



# Effects of Nutrition Education on General Health and Nutrition Status of Pregnant Women

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## Abstract

Nutrition education improves maternal nutrition and reduces the risk of poor health outcomes in both mothers and their children. The relationship between maternal nutrition education and mother's nutritional knowledge score, dietary habits, food consumption and health status (hemoglobin, hematocrit, blood pressure and body weight gain) were the subject of investigation in this study. This study has been conducted by random sampling on 150 low income pregnant women between the ages of 18-35, in intervention and control groups. Data was collected at an initial interview and again at a final interview after two nutrition education programs. There were significant increases in the nutritional knowledge score and mean intake of calcium, iron, vitamin A and weight gain in the intervention group ( $p < 0.05$ ), also increases on mean intake of energy, protein and vitamin C. Hemoglobin and hematocrit levels in the intervention group did not appear to be influenced by the nutrition education. The results indicate that nutrition counseling during pregnancy can improve dietary intake and maternal weight gain.

## Key words

Nutrition, Nutritional education, Pregnant

## 1. INTRODUCTION

Optimal maternal nutrition during pregnancy and lactation is vitally important to the health of mother and infant. Nutritional needs rise during pregnancy in response to the metabolic demand of the developing embryo as well as to changes in maternal physiology [1]. An association exists between health of fetus and adequate and balanced maternal nutrition during pregnancy, which is a natural event for every woman [2]. The nutritional status of the mothers in pre and postnatal periods is of great importance for the health of both the mother and their unborn babies thus maternal nutrition becomes a strong underlying determinant for the public health. The pre- and early postnatal phases are the periods during which changes to nutritional status may have the most detrimental impact. Furthermore, a large evidence base confirms that direct effects of maternal nutritional status on offspring adult health can occur. If birth weight and intrauterine growth restriction are assumed as proxy indicators for maternal nutrient supply [3].

When the maternal nutrition is inadequate and unbalanced during gestational period, the baby's needs are provided from the own tissues of mother. The risk incurred by the mother due to inadequate and unbalanced nutrition increases with the poor socio-economic and health conditions. If the increased energy and nutrient requirements are not met, various diseases, especially anemia, osteomalacia and decreased resistance to infection can occur in the mother. In addition, the incidence of complications in pregnancy and birth increases 3-4 folds [1,2,3,4]. There is a strong association between low birth weight and intrauterine growth restriction, and later: insulin metabolism; T2DM; central adiposity; abnormal lipid metabolism; obesity; hypertension; cardiovascular diseases (CVD); increased risk of death from ischaemic heart disease; and renal disease [5]. The malnutrition



due to inadequate and unbalanced nutrition during gestation has extremely important negative effects of on intrauterine growth. Stillbirth, preterm birth and low birth weight are among commonly encountered problems [2].

Maternal diet during this period is an important criterion for the outcome of the pregnancy. Daily energy and nutrient items for pregnant women and nursing mothers should individually be planned to meet their physiological requirements, to keep the nutrition stores in balance, to ensure normal growth and development of the fetus and to ensure adequate milk secretion during lactation [1, 4].

When maternal weight gain is insufficient during pregnancy, the risk of low birth weight is increased; therefore, diet should be managed to ensure that energy intake is neither excessive nor deficient. Energy and nutrient requirements of pregnant and lactating women are higher than normal women. Physiologic changes during pregnancy alter nutritional requirements. Plasma volume expands nearly 50% during pregnancy. Total mass of red blood cells increases about 33% over pre-pregnancy levels. Basal metabolic rate is increased by 15% to 20% toward the end of gestation. These changes require increased intake of energy, nutrients, and fluid [1].

Studies conducted in our country have revealed that the majority of pregnant women change the nutritional habits during gestation, but that is not in the desired manner, i.e. in accordance with adequate and balanced nutrition principles. It has been indicated that malnutrition problems are due to lack knowledge rather than economic difficulties. Unfortunately, in our country, correct and effective nutrition education services during pregnancy cannot be provided to a large portion of this risk group. Since the increasing the awareness of pregnant women for nutrition during gestation and lactation is of importance for achieving healthy generations, this study was performed to determine the influence of the nutrition education given to pregnant women with different frequencies at different stages of gestation on the nutritional status and overall health status in comparison with the pregnant women receiving no education [6].

The relationship between maternal nutrition education and mother's nutritional knowledge score, dietary habits, food consumption and health status (hemoglobin, hematocrit, blood pressure and body weight gain) were the subject of investigation in this study.

## **2. MATERIAL AND METHODS**

This experimental and investigation study was initiated with the permission of Ministry of Health. All participants provided written informed consent.

