Outcomes of prenatal nutrition counseling In developing countries

A Literature Review

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ABSTRACT

The purpose of this final project was to explore the outcomes of prenatal nutrition counselling in developing countries.Study was aimed to find out the impact of nutrition counselling imparted to prenatal mothers.

An applied systematic literature review was performed by using well-known electronic database method.Altogether 10 empirical research articles were analyzed. All the articles answered to the research question ,were written in english language, and in developing countries.The data was analyzed using deductive reasoning guided by Elo and Kyngäs (2007).

The main findings indicated that prenatal nutrition counselling has a positive outcome in respect to maternal and fetal health.Prenatal nutrition counselling came out with adequate maternal weight gain,less low birth weights, increase in hemoglobin level of mothers,change in dietary habits and other health related habits. Main findings showed that there is a need of nutrition counselling from the nurses.

The end product of this study is a poster which will be placed at metropolia that is targeted at prenatal nutrition counselling.It is hoped that student nurses will pay attention to the importance of nutrition counselling while imparting care to the prenatal mothers.In conclusion nurse as health personnel should pay more attention to nutrition counselling in prenatal period

Keywords

Nutrition, prenatal period, counselling, developing countries, nursing.

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TIIVISTELMÄ

Tämän opinnäytetyöntarkoituksena oli äitiys-ravitsemusohjauksen tuloksia kehitysmaissa. Tutkimuksen tarkoituksena oli saada äitiys-ravitsemusohjauksen antamisen vaikutus odottaville äideille.

Sovellettu systemaattinen kirjallisuuskatsaus tehtiin käyttämällä tunnettua sähköisen tietokannan menetelmää. Kaikenkaikkiaan analysoitiin 10 kokemusperäista tutkimusartikkelia.Kaikki artikkelit, jotka antoivat vastauksen tutkimuksen,oli kirjoitettu englaniksi kehitysmaissa. Aineisto analysoitiin käyttämällä deduktiivista päättelyä, jonka opastivat Elo ja Kyngäs (2007).

Tärkeimmät tulokset osoittivat, että äitiys-ravitsemusohjaukseela on positiivinen seuras äidin ja sikiön terveyden suhteen. Äitiys-ravitsemusohjaus tuli ilmi riittavänä äidin painonnousuna, vähemmän alhaisina syntymäpainoina,äitien hemoglobiinitason nousuna, muutoksena satunnaisiin ruokailutapoihin ja muihin terveyteen liittyviin tapoihin.Tutkimuksen keskeisimmät tulokset osoittivat, että hoitajien on tarpen antaa äitiys-ravitsemusohjausta.

Tämän tutkimuksen lopputuote on äitiys-ravitsemusohjaukseen kohdennettu juliste,joka sijoitetaan Metropoliaan. Toivottavasti hoitajaopiskelijat kiinittävät huomiota äitiys- ravitsemusohjauksen merkitykseen antaessaan hoitoa odottaville äideille. Johtopäätoksenä hoitajan pitäisi tervedenhuollon henkilöstöön kuuluvana kiinnitttää enemmän huomiota äitiys-ravitsemusohjaukseen äitiys-aikana.

Avainsanat

-Ravitsemus,Äitiys-aika, Ohjaus, Kehitysmaat, Sairaanhoito.

CONTENTS

1 INRODUCTION

The fundamental right of every child is good health status, proper growth and development. Good nutrition is the basic component of health. As growth and development starts from the womb, nutrition in prenatal period is really important because growth and development of the child depends upon the food taken by the mother. For good health status of mother and child it is important that mother takes proper diet during pregnancy. It is only possible if the mother has proper knowledge about nutrition recommendations. In developing countries where resources and knowledge is limited more responsibility lies on the health personnel to be aware of whether there is enough knowledge in the community. To study this aspect research and health education by health personnel at different level and about different subjects is needed. Nutrition counselling of prenatal mothers is an important factor which helps in reaching the goal to get good health status.

Nutrient deficit diet provokes health problems and increase susceptibility to disease, which leads to treating the problem. As it is said `prevention is better than cure´. It applies to the health system also. If we can prevent many complications and diseases just by educating people, we can save money and resources to be used in treating the diseases. The prenatal period is very important for both the mother and the child. If mother has the knowledge about her diet in prenatal period, it leads to good health of mother, prevention of complications and healthy child. As nurses we are the key persons who are in contact with the expecting mother in community, can play an important role in imparting the knowledge to mothers and help achieving the goal of health for all.

The World Health Organization has Millennium development goals for 2015, which includes to promote gender equality and empowering women (goal 3), to reduce child mortality (goal 4), and to improve maternal health (goal 5). All these goals can be linked to the education of women and good prenatal nutritional state. It is obvious that road to health in prenatal period depends upon the health of the mother. Her pregnancy health depends upon the food intake during that period. Improper nutrition and malnutrition of the mother leads to different health problems like anaemia in mother and different developmental problems in child or low birth weight babies. The problems

arising in prenatal period are always associated with maternal health. Outstanding denominator in this regarding is low birth weight (LBW). The proportion of newborn with a birth weight below 2500gms varies considerably from country to country in developing countries.(http://www.who.int/mdg/goals/en/index.html)

The Universal Declaration of Human Rights 1948 states that motherhood and childhood are entitled to special care and assistance. It was recognized that with overall progress in meeting the Millennium Development Goals being exceeding low, many of the goals will not be reached by 2015.For example South Asia is lagging behind in implementing goal 4, to reduce child mortality and goal 5, to improve maternal health. The WHO reports points to the key obstacle in achieving is weak and inadequate health system, particularly the crisis in trained health personnel. Appropriate counselling and nutrition care remains unavailable, unused, and inaccessible to many groups of the population. Freedom from hunger and malnutrition is a basic human right and their alleviation is a fundamental prerequisite for human and national development. (http://www.who.int/mdg/goals/en/index.html)

The 30 million low-birth-weight babies born annually (23.8% of all births) often face severe short- and long-term health consequences. Low birth weight is a major determinant of mortality, morbidity and disability in infancy and childhood and also has a long-term impact on health outcomes in adult life. The consequences of poor nutritional status and inadequate nutritional intake for women during pregnancy not only directly affects women's health status, but may also have a negative impact on birth weight and early development of the child. Low birth weight also results in substantial costs to the health sector and imposes a significant burden on society as a whole. Whereas the global prevalence of such births is slowly dropping, it is as high as 30% in many developing countries.
http://www.who.int/nutrition/topics/feto_maternal/en/index.html)

The purpose of this final project is to explore the outcomes of nutrition counselling given in prenatal period in developing countries. Studies done on this topic in the past were reviewed and analysed. Findings were drawn out which can be guidelines for implementation and research in future. In this study prenatal period and pregnancy were used interchangeably as both terms represent the same phase of life.

2. DEFINATIONS OF KEY CONCEPTS

2.1Developing countries and nutrition

D**eveloping** country is a term generally used to describe a nation with a low level of material well being. There is no single internationally-recognized definition of developed countries. These countries are the countries with medium to low standard of living and have not achieved significant degree of industrialization relative to its population. There is a strong relationship between low income and high population growth. Development of the country is measured by its per capita income, (income per person), Rate of literacy and life expectancy. The UN has developed HUMAN DEVELOPMENT INDEX (HDI), which is an index used to rank the countries by level of human development. Other terms used for developing countries are less developed countries, least economically developed countries, underdeveloped nations, non-industrialized nations or Third World nations.

