Nutritional and Health Status of Pregnant Fisher Women in Thoothukudi District

Krishna Priya, KP

(12PFN009)

Thesis Submitted To

Avinashilingam Institute for Home Science and Higher Education for Women

Coimbatore – 641043

In Partial Fulfilment of the Requirements for the

Degree of Master of Science in Food Science and Nutrition

March, 2014

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Signature of the Supervisor **Signature of the Head of the Department**

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I INTRODUCTION

"God's interest in the human race is nowhere better evinced than in obstetrics"

- Martin H. Fischer

Adequate nutrition before and after pregnancy has greater potential for a long term health impact than it does at any other time. Maternal health is a complex, influenced by various genetic, social and economic factors, infections and environmental conditions, many of which may influence the foetal growth.

During pregnancy, woman undergoes many physiological changes in the gastrointestinal, cardiovascular, hematologic, metabolic, renal and respiratory systems. The body changes its physiological and homeostatic mechanismswith the hormonal involvement in pregnancy to ensure the fetus. Levels of progesterone and estrogen rise continually throughout pregnancy, suppressing the hypothalamic axis and subsequently the menstrual cycle and responsible for the growth and development of the foetus (Carlin*et al.,* 2010).

The UN estimated that, in India, 1000 pregnant women die every day from complications during pregnancy and child birth. India's maternal mortality ratio came down from 570 deaths per 1,00,000 live births to 230 in 2010. India still had the highest rates of maternal deaths in the world with live birth at least 63,000 such deaths taking place in 2010 alone. In rural and urban areas was 58 and 36 per 1,000 respectively (National Institute of Public Cooperation and Child Development, 2009).

Malnutrition, frequent pregnancies, unsafe abortion, reproductive tract infections (RTI) and sexually transmitted infections (STI) and all combine to keep the maternal mortality ratio in India among the highest in the world (Retherford , 2009).

Global prevalence of low in birth weight is declining slowly. The current prevalence of low birth weight is 15.5 per cent or more than 20 million worldwide. About 96 per cent of low birth weight babies were born in developing countries. This will reduce from one third to two third by 2015 (UNICEF and WHO, 2010).

A spacing of between 1 and 2 years resulted in an infant mortality rate of 145, while a spacing of 3-4 years reduced the rate even further to 80. Two year spacing between births reduce India's aggregate infant mortality rate by 10 per cent and child mortality by 16 per cent (World Fertility Survey, 2010).

Gestational diabetes mellitus (GDM) is a metabolic disorder defined as glucose intolerance with the onset or first recognition during pregnancy. Women with GDM are at increased risk for adverse obstetric and perinatal outcome. The prevalence of GDM was 6.6%. Maternal and fetal complications in the GDM group were much higher than in the non-GDM group. Hypertension, vaginal candidiasis, and abruptio placentae were the common maternal complications, while macrosomia and stillbirths occurred in the fetuses (Kalra , 2013)

Nutritious diet is an important integral determinant of a healthy pregnancy. Eating a healthy diet with balancing of all nutrients like carbohydrates, fat, and proteins, and eating more fruits and vegetables usually ensure a good nutrition. Adequate folic acid intake decreases the risk of fetal neural tube defects such as spina bifida (birth defect). Dietary sources high in folate include green leafy vegetables such as broccoli, spinach and salad greens, some fruits and cereals and breads with added folic acid. DHA omega-3 is a major structural fatty acid in the brain and retina, and is naturally found in breast milk (Bez*et al*., 2010).

Health of women is linked to their status in the society. The demographic consequence of the women has formed expression in various forms, such as female infanticide, higher death rate, lower sex ratio, low literacy level and lower level of employment of women in the non-agricultural

sector as compared to men. Generally, at household level, cultural norms and practices and socio-economic factors determine the extent of nutritional status among women (Kamdaraj, 2010).

Palmer (2011) reported that pregnant/lactating women often lost weight during peak work (low food) seasons, and infants were summarily weaned at such times. Women and children are especially at risk during lean periods and fall below the survival line, as the shortfalls in caloric intake is exceedingly drastic. Even among slightly better-off households, discrimination against females in the allocation of food renders susceptible to malnutrition. The availability of off-season employment and food-for-work schemes mitigate these detrimental effects of agricultural seasonality on nutritional status to some extent.