### **2.1. Participant and Study Design**

This study was started with 173 pregnant women giving maximum two live births or less and aged between 18-35 who admitted to Pregnancy Clinic of Maternal and Child Health and Family Planning Center located in Çubuk, Ankara. However, the study has been completed with 150 pregnant volunteers because the 2 women had abortion during the first trimester of pregnancy and, authors could not reach gain to 21 pregnant women after the first interview. The women with chronic diseases such as renal, thyroid, cardiovascular problems and diabetes were excluded from the study.

One hundred and fifty pregnant volunteer women whose gestational age determined according to the last menstrual period were equally divided into six groups as controls and treatments containing 25 participants in each. Group 1 consisted of the participants at their first trimester (in 1-3 months) of pregnancy, Group 2 consisted of the participants at their second trimester (in 4-6 months) of the pregnancy and Group 3 consisted of the pregnant women who were at the third trimester (in 7-9 months) of pregnancy. A control was kept for each group.

### **2.2. Data Collection and Measurements**

A questionnaire consisting of questions that are designed to determine the women's personal information (age, age at marriage, pregnancy history, education and occupation, etc.), nutrition knowledge and dietary behaviors during pregnancy as well as daily food consumption, frequency food intake physical activity status, general health status and awareness of breastfeeding was administered

to the participants. Each question was scored as one point. Total score was 38. The scores of 0-12, 13-25 and 26-38 were classified as poor, medium and good respectively.

Heights and weights of pregnant women were measured at the beginning of the study. The measurements were repeated at each meeting in order to determine the weight gain. Weight and height were measured according to the technique by researchers in the clinical scales. The records related to edema, blood pressure, blood and urine tests were obtained from the personal file of participants after the examination by the clinician and nurses. Women's hemoglobin and hematocrit levels were determined with a hematocrit centrifuge by laboratory technician in the center. Dietary intake and physical activity were obtained by the method of keeping a daily record.

Gram values corresponding to practical measures were used to determine the amount of food consumed by the participants [7]. Energy and nutrient values for these nutrients were calculated using food composition tables. The amount of nutrients in a serving of the food consumed by participants was calculated according to the Standards Food Recipes for Institutions [8].

Women in Group 1 were trained twice at their first and second trimesters of pregnancy until the end of pregnancy. Only one nutrition education was given to women in the Group 2 (second trimester) and Group 3 (third-trimester). Pregnant women in the treatment groups were trained face to face for the issues of the impact of the pregnant nutrition on maternal and infant health, food groups, and the amount of the essential nutrients to be consumed during pregnancy, weight gain in pregnancy, iodized salt utilization, protection from anemia and the importance of food preparation and breast-feeding. An illustrated guide prepared for pregnant women was used in education, and a brochure containing the issues given during education was provided to each participant following the training. The same questionnaire was repeated again within 30 days for every woman to detect the changes after nutrition education.

In this study, there are some limitations. First, we studied the small sample size. Large-scale studies are needed on this issue in the future studies. Second, self-reported dietary intake data are likely inaccurate.

### **2.3. Analysis of Data**

Data were analyzed by the Statistical Package for Social Science version 16.0 software (SPSS, Chicago, IL, USA). Kruskal Wallis variance analysis for the differences between groups, Mann-Whitney U test, the Wilcoxon two-sample paired signed rank test for analysis of repeated measurements and Chi square tests for independent variables were performed. When the differences were significant, Bonferroni correction was performed to determine which subgroups are different. The relationship between variables was evaluated with Spearman correlation analysis. P values less than 0.05 were considered as significant [9].

## **3. RESULTS AND DISCUSSION**

All of the pregnant women participating in the study were housewife and the majority of them was primary school graduates. The mean age of the women at first pregnancy were between 19.28 and 20.32. The time between two pregnancies was longer than the required limit of 24 months in the great majority of women participated in the study. The 16% of the women had consanguineous marriages and the percentage of the families living with their parents were high. Most of the women had routine controls every month and had been examined by a midwife or nurse. The pre-pregnancy BMI (body mass index) of the women was within normal limits. Lack of obesity before pregnancy in the presented study, compare to overall BMI in Turkey, may be due to the lower age of the women participating in the study (Table 1).

Appropriate weight gain during pregnancy is directly related to the baby's birth weight. For women with a baseline BMI below 20, weight gain of 0.5 kg per week during the second and third trimesters is indicated. For overweight women (BMI of 25 to 29.9), weight gain of 0.3 kg per week during the same period is recommended. [10]. Weight gain of more than 1 kg per week at any time is generally excessive [1]. The recommended average weight gains in pregnancy were 0.065 kg/week for 0-10<sup>th</sup> weeks, 0.335 kg/week for 10-20<sup>th</sup> weeks, 0.45 kg/week for 20-30<sup>th</sup> weeks and 0.335 kg/week for 30-40 weeks [11a]. In this study, although, total weight gain of pregnant women varied in each trimester, they gained 12.5 kg  $\pm$  10 % (9 -14 kg) weight totally, approximately 1-1.5 kg per month. Observation of higher ( $p < 0.05$ ) weekly weight gain in women who trained and monitored from the beginning to the termination of the gestation as Ziegleranf Filerj's recommended (Table 1) [11].

