks on the baby.					
Pregnant women who crave salty or sour foods will have a boy.					
Birth defects are mostly the fault of the mother.					
A woman who dislikes tomatoes during pregnancy will produce a child who dislikes tomatoes.					
Eating lots of sweets during pregnancy produces a more mild manner child than not eating sweets.					

Belief Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
A pregnant woman should eat as much as she wants because she is eating for two.					
It doesn't completely matter what a woman eats during pregnancy because the baby will take what it needs from her body.					
Eating chicken legs during pregnancy will cause birthmarks on the baby.					
A woman should avoid animal foods during pregnancy.					
Pregnant women who crave sweets will produce a more hyperactive child.					
Gaining lots of weight during pregnancy makes a healthy baby.					
All pregnant women have cravings.					
A smaller weight gain during pregnancy allows for an easier delivery.					
A pregnant woman should give into her cravings or she will mark the baby.					
Low birth weight babies are mostly the fault of the mother.					
Beets add iron to a pregnant woman's diet.					
If a pregnant woman craves a food, her baby will like that food.					

Section II: Knowledge Statements

Directions: Answer the following true or false knowledge statements by placing a check (√) in the appropriate column.

True	False	Knowledge Statements
_____	_____	Eating carrots is good for eyesight during pregnancy.
_____	_____	Young pregnant teens run a greater risk of complications of pregnancy, such as toxemia and prematurity than older girls.
_____	_____	Pregnancy is a good time to lose weight.
_____	_____	Pregnant women should follow a strict low salt diet.
_____	_____	Pregnant women should drink milk to get calcium.
_____	_____	It's okay for a woman to continue activities that give her exercise while pregnant.
_____	_____	Dairy products are not tolerated by all subcultural groups and may not be emphasized during pregnancy.
_____	_____	The most common food aversions during pregnancy are to meat, alcohol and coffee.
_____	_____	Women should drink plenty of water during pregnancy.
_____	_____	Pregnant women should restrict use of artificial sweeteners, such as Nutra Sweet.
_____	_____	Obese women don't need to gain weight during pregnancy.
_____	_____	Pregnant women should restrict use of foods with caffeine, such as coffee.
_____	_____	A woman should not follow a low calorie diet during pregnancy.
_____	_____	If a pregnant woman takes prenatal vitamins, she doesn't have to worry about what she eats.
_____	_____	After a woman gains eight pounds during pregnancy, the rest she gains is fat.
_____	_____	It is okay for a pregnant woman to skip meals as long as she takes prenatal vitamins.
_____	_____	Taking large doses of vitamin C during pregnancy can predispose the infant to infantile scurvy.
_____	_____	A woman should not gain more than 20 pounds during pregnancy.
_____	_____	Drinking alcohol during pregnancy can be harmful to the unborn child.
_____	_____	Pregnant women need vitamin pills to have a healthy baby.
_____	_____	If a woman breast feeds her baby, she can lose all the weight she gained in pregnancy.
_____	_____	Smoking during pregnancy can be harmful to the unborn child.

Adapted with permission from Carruth, B and Skinner, J. "Inventory About Food Beliefs During Pregnancy". Dept. of Nutrition, University of Tennessee, Knoxville, TN, 1991.

APPENDIX E

NUTRITION QUESTIONNAIRE FORM

Date: _____
County: _____
Town: _____
Program: _____

Participant No. _____
ES/WIC Nutrition Education Initiative 1993-94
OFFICE USE ONLY

NUTRITION QUESTIONNAIRE
Pregnancy

Please answer the following by checking the appropriate box or filling in the blank. Answer only those questions which apply to you. All information is confidential.