The amount of healthy weight gain during pregnancy varies. Weight gain is only partly related to the weight of the baby and growing placenta, and includes extra fluid for circulation, and the weight needed to provide nutrition for the growing fetus. Most needed weight gain occurs later in pregnancy (Thangaratinam , 2012)

Institute of Medicine (2013) recommends an overall pregnancy weight gain for those of normal weight (body mass index of 18.5–24.9), of 11.3–15.9 kg having a singleton pregnancy. Women who are underweight (BMI of less than 18.5), gain weight between 12.7–18 kg, while those who are overweight (BMI of 25–29.9) are advised to gain between 6.8–11.3 kg and those who are obese (BMI>30) gain between 5–9 kg.

Women die as a result of complications during and following pregnancy and childbirth. Most of these complications develop during pregnancy. Other complications exist before pregnancy but are worsened during pregnancy. Every day, approximately 800 women die from preventable causes related to pregnancy and childbirth. The major complications that account for 80 per cent of all maternal deaths are severe

bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy (pre-eclampsia and eclampsia), unsafe abortion (WHO, 2011).

Women are generally vulnerable to under nutrition especially during pregnancy and lactation where the food and nutrient requirements are more during that period. The demographic consequences of the lower status in women has formed expression in various forms such as female infanticide, higher death rate for women compared to men, lower sex ratio, lower literacy rate in female, lower level of employment of women in the nonagricultural sector as compared to men (Tara , 2010).

Under nutrition and anemia among pregnant women and adolescent pregnancies are the main contributory factors for low birth weight babies. Intrauterine growth retardation (IUGR) during pregnancy is the main cause of low birth weight and nutritional anemia during pregnancy which is a major determinant of IUGR. Compared to a well nourished child, a mildly malnourished child has twice the risk of dying from common childhood diseases; moderately malnourished child has eight times at risk (Gupta, 2011).

The prevalence of angular stomititis, a sign of B complex vitamin deficiency was 1.1 per cent and 0.8 per cent in urban and rural pregnant women respectively. About 14 per cent of tribal and 12 per cent in urban pregnant women had dental caries. The prevalence of goiter was more in urban area pregnant (4.9 per cent) than rural area (0.8 per cent) (NNMB, 2009).

Most Indian mothers are malnutrition, anaemic and have short pregnancy interval which could be easily prevented. Women especially in younger age are at high obstetric risk (using the risk criteria of height less than 145 cm and weight less than 38 kg). Several studies serve underscores the relationship between maternal nutrition and incidence of low birth weight. A study carried out by NNMB the prevalence of micronutrient deficiencies

revealed that the overall prevalence of anemia was observed to be highest among lactating women (78 per cent) followed by pregnant Women (75 per cent) and adolescent girls (70 per cent) (Agarwal, 2010).

Lee *et al.,* (2011) reported on energy and other nutrients intake of pregnant women in low and middle income countries. Overall range of nutrient intake including energy, fat, protein and carbohydrate are higher among South American Pregnant women than in women living in Asia. Their macronutrient intake level was lower than recommended by the FAO/WHO. The percentage of energy from carbohydrate and fat varied inversely across regions. While protein as a percentage of energy intakes were less variable.

According to NFHS-3 data shows that 93 per cent of deliveries in India took place in some health care institutions and only a miniscule proportion of seven per cent took place at home. One notable aspect is that almost a third of the total deliveries in India ended up in caesarian section. It is well known that the medical risks involved in a caesarian are much higher than that in normal delivery. During pregnancy, suitable nutritional support and care is essential to promote successful pregnancy and safe delivery.

With these backdrops, an attempt has been made by the investigator to conduct the present study on “Nutritional and Health Status of Pregnant Fisher Women in Thoothukudi District”. With the following objectives of,

- Eliciting information regarding socio economic profile of the selected respondents.
- Analyzing food and nutrients consumption of the selected respondents and
- Assessing nutritional and health status of the selected respondents.