According to Mishra & Puri (2004) economy which fails to provide acceptable levels of living to large proportions of the country's population with resulting misery and material deprivations is accounted developing. As compared with advanced countries developing countries are underdeveloped with capital in relation to their population and natural resources. The world Development Report points out that the average per capita income of an underdeveloped economy is 756 dollars per year or less while that of developed economy is 9386 dollars per year or more. Nearly 77% population of the world lives in underdeveloped countries, only 23% lives in advanced countries. The per capita income of developed countries is15 times more than those of underdeveloped countries. Economic inequalities are more pronounced in less developed countries. Per capita calorie intake is hardly 2000 as against the required level of 2500.In developing countries clothing standards and housing conditions are poor. Majority of population suffers from malnutrition. The infant mortality rate is higher than those of advanced economies. Among the least developed countries, literacy rate average only 34% of the population, compared to93% in developed countries.

About 95 percent of all LBW (LOW BIRTH WEIGHT) births or 20 out of 21 millions per year occur in developing countries. This problem is particularly important in southern Asia where 20-30 percent of new born babies have a birth weight below 2500gms. Any setting with a LBW incidence above 7-8 percent is at the risk of high mortality rate. In developing countries it is due to combination of factors including improper nutrition of the mother in pregnancy, anaemia, and other unknown factors. Almost 800 million people live in permanent state of malnutrition in developing countries. Reason for malnutrition is decrease in food production also. Infant mortality rate is also higher in developing countries as compared to developed countries. On average one in five newborn infants will die, which can be because of improper diet received from the mother in womb. There are 200 million people without any organized water supply; 1500 million have to use only wood for fuel in developing countries. (Lankinen & Bergström 2006.)

Poor nutrition of knowledge plays a role in most of the multi-sector factors involved in the development of malnutrition, which is prevalent in developing countries. Inadequate food intake and unhygienic dietary practices are often related to poor knowledge of sound nutritional practices. In developing countries it is combined with limited resources, deficiencies in knowledge of sound budgeting, food purchasing and food preparation methods leading to poor nutrition and problems arising from that (Walsh et al 2003.)

In many developing countries, poor nutrition rates are decreasing, but in many countries it is increasing. This trend is probably due to economic decline in 1980s which resulted in decreased government's budget, affecting quality and access to basic health care services. It is estimated that globally 226 million children are stunted, meaning they are shorter for their age than they should be according to set standard. Poor nutrition of mother during pregnancy may be the leading cause resulting this. In developing countries approximately 183 million children are underweight due to problems of poor nutrition of mother during pregnancy. (UNICEF 1998.)

One of the studies by (Simkhada et al 2008) argues that inequality in the health and well being of the prenatal mothers is a growing concern in developing countries. The risk of maternal death in developing countries is estimated to be one in 61. Improper nutrition in prenatal period causes complications in pregnancy and childbirth is a leading cause of

death and disability among women of reproductive age in developing countries. There are estimated 529,000 maternal deaths each year, of which 99% are in developing countries. Every day 1500 women die due to complications in pregnancy or childbirth. 10,000 babies per day die within the first month of life and an equal number of babies are born dead.

2.2 Prenatal period and nutrition

Prenatal period is the period in which mother carries the baby in the uterus after conception and before delivery of the child. Prenatal period is divided into three trimesters. Maternal body undergoes a lot of anatomical and physiological changes in adaptation of increasing demand of the growing fetus. Developing baby in the uterus undergoes tremendous growth and change, for that nutrients and oxygen are transported from mother and waste products are also removed through mother. In normal pregnancy, the total weight gain during the course of pregnancy averages 11 kg. This has been distributed to 1kg in first trimester and 5 kg in second and third trimester. The patients who are underfed during pregnancy are likely to gain less weight .This happens in most of the mothers in the developing countries. (Dutta 2001.)

Nutrition may be defined as the science of food and its relationship to health. It is concerned primarily with the part played by the nutrients in growth, development and maintenance of the body. The word Nutrient or food factors are used for specific dietary constituents such as protein, carbohydrates, fats, vitamin and minerals. Discovery made by McCollum and Davis proved that a fat- soluble factor is present in butter was essential for the growth of animals on synthetic diet and vitamin A was discovered. A lot of discoveries afterwards found out more vitamins like B, C, D, E and K. Main function of vitamins are helping in vision, absorption of calcium in the intestine, promotion of bone calcification, protecting red blood cells from haemolysis, and protecting liver injuries. Some more functions are formation of collagen and intercellular cement substance in the capillaries, teeth and bones as well as helping rapid healing of wounds. Different sources of vitamins are liver oil, egg yolk, green leaky vegetables, sunlight, fish and different fruits. Nutrition is an input to and foundation for health and development. Interaction of infection and malnutrition is well-documented. Better nutrition means stronger immune systems, less illness and better health. Healthy children learn better. Healthy people are stronger, are more productive and more able to

create opportunities to gradually break the cycles of both poverty and hunger in a sustainable way. Better nutrition is a prime entry point to ending poverty and a milestone to achieving better quality of life. (Barker 1996.)

Since foods vary widely in their contents of various nutrients, they have been broadly grouped under three headings from the nutritional point of view. Foods rich in carbohydrates and fats are called energy yielding foods. Cereals, roots and tubers, dried fruits, sugars and fats are included in this group. In addition fair amount of proteins, minerals and certain vitamins and form the important source of the above nutrients in poor dietaries. Foods rich in proteins are called body-building foods. Milk, meat, fish, eggs, pulses, oilseeds, nuts and low-fat oilseed flours are included in the group of body-building foods. Foods rich in proteins, vitamins and minerals are termed protective foods. Milk, eggs, liver, green leafy vegetables and fruits are included in this group. Protective foods are broadly classified into two groups. (a) Foods rich in vitamins, minerals and proteins of high biological value, e.g., milk, eggs and liver, and (b) foods rich in certain vitamins and minerals only, e.g., green leafy vegetables and fruits. (Garrow, James & Ralph 2000.)

WHO has traditionally focused on the vast magnitude of the many forms of nutritional deficiency, along with their associated mortality and morbidity in infants, young children and mothers. However, the world is also seeing a dramatic increase in other forms of malnutrition characterized by obesity and the long-term implications of unbalanced dietary and lifestyle practices that result in chronic diseases such as cardiovascular disease, cancer and diabetes. All forms of malnutrition's broad spectrum are associated with significant morbidity, mortality, and economic costs, particularly in countries where both under- and over nutrition co-exist as is the case in developing countries undergoing rapid transition in nutrition and life-style. http://www.nutrition.gov/nal_display/index.php?info_center=11&tax_level=129,10

Total metabolism in pregnancy is increased due to needs of the growing uterus and the fetus. Energy intake must be increased, to ensure proper development of the fetus. Basal metabolic rate is increased to the extent of 30% higher than that of non-pregnant women. National Health Service recommends that overall weight gain during the 9 month period for women who start pregnancy with normal weight be 10 to 12kg. During pregnancy, insufficient weight gain can compromise the health of the fetus. Nutritional supplements and encouraging the patient to eat more during pregnancy are

likely to improve weight gain. Conversely, the obese patients are likely to gain more weight and reduction of carbohydrates and fat in the diet can help in stabilising the weight gain. Poor weight gain in pregnancy is often associated with the higher incidence of prematurity and mortality and morbidity.(Dutta 2001.)