Strychar et al. (2000) who investigated the effects of psychosocial and lifestyle factors on weight gain of 115 pregnant women during pregnancy, and reported that being under doctor or dietician control improves the weight gain. These authors also observed that women gained insufficient weight when they smoked more but controlled less by clinician or dietitian as well as have less knowledge about weight gain during pregnancy [12].

Antenatal care is one of the most important preventive healthcare and support providing regular check-ups by doctors or midwives for mother and unborn baby [13]. Although, the timing and number of antenatal visits depends on the individual, pregnant women should be monitored by health professionals at least four times [14a].

The physical examination of pregnant women is performed, blood pressure is taken and height and weight are measured, and if it is in accordance with the vaccination calendar, they are vaccinated against tetanus, and education related to pregnancy, labor and the baby is given during routine follow-up. However, a standard training for the principles of nutrition during pregnancy is not included in these applications. Even, medical staffs who have limited nutrition knowledge cannot give enough nutrition education to women. In the presented study, most of the women visited the clinics every month (88% 84%, 84%, 44%, 80%, 76% respectively) and underwent routine examinations (76% 56%, 64%, 48%, 60 %, 52 % respectively).

Maternal anaemia is associated with mortality and morbidity in the mother and baby, including risk of miscarriages, stillbirths, prematurity and low birth weight [15]. 32.4 million pregnant women with anaemia and 0.8 million pregnant women had severe anaemia worldwide in 2011 [16]. Maternal anemia remains a significant health problem specially in low and middle-income countries. Rahman et al (2016) conducted a systematic review and meta-analysis to estimate the pooled prevalence of anemia, the association between maternal anemia and pregnancy outcomes. There were significantly higher risks of low birth weight (12%), preterm birth (19%), and perinatal mortality (18%), in pregnant women with anemia in low- and middle-income countries [17].

Anemia is a major public health problem that still preserves the severity in Turkey. In a study investigating the maternal deaths and their causes, it has been demonstrated that anemia is responsible for 3.7% all of maternal deaths in Turkey [18]. In a survey conducted by the Ministry of Health, 54.7% of mothers receiving at least one diagnosis of anemia during their lives and 46.6% of the mothers (anemia diagnosed in 85.2% of mothers) had this diagnosis during pregnancy [19]. Birth and excess number of pregnancies, short pregnancy intervals, malnutrition, recurrent infections and blood losses due to miscarriages and unhealthy deliveries are the leading factors of anemia seen in pregnancy [20].

In the presented study, decreases were observed in hemoglobin and hematocrit levels of all of the women in the experimental and control groups in every trimesters. However, more pronounced decreases in hemoglobin levels were determined, particularly, in the second and third interviews after the second trimester (Table 2). In the last interviews, the percentages of the women with hemoglobin level lower than 11 g/dL were found as 64%, 60%, 72%, 64%, 68% and 60% respectively.

In another study conducted on 320 pregnant women determined the prevalence of anemia in pregnant women in Afyon province and the factors that affect anemia in order to attract the attention of public to this issue, and found the prevalence of anemia as 29.38 % in pregnant women by considering the hemoglobin values. The author reported that 17.65% of pregnant women with anemia were at first trimester, 32.48 % of them were at second trimester and remaining 32.59 % were at third trimester which indicates high prevalence, thus emphasized that the priority should be diverted to the education and service delivery [21]. In another survey conducted on the pregnant women admitted to Güzelbahçe Health Center, İzmir where located in western part of Turkey, the Hb level lower than 10.5 g/dL was accepted as anemic. The 28.9 % of the women was found anemic and the 75% anemia was due to iron deficiency. It has been shown that the risk of anemia increased by 2.8 fold in second trimester and 4.2 fold in third trimester. The 67 % of pregnant women used iron and folic acid pills with a doctor's recommendation during that survey, and no significant effect of the use of iron and folic acid on anemia in pregnant women was reported [22].

Dietary factors play a major role in the development of the anemia. Therefore, dietary nutrition education should be a good first step in preventing anemia depending on nutritional insufficiency. In our study no significant correlation was determined between nutrition knowledge and hemoglobin and hematocrit levels of the women. Lack of significant correlation between women's nutrition knowledge and hemoglobin and hematocrit levels in this study may be due to several variables affecting hemoglobin and hematocrit levels.