1. Before this pregnancy, what was your usual weight?
   _____ lbs. _____ Don't know
   If you have been pregnant before, how much weight did you gain?
   _____ lbs. _____ Don't know
   How much weight do you expect to gain during this pregnancy?
   _____ lbs. _____ Don't know
   Have you ever had any problems with your weight? ☐ Yes ☐ No
   If yes, what? ☐ Underweight
   ☐ Overweight
   ☐ Other

2. How would you describe your appetite?
   ☐ Hearty ☐ Moderate ☐ Poor
   With this pregnancy, have you experienced any of the following?
   ☐ Nausea
   ☐ Vomiting
   ☐ Increased appetite
   ☐ Decreased appetite

3. How would you describe your eating habits?
   ☐ Regular ☐ Irregular

4. Indicate the person who does the following in your household:
   Plans the meals _____
   Buys the food _____
   Prepares the food _____

   How much is spent on food each week for your household?
   $ _____ ☐ Don't know
   How many people does this feed? _____
   Indicate the types of kitchen equipment you have in your home:
   ☐ Refrigerator ☐ Stove
   ☐ Hot plate ☐ Other _____

5. Are you taking any vitamin or mineral supplement? ☐ Yes ☐ No
   Do you take any pills to control your weight? ☐ Yes ☐ No
   Do you take diuretic (water) pills? ☐ Yes ☐ No

6. Are you now on a diet to lose weight? ☐ Yes ☐ No

APPENDIX F

TWENTY - FOUR HOUR DIETARY RECALL FORM

Name: _____ Date: _____

Date: _____
County: _____
Program: _____
Pre/Post (Circle One)

Participant No: _____
ES/WIC Nutrition Education Initiative 1994-95
OFFICE USE ONLY

PREGNANCY DIET INTAKE

"I would like to know what you've eaten within the past 24 hours. Could you please tell me everything you ate or drank, including meals, snacks, beverages, candy and alcohol? Why don't you start with the last thing you've had to eat or drink today and we'll go backwards."

Time:	Place:	Food or Beverage Consumed:	Amount	Milk	Meat	Vegetables	Fruits	Grain Products	Fats and Oils	Sweets
			Minimum Recommended Number of servings/day for adults	4-5	3	3	2	6	2	As needed
			Total Number of Servings							

Is this a typical day? _____

Nutrients diet may be lacking in: _____

Nutrients diet may be excessive in: _____

Adapted with permission. Nutrition Management of the Pregnant Adolescent by Mary Story, Washington DC: National Clearinghouse, 1990, p. 165.

Date: _____

Program: _____

County: _____

Pre/Post (Circle one)

Participant No. _____

_____

OFFICE USE ONLY

Name _____

TO BE COMPLETED AFTER BABY IS BORN

1. Date of birth _____
2. Baby's sex _____
3. Baby's birthweight _____
4. No. of days baby in hospital _____
5. No. of days mom in hospital _____
6. Baby's weight at one month _____
7. Mother's total pregnancy weight gain _____
8. Mother's current weight _____ height _____
9. How are you feeding your baby? _____
10. Are you and your baby enrolled in WIC? _____

Incomplete Pregnancy

_____ miscarriage _____ stillborn _____ prematures

VITA

Chi Ching Wong

Candidate for the Degree of

Master of Science

Thesis: EFFECTS OF NUTRITION EDUCATION ON NUTRITION BELIEFS AND KNOWLEDGE, DIETARY INTAKE, MATERNAL WEIGHT GAIN AND BIRTH OUTCOMES OF PREGNANT ADOLESCENTS

Major Field: Nutritional Sciences

Biographical:

Personal Data: Born in Hong Kong, on June 22, 1974, the daughter of Fung Lan Lee and Kam Pui Wong

Education: Graduated from Ming Kei College, Hong Kong in July, 1991; received Bachelor of Science degree in Nutritional Sciences and completed Dietetic Internship at Oklahoma State University, Stillwater, Oklahoma in May 1996 and May 1997, respectively. Completed the requirements for the Master of Science degree with a major in Nutritional Sciences at Oklahoma State University in December, 1998.

Experience: Employed as a Graduate Research Assistant by Department of Nutritional Sciences, Oklahoma State University, May 1997 to present.

Professional Memberships: American Dietetic Association; Oklahoma Dietetic Association; Kappa Omicron Nu Honor Society.