Dieting during pregnancy is never recommended, even for the patients who are morbidly obese. Severe restriction of energy intake is associated with a 250 grams decrease in average birth eight. As demands of pregnancy necessitates additional dietary requirements, energy requirement in pregnancy are increased by 17% over the non-pregnant state. A woman of normal weight should consume an additional 300 kilocalories of energy per day; however this energy should be of high nutrient density. Nutrient density reflects the amount of protein, vitamins and minerals. Protein should comprise twenty percent of normal pregnancy diet. Many animal sources of protein are very high in fat and might contribute to excessive weight gain; therefore, animal proteins should be taken sparingly. Fat should only comprise thirty percent of normal pregnancy diet. A sample diet for normal pregnancy is based on the food pyramid and should include 6-11 servings of grains, 3-5 servings of vegetables, 2-4 servings of fruits,3-4 servings of dairy, 2-3 servings of meats, beans, or nuts, and one serving of sweets.(Booker 2009.)

Transfer of increased amount of glucose is needed throughout pregnancy. There is increased absorption of fat in later months of pregnancy. An average of 3-4 kg of fat is stored in during pregnancy mostly in the abdominal wall, breasts, hips and thighs. Iron is transported actively across the placenta to the fetus. During pregnancy there is increase in the demand of calcium by the growing fetus to the extent of 28 gm,2/3rd of which is required in the last trimester Demand of other minerals like zinc, copper, magnesium , and iron also increases during pregnancy Maternal nutrition during prenatal period is known to have significance on the fetal growth and development. Under situations of reduced nutrient intake or increased nutrient requirements, competitions during prenatal period between mother and fetus may limit the availability of nutrition’s required for optimal fetal growth(Chang 2003). Deficiency of calcium in prenatal period affects not only the bone density of the mother herself but also that of newborn. Maternal calcium supplementation up to 2 g/day during second and third trimester during pregnancy increase the bone density of the babies in undernourished

mothers. Dietary food products, more vegetables and fruits during pregnancy is of importance, with potential health benefits. (Piirainen et al 2006.)

Maternal zinc deficiency is relatively common in developing countries, but its consequences for fetal growth are not established. The observed positive effect of prenatal zinc on fetal femur length is consistent with the results of experimental studies in animals Maternal zinc supplementation has been suggested a potential intervention to reduce the incidence of low birth weight in developing countries. Supplementation of zinc in second trimester with other supplementation of iron can improve the weight of the baby (Osendarp et al 2000.)

Anemia is caused by inadequate diet (mostly insufficient iron but also dietary deficiencies of folate and vitamin B12). It is most common in pregnancy in developing countries. Women are more victim of anemia because of menstruation in normal life, childbirth or repeated pregnancies. The evidence that maternal anemia can reduce pregnant woman's ability to withstand sudden blood loss or that it increases the risk of spontaneous abortion, preterm delivery, low birth weight and maternal mortality (Sloan 2002).Iron deficiency anemia in pregnancy is major problem in developing countries. The global prevalence of anemia among pregnant women is 41.8 %, more prevalent in developing countries. The risk of anemia is highest during pregnancy because the amount of dietary iron cannot meet the increased need for iron during pregnancy. Iron supplementation is the most widely used approach to meet the elevated physiological demand.(Risonar et al 2007.)

2.3 Prenatal nutrition counselling

Counselling is defined as guidance means something which provides direction or advice as to decision or course of action, opinion or instruction given in directing the judgment or conduct of another. Further it aims at aiding the recipient to grow in his independence, and ability "To be responsible for him or herself." In other words assistance made available by qualified and trained person to an individual to help to develop an individual point of view. A specialized service of guidance and basically an enabling process, designed to help an individual come in terms of his or her life and

grow to greater maturity through learning to take responsibility and to make decision for himself /herself. Counselling includes helping relationship between someone seeking help, someone willing to give help who is capable and trained to help, in a setting that permits help to be given and received. Counselling can be carried out in accepting, trusting and safe relationship in which client or patient learns to discuss freely and acquire the essential skills. (Thappa 2003.)

According to Green & Otoson (2006) counselling can be effective to the extent that it affects health knowledge, dietary attitude and dietary practices. Counselling must win acceptance of a practice, arose a desire in mothers to benefit from it, obtain the involvement of mother and support the maintenance of changes in dietary habits. It is mostly direct communication with mothers to accept the programme and to increase their motivation to benefit from it. There may be many obstacles like culture, superstitions and human tendency to seek earliest solution for everything.

There are some common phases in counselling although it is difficult to divide such a carried process in clearly defined phases, These phases may overlap each another, e.g. the assessment may begin even while the phase of establishing the relationship is going on or goal setting may start while assessment is still going on. These phases are in progressive movement and collectively describe the counselling process.

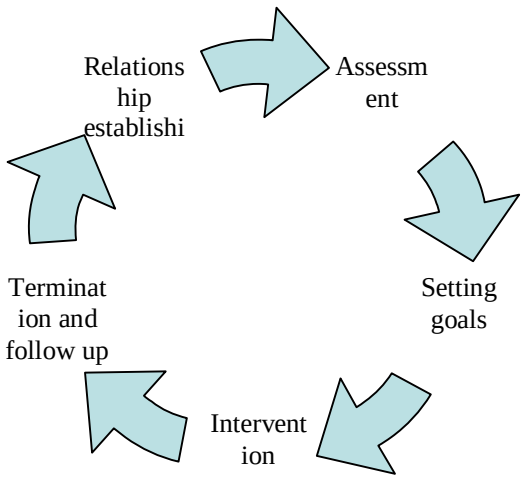

FIGURE 1 Phases of counselling (Thappa 2003).

Counselling starts with the interaction with the person to be counselled. Before the actual interaction, it is helpful to determine the information needed and then to formulate question. During the interaction, it is essential to introduce and openly talk in order to get the confidence of the person to be counselled. In addition, in order to seek information, people must be encouraged to talk; meanwhile, it is suggested that the interviewer maintains an attentive attitude and observe keenly. Counselling is more effective if information is imparted in a very friendly way avoiding superiority and authority. Counselling needs more than one meeting as well as follow up.(Thappa 2003).

Prenatal nutrition counselling refers to the guidance given to pregnant mothers regarding their diet and diet habits. It includes normal requirement of nutrients during pregnancy, and its effect on maternal body and growth of the developing child. How mothers can get different essential nutrients like vitamins, protein, iron and calcium etc from the food is also covered. It also includes the information regarding problems which can be faced because of deficiency of these nutrients. One of the studies by (Jo et al 1990) states that prenatal nutrition counselling is easy to recognise but not always easy to achieve. Prenatal nutrition counselling is a particular challenge to the nurses, as group will be varied in their ages and their knowledge, connected only by one event they have in common. Nutrition counselling in prenatal period consists of approaching a subject in which mothers are deeply involved and about which they may have strong feelings.