II REVIEW OF LITERATURE

The primary objective of the present study is to study the Significance of food and Nutritional requirements, Physiological adjustments and Maternal Complications during pregnancy. Available literatures, therefore, were perused in relation to the objectives set forth for the study. The studies conducted by the Food Scientists and Nutritionists are reviewed in this chapter under the following headings

2.1 Prevalence of Malnutrition among Pregnant women

2.2 Physiological changes of pregnancy

2.3 Nutritional Demands Related to Pregnancy

2.4 Maternal Complications in Pregnancy and

2.5 Nutritional Management of Single and Twin Pregnancies

2.1) Prevalence of Malnutrition among Pregnant women

Adequate nutrition before and during pregnancy has greater potential for long-term health impact than it does at any other time of life. The future health of the developing fetus depends to a large extent on the nutritional foundation established in prenatal life.

In the early stage of pregnancy, the embryo weighs approximately four grams. Then on, it grows at tremendous pace increasing in length and weight. For this rapid growth, ready supplies of nutrients are needed and the growing fetus draws the nourishment from the mother according to its metabolic needs (Guthrie, 2010).

Adequate nutritional status and good dietary intake during preconception and pregnancy are the most important factor for healthy outcomes of pregnancy. On other hand, under nutrition and suboptimal diets with poor energy and micronutrients during these stages have been associated with poor fetal growth, pre term delivery, poor infant survival and increased risk of chronic disease in later life. Suboptimal prenatal diet have

also been associated with gestational diabetes and pre eclampsia in the mother and increased risk of still birth and large for gestational age in the baby (Krause, 2011).

Global prevalence of low in birth weight is declining slowly. The current prevalence of low birth weight is 15.5 per cent or more than 20 million worldwide. About 96 per cent of low birth weight babies were born in developing countries. This will reduce from one third to two third by 2015 (UNICEF and WHO, 2010).

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In the study, Shamin*et al.,* (2013) reported that one in five women at median gestational age of 10 weeks were an anemic, with only 2.1 per cent having moderate to severe anemia. The prevalence of iron, Folate and Vitamin A deficiencies was 10 per cent, 2.8 per cent and 7.1 per cent respectively but Zinc deficiency (14.7 per cent) and Vitamin B12 (19.7 per cent) and α- tocopherol deficiency (43.5 per cent) were also commonly observed.

Habimana*et al.,* (2013) pointed out iodine and iron status of pregnant women from rural, semi- urban and urban areas of India. Over half of the women in their study had insufficient iodine intake based on WHO criteria for median Urinary Iodine Concentration (UIC). Mean UIC was lower in late pregnancy when compared to early pregnancy. The prevalence was almost 40 per cent, it is the highest in the third trimester of pregnancy and higher in rural than in urban areas. One in six pregnant women had both Iodine and Iron deficiency. But in rural areas, it was high as one in three had both deficiencies.

Iron deficiency anemia is also common health problem in high income countries. Nearly 16.2 per cent of pregnant women were iron deficient at gestational period week of 10 and 14 per cent had developed iron deficiency anemia. Woman who had iron deficiency at an early stage of pregnancy and did not take iron supplements had significantly higher prevalence of iron deficiency at delivery. Iron supplements during pregnancy were found to have a significant protective effect against iron deficiency at delivery, although moderate iron supplementation (upto 60mg/day) did not prevent iron deficiency anemia (Arija*et al.,* 2013).

In another study among pregnant women conducted in Asia, more than half of the women did not meet recommended guidelines for ω-3 and ω-6 fatty acids. Nearly two-third of the women did not meet the recommended intakes of iron and Vitamin E. Further compared to women born in foreign, women born in Asia had lower intakes of carbohydrate but higher of protein and total fat, Saturated fatty acids, Mono Unsaturated Fatty Acids (Bernal *et al.,* 2012).

Supplements were taken by pregnant women to promote nutritional adequacy. In the study, total of 7500 pregnant women in USA, Germany, Asia were selected and observed. Nearly 90per cent of women were using more than two supplements. Sixty five per cent took Vitamin D supplements and found to be the highest proportion of users in the USA and 25per cent in Asia. Overall 45per cent of the women took fatty acid supplements, and was the highest proportion in Germany 27per cent (Aronsson*et al.,* 2013).