Education has always been a perennial process since the dawn of mankind. It can be said that in any situation where learning occurs educational process changes human behavior. Education is defined as the process forming desired changes in behaviors of individuals that occurs as a result of their experiences [23]. Nutrition education

is not only an important factor in the development of healthy families and communities, but also, in some manner, it helps to improve the nutritional status of women and children, and contribute to overcome the health problems such as chronic diseases, maternal mortality, infant and child deaths, which are still striking problems in our country. Nutrition education is one of the most important preventive health services.

It has been reported that the ultimate goal of nutrition education is to produce nutritionally literate decision makers who are motivated, knowledgeable, skilled, and willing to choose proper nutrition alternatives [24]. The lack of nutrition knowledge of families is one of the prime causes of malnutrition seen particularly in children and pregnant women. Although many families have enough food in various types in their homes, they cannot use them in accordance with the principles of nutrition. In the presented study, after every call, an increase was observed in nutrition knowledge status of women who received nutrition education. The increase in the awareness was the highest at all trimesters in the women who were monitored and trained nutrition starting from the first trimester. In this group, the scores were 15.4, 23.4 and 27.6 for the first, second and third trimesters respectively. Likewise, in this group, the number of wrong answers after each training was low, which was followed by the women who received education at second trimester and the highest wrong answers were given by the women who received education only at third trimester with the scores of 11.1, 10.1 and 7.6 for the first, second and third trimesters respectively ( $p < 0.05$ ) (Table 3).

Considering the questions for assessing the nutritional behavior of women, the highest number of correct answers for use of iodized salt, preparation and cooking the food and oil use was observed in women who received education. Compare to treatment Groups 2 and 3; higher rates of correct answers were determined in the treatment Group 1 for the questions such as what should be the first food for baby, when breast milk should be given for the first time after the birth. At the beginning of the study, the rates of correct answers given to the question searching the month of additional food was lower (32%, 32%, 44%, 48%, 20%, 52% respectively). But education increased the correct answer rates markedly in the experimental groups (80%, 36%, 60%, 56%, 60%, 40% respectively). Different responses were obtained from the participants concerning the time of first nutritional supplement to be taken. Rice flour-starch foods, milk and fruit juice had been preferred before the training whereas priority was given to milk and yogurt after the education.

Women in all experimental groups consumed the recommended nutrients, such as milk, yogurt, eggs, vegetables and fruit, more frequently than the women in the corresponding controls after the nutrition education with more pronounced increase in the experimental Group 1. Significant differences were determined between the interviews concerning the calcium, iron and vitamin A intake of the participants in the Group 1 and its control group (Control 1) ( $p < 0.05$ ) based on a daily dietary intake that was calculated from the energy and nutrient items coming from the consumption of food during a day. After the training, women in the experimental groups consumed these nutrients more than before the nutrition education. Energy, protein and vitamin C consumption levels were also increased in women in the experimental groups after training. An increase was observed in the consumption of food items of women in the Group 2 in the next meeting after the education ( $p < 0.05$ ). The increase only in vitamin A was significant ( $p < 0.05$ ) in the Control Group 2 (Table 4). Women receiving nutrition education at their third trimester consumed more energy and protein but decreases were observed in calcium, vitamin A and C intake ( $p < 0.05$ ). Declined energy, calcium and riboflavin intake in the corresponding controls at the last meeting (Control 3), may indicate that nutritional education in the last months of pregnancy is not very effective in the food intake.

#### 4. CONCLUSIONS

The results of the presented study have revealed that the knowledge of pregnant women in the rural area concerning the nutrition during pregnancy and anemia is insufficient which may lead the development of anemia and/or adversely affect the course of anemia. However, the desired level of nutrition education cannot be provided to most of the pregnant women who constitute an important risk group in our country. Therefore, providing nutrition education to the pregnant women is of paramount importance for the health of mother and unborn baby for creating healthier generation. In addition, determining nutrition policy and inserting it into routine health services for preventing nutritional problems in pregnancy as well as the implementation of comprehensive prenatal care and follow-up program and training of prenatal care staff by giving an effective nutrition education is a necessity in our country. The observation of very common and severe anemia in our country highlights the need of large-scale surveys. The importance of nutrition during pregnancy and breastfeeding emphasizes that the necessary precautions, such as iron and folate supplements in addition to dietary modification, should be taken for preventing the vitamin and mineral deficiencies.

## ACKNOWLEDGMENT

The author acknowledge staff of Pregnancy Clinic of Maternal and Child Health and Family Planning Center in Çubuk, Ankara for their support given to this work.

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