Prenatal nutrition counselling is a key strategy for reducing maternal and fetal mortality and morbidity. In developing countries a lot of mothers are not getting that in the way it should be. Cultural beliefs and ideas about pregnancy and foods influence the health in pregnancy. Parity has a statistical significance in getting the counselling. Women with higher parity are less interested in advice, while women with first pregnancy are more interested. (Simkhada et al 2007.)

Prenatal nutrition counselling can only be planned after identifying the need of the pregnant mothers, which depends upon the knowledge and past history of some complications. There is much controversy whether nutrition counselling adverse the pregnancy condition and outcomes. Nutrition counselling is mainly aimed to proper weight gain during pregnancy and to prevent various nutrient deficiencies. To reduce

low birth weight babies is one other aspect of prenatal nutrition counselling.(Greg & Korenbrot 1995.)

Infant and maternal mortality and morbidity caused by malnutrition in a particular area can act as a guide for nutrition counselling in prenatal period. Prenatal nutrition counselling had effect on the knowledge of mothers regarding their babies' wellbeing and their practices regarding health. Data from developing countries regarding effect of counselling is limited, but there is problem to put the things in practice taught to prenatal mothers. When Iron supplementation is promoted through counselling, non-compliance has been reported. After counselling special supervision helps to improve the practice (Sloan et al 2002.)

According to Orstead et al (1985) Prenatal nutrition counselling must be done in a relaxed, informal, and caring manner. Maternal nutrition knowledge is of importance only if it is introduced to and practiced by the one she is most involved. The ultimate quality of product of gestation can only be as good as the quality of ingredients that produce. Cost of nutrition counselling is one fifth less than the cost of treating morbidity as a result of mal nutrition. Prenatal period represents the ideal opportunity for nutrition education, since at that time more than any other, she may be highly motivated to understand and accept advice.

One of the studies (Kafatos et al1991) states that prenatal nutrition counselling not only helps in improving nutrition in prenatal period ,but effects the habits after delivery also. Prenatal nutrition counselling helps mother to understand the importance of nutrition for her baby also, which in turn had some effect on infant feeding.

3. PURPOSE OF THE STUDY AND RESEARCH QUESTION

Purpose of this study is to explore the outcomes of prenatal nutritional counselling in developing countries.

Research question

What are the outcomes of prenatal nutrition counselling in developing countries?

4. METHODOLOGY

This study is based on a systematic literature review. According to LoBiondo-Wood et al. (2006), this is a method of data collection that adheres to strict and precise criteria to synthesize relevant studies about given subject and to provide a critical analysis of their finding. The review of literature is considered a systematic and critical review of most important scholarly literature on a particular topic.

4.1 Data Search and selection

To collect the data, electronic search was done using CINAHL, MEDLINE, PUBMED COCHRAIN and OVID database. To ensure retrieval studies, keywords used were prenatal, nursing, counselling, nutrition, and developing countries. As few studies were found done in developing countries on prenatal nutrition counselling, years of publication were extended from 1985 to 2009. Database search yielded 1339 articles for possible inclusion in review. Headings of all the articles were gone through. Abstract of 81 articles were screened for focused study after which only 10 were selected, which were focused on the nutrition counselling to prenatal mothers in developing countries.

DATABASE AND SEARCH WORDS	NO OF ARTICLES REVEALED AFTER YHE SEARCH	NUMBER OF ARTICLES RELEVENT SCREENED BY THE TITLE	NUMBER OF ARTICLES SCREENED BY ABSTRACT	EXCLUDED (NOT MEETING CRITERIA)	INCLUDED (RELEVANT TO RESEARCH QUESTIONS)
Prenatal, counselling, nursing PUBMED	75	75	15	13	2
Prenatal, nutrition, counselling, PUBMED	100	100	10	5	5
prenatal nutrition, counselling ,PUBMED	10	10	5	4	1
prenatal nutrition counselling, developing countries PUBMED	7	7	5	3	2
Prenatal, counselling ,nursing OVID	150	150	10	10	0
Prenatal, nutrition, counselling OVID	75	75	5	5	0
prenatal, nutrition, counselling, ,nursing OVID	6	6	1	1	0
prenatal, nutrition, counselling, developing countries OVID	10	10	1	1	0
Prenatal, counselling CINHAL,COCHRAIN	6	6	0	0	0
Prenatal, nutrition, counselling, nursing CINHAL,COCHRAIN	340	340	6	6	0
prenatal. nutrition. counselling CINHAL,COCHRAIN	221	221	9	9	0
prenatal, nutrition, counselling ,developing countries CINHAL,COCHRAIN	339	339	9	9	0
TOTAL	1339	1339	81	71	10

TABLE 1 Data selection process

Reasons for excluding articles

- Articles were not empirical.
- Articles were not answering the research question, means effect of prenatal nutrition counselling.
- Articles were not really from developing countries but from rural areas of developed countries.
- Articles were not specific about nutrition counselling.

Reason for including articles

- Published research articles which examined the effect of prenatal nutrition counselling were included
- Articles written in English were selected.
- Articles from 1985 and 2009 were included.
- Articles with full text were selected.
- Articles related to developing countries were selected.

Each research study was summarized according to the following criteria: study, purpose of the study, data collection, data analysis and main findings.

Refer to appendix 1 for a detailed summary of the studies.

4.2 Data analysis

The process of data analysis adopted was deductive content analysis introduced by Elo and Kyngäs (2007). According to this deductive content analysis involves testing categories, concepts, model, or hypothesis. Individual reading, reviewing, and re-reading of the retrieved articles was done to be immersed in the data. Articles were screened several times to find out similarities and differences in respect of research findings. Key points answering the research questions were drawn out to be used as research findings. Words and combination of words answering the research question of the final project were highlighted and noted down. A structured categorization matrix of the analysis was developed aiming at the answer to the research question of the final project. After categorization matrix has been developed, all the data was reviewed for content and coded for correspondence with the exemplification of the identified categories.