Tomedi *et al.,* (2013) reported that there was an association between mid–pregnancy obesity and their nutritional pattern of maternal micronutrient and essential fatty acid (EFA) status during mid-pregnancy in India. Obese women had lower concentration of plasma ascorbic acid and carotenoid concentrations. Consequences of lower essential fatty acid and carotenoid concentrations during pregnancy affect fetal growth.

According to WHO, in developing countries, the prevalence of anemia among pregnant women is 56 per cent. The prevalence of anemia in

India is about 60 -70 per cent. In India, anemia is the 2nd most common cause of maternal deaths accounting for 19 per cent of total maternal death in the year.

Women die as a result of complications during and following pregnancy and childbirth. Most of these complications develop during pregnancy. Other complications may exist before pregnancy but are worsened during pregnancy. Every day, approximately 800 women die from preventable causes related to pregnancy and childbirth. The major complications that account for 80 per cent of all maternal deaths are severe bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy (pre-eclampsia and eclampsia), un safe abortion (WHO, 2011)

2.2) Physiological changes of pregnancy

Placenta is the principal site of production for several hormones responsible for regulating fetal growth and development of maternal support tissues. It is also involved for exchange of nutrients, oxygen, waste products. Placental insults compromise the ability to nourish the fetus. Placental size can be 15 per cent to 20 per cent below normal fetus (Davis *et al.,* 2010)

Blood volume expands upto 50per cent by the end pregnancy. This results in decreased in haemoglobin, serum albumin, other serum proteins, and water-soluble vitamins. The decline in serum albumin resulted in fluid accumulation. The decrease in water-soluble vitamin concentration reduces the intake of nutrients or deficient nutrient in body. Serum concentration of fat-soluble vitamins and other lipid fractions such as triglycerides, cholesterol and free fatty acids level increased in the body (Entin, 2010).

Cardiac output increased during pregnancy and cardiac size extend upto 12per cent. Diastolic blood pressure decreases during the first two trimesters because of peripheral vasodilation but it returns to normal in third trimester. Mild lower extremity edema is a normal condition of pregnancy resulting from the pressure of the expanding uterus on the inferior vena

cava. Blood return to the heart decreases that lead to decreased cardiac output and fall in blood pressure and lower extremity edema. Mild physiological lower extremity edema is associated with slightly larger babies and lower rate of prematurity (Davis *et al.,* 2011).

Maternal oxygen requirements increase and threshold co_2 decrease that make the pregnant women to feel dyspneic. Adding to this feeling of dyspnea is the growing uterus pushing the diaphragm upward. Compensation results from more efficient pulmonary gas exchange (Scholl, 2009).

The function of gastrointestinal system changes in several ways that affect the nutritional status during pregnancy. Increased progesterone concentrations relax the uterine muscle to allow for fetal growth while also decreasing GI motility with increased reabsorption of water resulted in constipation. In addition, a relaxed lower esophageal sphincter and stomach from the growing uterus can cause regurgitation and gastric reflux (Stazi, 2011).

During the second and third trimester the volume of the gallbladder increases almost twofold, and its ability to empty efficiently is reduced. Constipation and dehydration are the risk factors for gallstone development. Gallbladder disease is the most common medical problem in pregnancy, affecting approximately four per cent of pregnant women (Bech*et al.,* 2010).

Celiac disease affects one in hundred people in Asia and it adversely affects the reproductive career of the woman. Women with celiac disease are at higher risk of spontaneous abortion, LBW infants, and reduced duration of lactation. Celiac disease includes malabsorption and deficiencies of factors essential for organogenesis. (Mantovani , 2011).

The Glomerular Filtration Rate (GFR) increases by 50 per cent during pregnancy, although the volume of urine excreted each day is not increased. Increased blood volume results in an increased GFR with lower serum creatinine and blood urea nitrogen. Renal tubular resorption less efficient in

pregnant state along with increased excretion of water-soluble vitamins (Hill *et al.,* 2009)

2.3) Nutritional Demands Related to Pregnancy

The role of pre-conception nutrition in pregnancy outcome resulted on good fertility rate and growth development. The period of intrauterine growth and development constitutes the most vulnerable period in the life cycle and both biological and social adjustments are made to provide effective protection for this fundamental process. Central to this are the social conventions related to food and nutrition before and during pregnancy as well as the biological adaptations which take place in maternal metabolism (Jackson, 2010).