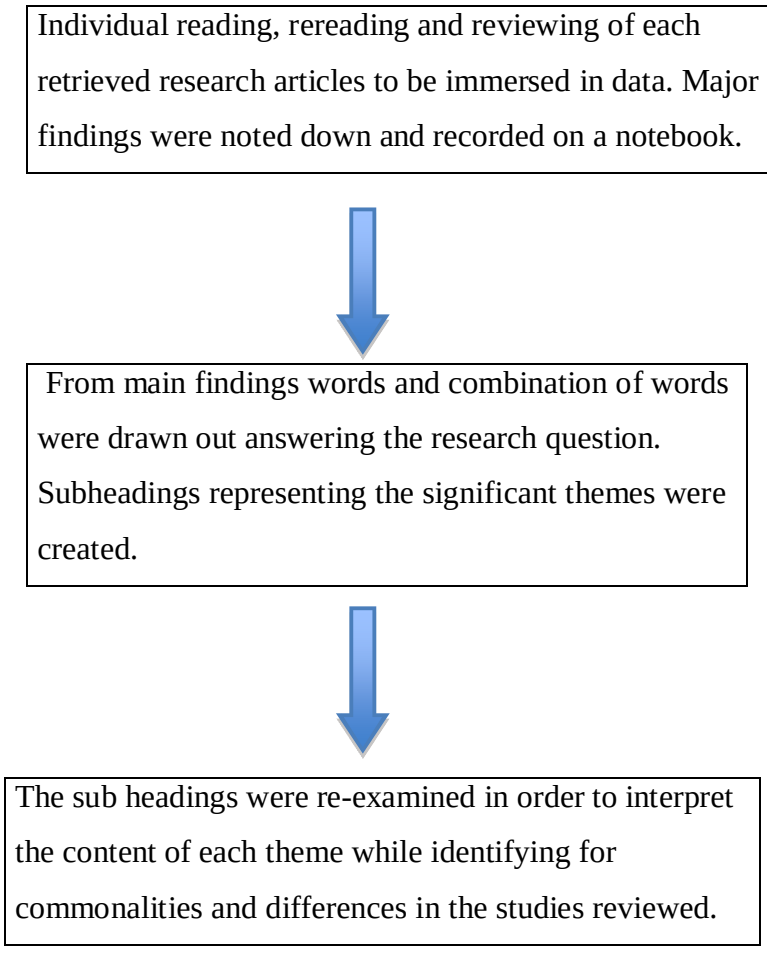

Figure2. Data analysis process

5. RESEARCH FINDINGS

5.1 Maternal weight gain

The mean percentage reference weight for height of experimental group according to gestational age during pregnancy improved more as compared to control group. Mean percentage weight was less in experimental group before counselling. Weight gain per week in the post nutrition counselling group varied between 230 grams to 570 grams with an average of 400 grams, which was less than this before counselling(Garg & Kashyap2006.)Other study by (Hiday & Zumravi 1992) showed that weight gain in pregnancy was affected by nutrition counselling, although not many mothers could gain to the level of recommendation, as recommended weight gain is eleven kilograms to twelve kilograms. Total weight gain in experimental group was seven kilograms and eight kilograms after nutrition counselling as in control group not even a single mother gained more than seven kilograms in pregnancy.

In the third trimester mothers gained more weight in experimental groups than in control group. Weight gain per week in two experimental groups were 460 grams and 450 grams as compared to 280 grams per week in control group. In 14 weeks time period of pregnancy maternal weight gain in two experimental groups was 5.8 kilograms and 6 kilograms respectively, as in control group it was 3.6 kilograms. There was increase in arm circumference of mothers in experimental groups, which was not noticed down in control group. Gain in triceps skin fold thickness was recorded after nutrition counselling in experimental group, whereas this gain was absent in control group. (Tontisirin et al 1985.)

The average weight gain during pregnancy in experimental group was more than in control group. Mothers in experimental group gained up to seven kilograms in whole pregnancy , where as mothersin control group gained 6.3 kilograms (Sachdeva & Mann1993.) Weight gain before counselling was less than the weight gain afterimparting counselling. Mothers in experimental group gained nine kilograms weight during whole pregnancy, as in control group not even a single mother could gain

same weight as that in experimental group.(Sun, J.D 1990).

5.2 Decrease in low birth weight babies

Babies of the women received counselling were heavier as compared to other group. The average of birth weight range between 1.75 kilograms to 3 kilograms in experimental group, where as in control group no baby was born with the weight of 3 kilograms (Hiday & Zumravi 1992.) The mean birth weight of neonates of experimental group was more as compared to control group. Mean birth weight of the babies in experimental group was 2.7 kilograms, whereas mean birth weight of babies in control group was 2.3 kilograms. Majority of the babies of control group weighed less than 2.5 kilograms in contrast to only one third of the babies born in experimental group with this weight. The average skin fold thickness of neonates of experimental group was also more as compared to skin fold thickness of neonates of control group.(Sachdeva & Mann1993.)

Study by (Mahsid, A. et al 2006) found out mean birth weight significantly higher in intervention group than control group. The mean birth weight of babies for at risk women in experimental group was higher than for their counterparts in the control group, . The mean birth weight for women at no risk in pregnancy in experimental group was also higher compared to mean birth weight of the babies in control group.

The mean value of birth weight was three kilograms in experimental group and two kilograms in control group. The rate of low birth weight was two percent in the control group and one percent in the counselled group.(Sun, J.D1990). In the study by (Tontisirin et al 1985) mean birth weight of babies in experimental groups was higher than control group. Mean birth weight of babies was 3,089 kilograms and 3,104 kilograms as compared to 2,853 kilograms in control group. The mean length of the babies in experimental groups was 51 centimetres as in control group it was 50.4 centimetres. The mean placental weight in experimental groups was 630gm and 616grams, while in control group it was 563grams.

The average birth weight in experimental group was higher than average birth weight in control group.Majority of the babies that is only one fifth in control group were more than 2.5 kilograms, while only one eighth of babies were less than 2.5 kg in

experimental group. The average length of the babies in experimental group was 46 centimetres, while in control group it was 44 centimetres. Skin fold thickness of the babies in experimental group was significantly more as compared to in control group (Sachdeva & Mann 1993.)

5.3 Change in haematological values and other minerals

The mean haemoglobin level in experimental group was less before counselling, which increased significantly after nutrition counselling. Not a single mother was found with severe anemia after counselling, As few mother in experimental group were severely anemic before nutrition counselling. Mean haemoglobin level of control group was less than that of experimental group.A regular shift in the severity of anemia was observed with intervention of counselling, thus showing the impact of nutrition counselling. (Garg & Kashyap 2006.)

Although there was not much difference in serum mineral levels in experimental and control group during first trimester. The average serum iron level during the first trimester was almost same in both experimental group and control group. The corresponding levels after the intervention was higher in experimental group as compared to control group. The mean serum calcium level was significantly elevated after the intervention in experimental group. The mean serum zinc and copper level were more in experimental group than control group. The average cord serum iron levels were 120.4µg/dl in experimental group and 108µgdl in control group. There was significant increase noted down in copper level of experimental group which was not so high in the control group. (Sachdeva & Mann1993.)

In the study by (Tontisirin et al 1985) prevalence of anemia was significantly reduced after the intervention. In experimental groups anemia decreased to twenty percent after the intervention. In control group increase in anemia was noticed . Haemoglobin level of mothers enrolled in counselling was higher than of mothers not enrolled. One tenth of women in experimental group had 11.65 g/dl, one third of women in experimental group had 9.02 g/dl.(Hiday, M 1992). After nutrition counselling haemoglobin level in counselled group was increased .Half of the mothers in counselled group had

haemoglobin more than 11g/dl and in control group only one fifth of mothers had haemoglobin more than 11g/dl. Hemoglobin level was 9.7g/dl in counselled group before counselling, which shows the positive impact of counselling. Hemoglobin level of mothers in control group was lower than the experimental group(Chawla & sachdeva 2004.)At enrolment one third of the women had anemia in the experimental group which was reduced to one half after the counselling proving counselling to be successful up to some extent. (Zavaleta et al 2007.)

After counselling the level of serum nutrients was higher in counselled group than in control group. The level of serum protein, albumin, vitamin A, copper, zinc, and haemoglobin at delivery was much higher in counselled group than in control group. The level of serum total protein, albumin, zinc, magnesium, and haemoglobin in cord blood in the counselled group was higher in the counselled group than in the control group. The incidence of anemia was one-half in the control group and one third in the counselled group. As in pregnancy mothers were taking more vegetables than meat and after counselling women intake animal food also. Hence, there was more absorbable iron and lower incidence of maternal anemia. (Sun, J.D 1990.)

5.4 Less post partum complications

In the study by(Nian, L 2009) showed that after nutrition counselling the incidence of constipation, leg cramps or joint pain was significantly lower in intervention group. The intervention was successful in improving women's nutrition and health knowledge in health practices. Because of postpartum false beliefs a lot of foods were avoided and some unhealthy practices like no bathing, no hair washing or teeth brushing in puerperium were practiced before counselling. Counselling helped the mothers and their families to understand the importance of hygiene. After counselling intervention group understood the importance of food being avoided .Nutrition counselling helped mothers to understand the importance of food even after delivery which helped to prevent constipation. More intake of milk and other sources of calcium prevented leg cramps and joint pain.

5.5 Behavioural changes in dietary habits

In the study done by Garg & Kashyap (2006) after nutrition counselling sessions which were comprised of improving quantity and improving the quantity of nutrients like iron, researchers found out a great change in dietary habits. The mean percentage of recommendation for almost all stuff was low than the recommended guidelines before counselling. Food habits were simple with 2 main meals a day pattern before counselling. There was a significant increase in amount of almost all the food groups consumed in the post counselling period as compared to pre counselling period and to the control group. In case of cereals and pulses increase was more in the amount consumed than the frequency. Although all the nutrients could not reach the level of adequacy but fat, vitamin A and vitamin C reached the level of nutritional adequacy. Energy intake increased per day after nutrition counselling, although it did not meet the amount required. Similarly an increase in protein, calcium, iron, vitamin C, and vitamin A were reported after nutrition counselling. Mother in the experimental group started using iodised salt for the cooking purposes.

According to study done by Sachdeva & Mann (1993) it was found out that there was a significant improvement in intake of energy and protein in experimental group. Daily energy intake increased from 1565Kilocalories per day to 1897Kilocalories per day, in control group it was 1607Kilocalories per day. Protein intake also increased per day in experimental group as compared to the control group. The intake of copper and manganese was with the recommended range.

Study by Nian, L (2009) found out that there was a change in dietary habits of women after counselling. Mothers in intervention group consumed significant more fruits than those in the control group in rural area.. Higher Vitamin C, Vitamin A and calcium intake were found in intervention group. In urban areas more consumption of soyabean products, vegetables, and fruit intake were noticed in intervention group.

The experimental group increased their consumption of food like meat and vegetables. More than half of experimental group increased food intake as only one tenth of control group was taking sufficient food. More than half of mothers in experimental group increased meat intake after counselling as only few mothers in control group were taking sufficient meat(Mashid, A et al 2006 .) In the study by Chawla,et al(2004) a

significant change was noticed in nutrients intake after the counselling. Average daily intake of energy in experimental group was higher than in control group. There was increase in intake of vitamins, minerals and protein in experimental group.

Before counselling the intake of grain, fat, carbohydrates, iron, thiamine and total energy was higher in the control group than in counselled group. Yet after counselling the average intake of food and nutrients in the counselled group was higher than that in control group and the intake of egg, protein, calcium, iron, retinol, and riboflavin was much greater than that in the control group. Before counselling the consumption of most nutrients in the control group was more in control group than counselled group. Consumption of most nutrients in the control group was closer to required daily allowance. After counselling the proportion of mother's consumption of the required daily allowance in the counselled group were higher than those in the control group. This study also found out that iron intake in pregnancy was from vegetables, which lead to sufficient iron intake. This implies that nutrition counselling was beneficial in terms of increasing the average daily intake of food and nutrients and increasing the proportion of women whose nutrient intake reached the required daily allowance. This shows that nutrition counselling can influence almost all participants to exchange unsound dietary habits for the balanced diet. (Sun J. D. 1990)

After counselling in counselled group intake of milk and milk products was increased. At ninth month the intake of green leafy vegetables was more than the required, As availability was also there. At the ninth month the intake of other vegetables and roots was doubled than suggested intake in counselled group. Daily intake of calcium was more in counselled group than in control group in 5^{th} month of pregnancy. Daily intalke of iron was also more in experimental group than in control group. The average daily intake of energy was 1850kilocalories in counselled group and 1760kilocalories in control group in 5^{th} month of pregnancy. The average daily intake of energy was morel in counselled group as compared to the control group. There was increase in intake of vitamin C in counselled group than in control group, as nutrition counselling helped counselled group to select foods rich in vitamin C like lemons, tomatoes and sprouted pulses. (Crawl & Sachdeva 2004.)

5.6 Other aspects influenced by counselling

5.6.1 Breast feeding, immunization and regular antenatal visits

Nutrition counselling not only affected the nutrition intake, but mothers understood other aspects of heath also necessary for them and their children. From experimental group nearly all of mothers immunized them against tetanus and initiated breast feeding their neonates on 1-3 days. From control group only few mothers were immunized and only few mothers breast fed their neonates on 1- 3 days. More mothers continued breast feeding up to six months in experimental group as compared to the control group. In experimental group mothers added semi solid food to their children's diet also after six months. (Hiday& Zumravi1992.)

Nutritional counselling resulted in regular visit of the pregnant mothers of experimental group for antenatal check up and getting themselves vaccinated for tetanus. None of the mothers from control group went for antenatal check up. All the mothers in experimental group visited a doctor for check-up and vaccinated against tetanus during the second and third trimester. Only one third of mothers visited doctor even once during their whole of gestational period.(Sachdeva & mann 1994.)

All the mothers in experimental group visited a doctor for check up and vaccinated against tetanus. It was observed that two third of the mothers in control group visited a doctor during second and third trimester, One third of the mothers in control group did not visit a doctor during the pregnancy. (Sachdeva & Mann1993) In the study by Garg & Kashyap(2006) findings showed hat there was improvement in antenatal visits after counselling, as mothers understood the importance of their health and its effect on the baby. Half of mothers in experimental group went for at least one antenatal check up against one third in control group. It was noticed that mothers came to know about tetanus vaccinations and its effect on mothers and their children. More mothers got them tetanus vaccinated against tetanus. The percentage of women getting their injection completed by the end of pregnancy was 97.9% in experimental group while in control group it was 72%.

5.6.2 Misconceptions about nutrition

A study by Hiday & Zumravi (1992) found out that nutrition intake in pregnancy is really influenced by a lot of misconceptions and false beliefs. In this study researchers found out that a lot of women were taking only one to two major meals in pregnancy, while before pregnancy they were taking three meals. Intake of less food was to avoid more weight gain and to ease the delivery, as it was conceived that with more baby weight delivery is difficult. Food like water melon, fresh fish, sesame seeds, fatty meat, and camel's liver were avoided because of tradition and false beliefs that these foods can cause abortion. Milk was avoided as it was thought a cause of diarrhoea and nausea. Men and guests were used to serve with good food and before females who used to eat whatever is left after serving.