Energy intake should be increased during pregnancy to support metabolic demands of pregnancy and fetal growth. Metabolism changes by 15 per cent in pregnancy Energy requirement during pregnancy comprises the normal requirement for an adult woman and an additional requirement for foetal growth plus the associated increase in body weight of the woman during pregnancy, most of which occurs during the second and the third trimesters. The total energy requirement during pregnancy for a woman is recommended additional daily allowance of energy of 150 kcal/day during first trimester and 350 kcal/day during the second and the third trimester (ICMR, 2010).

Energy needs during pregnancy are influenced by several factors. The growth of foetus, although very slow at first needs for additional energy. As the foetus matures it needs energy from growth and for some physical activity. Energy needs for foetal growth are not even throughout the pregnancy. In the first trimester, energy needs are only 10 kcal/ day followed by an additional 90 kcal/day during the second trimester and 200kcal/day in the third trimester primarily for the growth of foetus and placenta (Guthrie, 2012)

Adequate energy intake is important for the growth and development of the foetus. Weight gain during pregnancy is a family sensitive indicator of during pregnancy energy intake and in turn wellbeing. When the weight gain is low, there is likely to the foetal growth retardation (Jackson, 2010)

Energy requirement during pregnancy comprises body weight gain consisting of protein, fat and water. Protein is predominantly deposited in fetus (42%) but also in uterus (17%), blood (14%) placenta (10%) and breast (8%). Fat is predominantly deposited in fetus and maternal tissues and contributes substantially to overall energy cost of pregnancy. Protein and fat gain associated with gestational weight gain of 12 kg would be 597g and 3.7 kg respectively (NIN, 2010).

ICMR prescribed for a pregnant woman 65g/day to meet the needs of protein for i) rapid growth of the fetus ii) the enlargement of the uterus, mammary glands and placenta iii) increase in maternal circulating blood volume and subsequent demand of increased plasma protein to maintain colloidal osmotic pressure and circulation of tissues fluids iv) formation of amniotic fluid and storage reserves for labour, delivery and lactation and so on (ICMR – RDA, 2010)

If protein requirements are not met during pregnancy, there is i) an increased risk of pregnancy ii) the foetus may grow at the expense of mother iii) maximum growth of the baby cannot be obtained and number of cells in tissues particularly in brain may be less. Protein and calorie deficiency during gestation may result is poor utilization of food by the off spring after birth and a failure to ever compensate for early food deprivation (Srilakshmi , 2013)

Protein requirement increased throughout gestation and its maximum during third trimester. The current RDA of protein 1.3g/kg/day in pregnancy, totally 82g /day is needed. For twin babies additionally 25g/day protein is recommended. Protein provides good tissue development (repairing &maintenance). An efficiency of 70 per cent of protein is for the conversion of dietary protein to foetal, placental, and maternal tissues (Onis*et al.,* 2010).

Daily consumption of whole-grains bread, cereals, green leafy vegetables and yellow vegetables and dried fruits gives good amount of minerals, vitamins and dietary fiber. Fiber is essential to maintain body weight and composition, blood levels of sugar (low glycemic index), triglycerides and cholesterol (binding by fiber components and increased excretion). These fibrous compounds also help to promote weight loss, reduce risk of colon cancer and heart disease. One Indian study also found decreased risk of cardiovascular disease through better control of lipoprotein lipids in those supplemented with good fiber (Liu, 2011).

Dietary fat (lipids) provides energy and essential fatty acids, serves as a vehicle for fat-soluble vitamins and facilitates their absorption. In the body, fatty acids, used for generation of cellular energy and biosynthesis of membrane lipids and lipid mediators, are essential in development of central nervous system, modulate lipoprotein metabolism and risk for diet-related non-communicable diseases namely, coronary heart disease (CHD), diabetes and cancers. Supplementation with fish oil during pregnancy results in improved docosahexaenoic acid status in infants at birth, which in turn may confer benefits in terms of neurodevelopment (Miller, 2010).