5.6.3 Increase in knowledge status

The knowledge and health knowledge test was performed for all the participants at the time of the recruitment. The understanding rate of the nutrition and health knowledge was very low among all the participants. No significant difference was found between the intervention and control group before intervention. The repeated test was performed at the last postpartum visit for all of them. Women in intervention group exhibited significantly great involvement in overall nutrition and health knowledge after the education sessions. In both areas, significantly more women in intervention groups responded correctly to the questions than those in control group.(Nian, L et al 2009).

5.6.4 Healthy behaviour after counselling

Study by Nian, L et al(2009) found out that after counselling besides diet habits there was change in health behaviour also. Women in intervention group understood the importance of hygiene which included exposing to sunshine, bathing, hair washing, cleaning the perineum and ventilation of room after the delivery. The details of behaviour were recorded after the delivery. Intervention group practised more healthy habits as compared to control group. Women in urban area practised more healthy habits as compared to rural area.

5.6.5 Day time rest and avoidance of second hand smoking

After nutrition counselling mothers understood the importance of their health for the well being of the baby. Mothers in intervention group increased day time rest. 64.1% mothers in intervention group had day time rest as compared to 11.7% in control group. After nutrition counselling mothers understood, how important day time rest was during pregnancy. A lot of mothers were in exposure of second hand smoking in the area where study was conducted. Mothers were helped to understand the harms of exposure to the second hand smoking. Almost all the mothers started avoiding second hand exposure to smoke in the intervention group. (Mahsid, A et al 2006) .

6. DISCUSSION

6.1Validity and reliability

Sources used in this project are primary sources retrieved from academic journals. Database was health related such as CINAHL; MEDLINE and OVID and COCHRAIN.As there were not many studies done on prenatal nutrition counselling in developing countries, although there were studies on prenatal care, so publication years were from 1985-2008. Others limits were English language with full text. Selected articles were directly related to outcome of prenatal nutrition counselling.

The keywords used were prenatal nutrition counselling, effect of prenatal nutrition counselling and effect of prenatal nutrition counselling in developing countries. Keywords were entered and search was performed using health related database. The studies chosen were conducted in developing countries like Egypt, India, China, Sudan, Peru Thailand and Philippines.

The data selected from the chosen articles was reliable in the way that articles were consistent in their measures. The methodology used to gather data was the same throughout the study and responds to strict inclusion criteria as set.

To analyse and synthesize the findings of the retrieved studies, at first, a preliminary reading of the abstracts was done to specifically organise the research articles before critical reading. Afterwards detailed comparison study between method used, sample size and findings was done.

The purpose of the study is well defined and findings answer the original research question.

6.2 Ethical consideration

This final project data has not been collected directly from human subjects, but was through systematic literature review. Ethical consideration was taken into account while collecting the data and analysing the data collected .It was ensured that research articles were accurately reported and bias avoided. In addition, studies included for the review were permitted by institutional review boards and participants in the different studies gave informed consent.

While carrying out this research project ethic considerations set by the American Nurses Association was kept into consideration. In different studies which were included, there was no mention of names or any personal information which may lead to recognition of the persons. Privacy, confidentiality and protection from harm to the participants were respected by the researchers in the selected articles. The measuring tools used in the data only measured what was supposed to be measured.

Whenever a direct quotation was used, it was marked accordingly. Appropriate credits were given as new information was introduced. The findings of the various research articles were of the benefit for nursing profession as well as, for the population concerned. Ethical consideration was kept in mind while collection of data with a view of maximum possible benefit to the persons being cared by health professionals.

This study was only conducted to find out how a specific change like counselling in providing health care can improve the heath of the pregnant mothers and outcome of pregnancy. Although this projects is related to developing countries, but can be useful as guidelines to nurses in the community anywhere. Findings of this study are really beneficial for the nurses. This study did not put potential subjects under risk of being harmed. This study was not carried out for any financial benefit. The results will be displaced on poster in the school after the permission of the related authorities.

6.3 Overview of findings

It is clear from the study that maternal nutrition plays a fundamental role in optimizing pregnancy outcome and unlike other factors, such as hereditary or pre-existing conditions, the nutritional status is amenable to change. Research relating to pregnancy outcome has documented the critical need of nutrition counselling. Nutrition counselling has positive outcome like increase in maternal weight gain, decrease birth weight of the babies, decrease in anemia, increased level of understanding about nutrition, and removing misconception.

Nutrition counselling is one of the prerequisites for improving the nutritional status of any group. Almost in all the countries diet of women in pregnancy is influenced by culture, family customs, and individual eating habits. It is evident that nutrition counselling is more effective during pregnancy than in situations where there is no pressing impetus. The prenatal period represents an ideal opportunity for nutrition counselling since at that time, mother may be highly motivated to understand and accept advice.

6.4 Summary

In developing countries a lot of people are living under poverty line. They cannot afford or they do not have the knowledge of the rich sources of the different nutrients. Prenatal period is an important period in which if mothers are not taking proper diet effects both the mother and the coming child, Not only at the time of birth but even in later life also. The health personnel are the key personnel to bring awareness among the mothers about the importance of nutrition and its outcomes. Considerable interest in this effect springs from the hope that by the increasing factual knowledge, food habits can be modified in such a way as it improves the health of the mother and the fetus.

6.5 Implication for nursing practice and future research

Nutrition counselling has played an important role in many aspects like dietary intake of mothers, birth weight of the babies. Nutrition counselling lessons with emphasis on the importance of weight gain and birth weight of the baby increase the effectiveness of counselling. Nutrition counselling can include pre and post nutrition test, face to face approach, health education guidebooks home visit and follow up evaluation techniques. Nutrition counselling should have its aim to give so much information that the

consumer knows what he eats and why; then he can choose his food to provide maximum mixture.

In health field nutrition counselling should be imparted with objectives related to nutritional problems prevalent among a specific area. The content of these learning programmes need to be standardized so that there is no confusion among nurses. Because of the positive outcome of nutrition counselling, this intervention has potential for further adaptation and development in all developing countries. Television, magazines and internet could be added to the intervention. Media could potentially add a lively, modern colourful and attractive channel for the message to reach the families.

There is need for more quantitative research studies about effect of nutrition counselling especially in developing countries. It would have been interesting to collect data with a bigger sample size and over a longer period of time like for the whole pregnancy.

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First Author, year of publication, Country	Purpose of the study	Sample size	Data collection and analysis	Main findings
Hiday, M., 1992. Sudan.	To investigate the effect of nutritional programme on pregnant women attending Khartoum Model Clinic.	120 pregnant women were divided into 60 each for experimental and control group.	Data was collected by questionnaire, interviews, pre and post counselling tests, Multiple analysis of the data collected was done after tabulating the readings.	Babies of the experimental group were heavier than the counseled group. After nutritional counseling there was change in dietary intake of mothers in experimental group. Haemoglobin level of mothers in the experimental group was higher than control group. Weight gain of mothers in experimental group was more than in control group. More mothers breast fed their babies in experimental group than in control group. Percentage of mothers had immunization was higher in controlled group. Some misconception about food during pregnancy was also noticed during the study.
Mahshid, A., 2006. Egypt.	To evaluate the effect of Positive deviance based antenatal nutrition project.	519 pregnant mothers were selected. 344 were in experimental group and 175 were in control group.	Intake of food of mothers and birth weight of babies were recorded and tubulised. Data was analysed by comparing intake of food before and after intervention .Birth weight was compared in experimental and control group.	Birth Weight of the target group increased 2.2 times more than comparison group. After intervention significant increase in quantity and quality intake of food, specially meat and vegetables was recorded in experimental group. Rest during pregnancy and avoidance of second hand smoking was recorded in experimental group which was not noticed in control group. The cost per 100 gm of improvement in birth weight was 3.98 US dollars which is much less than the as compared to treatment of complications caused by low birth weight.

First Author, year of publication, Country	Purpose of the study	Sample size	Data collection and analysis	Main findings
Nian,L., 2009. China.	To explore the effect of health and nutrition education intervention on women's postpartum beliefs and practices.	Sample size was 302 pregnant mothers with154 in intervention group and 148 in control group.	Data was collected by questionnaire and interviews before and after counselling. Data about food intake was collected by 3 day food records at different phases of the study. Statistical analysis was done using SAS statistical software package.	Women in counselled group showed greater improvement in dietary behaviour such as consumption of more fruits and vegetables as compared to the control group. Level of nutrition and health knowledge was higher in experimental group after counselling. Healthy hygienic behaviour was noticed in experimental group after counselling. The incidence of constipation, leg cramps, and joint pains was lower in counselled group as compared to the control group.
Sachedeva, R., 1993. India.	To investigate the impact of nutrition education and medical supervision on pregnancy outcome.	60 pregnant women were selected out of which half comprised the experimental group and half comprised control group.	Weight of the mother, mid - upper arm circumference before and after the counselling was recorded. Birth weight of the babies of both experimental and control group was recorded. Data was analysed statistically on the computer.	Average weight in counselled group was 7 kg as compared to 5.7 kg weight gain in the control group. There was statistical difference in the birth weight of babies in both the groups. Babies of the mothers who had counselling were heavier than the babies of the control group. Skin fold thickness of the babies of counselled group was more than the skin fold thickness of the babies of control group.

First Author, year of publication, Country	Purpose of the study	Sample size	Data collection and analysis	Main findings
Sachdeva,R. , 1994. India.	To assess the impact of nutrition counselling and supplements on the mineral nutriture of rural pregnant women and their neonates.	66 pregnant mothers were selected out of which half comprised experimental group and half comprised control group	Data was collected by recording food intake by the weighment of cooked food, haemoglobin level and cord blood test for nutrients. Statistical analysis was done of the data collected.	Daily energy intake and protein intake was increased in experimental group after counselling. Anemia was decreased as there was increase in iron level along with calcium level in the experimental group. After nutrition counselling mothers went for regular antenatal check up and got them vaccinated against tetanus. Serum zinc level of counselled group was higher in third trimester. Level of serum zinc and manganese in cord blood was higher in experimental group than control group.
Sun.J.D., 1990 China.	To evaluate the effect of prenatal nutrition counselling on mothers and babies.	143 pregnant women were selected. 80 were in experimental group and 63 were in control group.	Birth weight of the babies, Haemoglobin level and other constituents in the blood were recorded and statistical analysis was done.	The women receiving counselling had fewer low birth infants as compared to the control group. The incidence of maternal anemia in counselled group was less against other group. Blood constituents' determination revealed that the level of serum protein, vitamin A, vitamin E, zinc, copper, magnesium in the blood of mothers of counselled group was higher as comparative to control group.

First Author, year of pupublication, Country	Purpose of the study	Sample size	Data collection and analysis	Main findings
Chawla, P., 2004. India .	To evaluate the impact of nutrition counselling on food and nutrient intake and haematological profile of rural pregnant women.	60 pregnant mothers were divided equally into two groups to form interventional and control group.	Data about diet intake was collected by 24 hour recall method for three consecutive days using standardised containers. Value of nutrients were calculated. Blood tests were recorded for Hb. Data was analysed statistically comparing values for both the group and before and after the counselling sessions.	There was increase in average energy intake in experimental group after counselling. An increase in protein, milk, milk products and vegetables were noticed in counselled, Intake of green leafy vegetables, other vegetables and roots was significantly higher in the experimental group as compared to the control group. Anemia was less in experimental group than in control group; a significant difference came after the nutritional counselling.
Garg,S., 2006. India.	To assess the effect of the nutritional counselling on dietary intake, and anaemia status of pregnant mothers.	100 pregnant mothers, out of which 50 formed control group and rest 50 formed experimental group.	Data was collected by food frequency and amount questionnaire before and after counselling. Other readings like mother weight gain, haemoglobin level, baby birth weight were recorded. Statistical analysis was performed.	After nutrition counselling there was change in dietary of mothers in experimental group. Increased in the amount and frequency of food intake was noted down. Mother in counselled group started using iodized salt for cooking. Hemoglobin level of mothers in experimental group was higher than control group. Mothers gain more weight after counselling as compared to the control group. Percentage of counselled mothers who got immunization against tetanus was higher in the experimental group.

First Author, year of pupublication, Country	Purpose of the study	Sample size	Data collection and analysis	Main findings
Tontisirin, K., 1986. Thailand.	To evaluate the effect of formulated supplementary food plan on the outcome of pregnancy.	43 pregnant mothers were selected making two experimental groups of 14 each and one control group of15.	Data was collected by recording 7 days food intake before and after counselling. Weight of the mothers, Hb level and arm circumference were recorded before and after counselling. Content analysis was done.	The women receiving counselling had fewer low birth infants as compared to the control group. The incidence of maternal anemia in counselled group was less against other group. Blood constituents' determination revealed that the level of serum protein, vitamin A, vitamin E, zinc, copper, magnesium in the blood of mothers of counselled group was higher as comparative to control group. Blood constituents in the umbilical cord at delivery.
Zavaleta, N., 2000. Peru.	To assess the change in haematological state of pregnant women after receiving nutrients life iron, folic acid and zinc.	1016 pregnant women with 645 in intervention group and 371 in control group.	Data was collected by recording weight and skinfold thickness. Blood samples were taken at three points and from umbilical cord at the time of delivery. Repeated measure analysis of variance (ANOVA) was used.	Women with anemia at the starting showed steady increase in hemoglobin concentration during pregnancy after the intervention. Women with poor hematological status, and consuming less of iron supplementation were more likely to have anemia at the end of pregnancy. Hemoglobin level of neonates of intervention group was higher than the neonates of control group.

Appendix 1

The final ten articles selected for the systematic literature review are:

- Chawla, P.Kaur, R. & Sachdeva, R.(2004) Impact of nutrition counselling on food and nutrient intake and haematological profile of rural pregnant women. The Journal Human Ecology15(1)
- Garg,A., & Kashyap, S.(2006) Effect of counselling on nutritional status during pregnancy. *Indian journal of Paediatrics,73(8*), 687-692.
- Hiday, M. & Zumrawi, F.Y. (1992) The effect of nutrition education programme on pregnant women attending Khartoum model clinic. .*Ahfad Journal* 9(2), 23-36.
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