Water soluble vitamins had particular significance for optimal pregnancy outcome. Among these folic acid requirements should increase in pregnancy in response to the demands of maternal erythropoietin, fetal and placental growth. In view of the proven role of folic acid deficiency as an etiological factor for elevated blood homocysteine and CVD, and congenital (Eichholzer*et al.,* 2009).

Experimental and human studies of maternal nutrition during pregnancy have indicated that vitamins play an important role in the maintenance of normal gestation and foetal development (WHO, 2010)

Pregnancy induces an elevation in the rate of folate catabolism even in the presence of low dietary folate. Therefore any increase in catabolism is likely to impose a drain on the available folates. During pregnancy, there is a fall in the serum and red cell folate level. This is not seen when folate

supplementation is introduced or when there is sufficient dietary folate to meet the increased requirements of pregnancy.

Choline was also considered as essential nutrient in pregnancy period. It is needed for structural integrity of cell membranes, cell signaling and nerve impulse transmission. Choline helps to protect against memory loss after grand mal seizures and prevent development of memory impairment in offspring of alcoholic mothers (cho*et al.,* 2009).

Ascorbic Acid with its reducing and chelating properties is the most efficient non-haeme iron absorption enhancer, Absorption studies have confirmed that increase in iron absorption is more only when the two are consumed together. Excessive Vitamin C in pregnancy leads to “rebound scurvy” (Jain, 2011).

Among fat soluble vitamins, Vitamin A (Retinol) is essential for normal vision, for maintaining the integrity of epithelial tissues and for a wide variety of metabolic functions. Vitamin A requirements during pregnancy have been calculated on the basis of the vitamin content of livers of the newborn. Additional intake of vitamin A required is about 25 µg/day throughout the pregnancy (Zervos*et al.,* 2010).

Vitamin D is activated in two series of hydroxylation reactions in liver and kidney to active hormones endogenously which mediate increased intestinal absorption and renal tubular resorption of calcium and contribute to an increase in the availability of calcium. The first hydroxylated compound, 25 hydroxycholecalciferol (25HCC) and the next 1, 25 dihydroxy CC (1,25 HCC) are the wellknown metabolites of vitamin D. In pregnancy period extra Vitamin D is needed for calcium absorption in fetus. Other than this fat soluble vitamin like Vitamin E and K is additionally needed in pregnancy to perform their functions (Rege, 2010).

A mineral like Calcium was influenced by hormonal factors in pregnancy period. Human chorionic samatomammotropin from the placenta

increases the rate of maternal bone turnover. Nearly 30g of calcium is accumulated during pregnancy almost all of it in the fetal skeleton (25g). The remaining is store in maternal skeleton which can be utilizing in lactation. Most of fetal accretion occurs in the third trimester of pregnancy, an average of 300mg/day (Gordon *et al.,* 2010).

Other important mineral rather than calcium is phosphorus, iron, zinc, during pregnancy. Along with calcium, phosphorus is also helpful for the bone development in fetus. Normally in pregnancy time erythrocyte volume increases by 20 to 30 per cent. Iron requirements during pregnancy for fetal growth, expansion of maternal tissue including the red cell mass, iron in the placental tissue and the blood loss during parturition. Zinc is an integral component of many enzymes and is widely distributed in the body and skeletal tissue, and muscle and soft tissues are rich sources. Zinc has a role in stabilizing macromolecular structure and synthesis. Zinc was shown to suppress free radical formation and regulate cellular signaling (ICMR, 2010).

Trace elements like Copper, Sodium, Magnesium, Fluoride, and Iodine are also considered as important minerals during pregnancy. Additional requirements were needed during pregnancy to perform their functions. Deficiency of these minerals leads to changes and cause defects in fetus (Pathak, 2010).

2.4) Maternal Complications in Pregnancy

Iron deficiency is the most widespread nutritional deficiency in the world. It is the most common cause of anemia during pregnancy. Other causes include parasitic diseases such as malaria, hookworm infections, and micronutrient deficiencies including folic acid, vitamin A, and vitamin B12 and genetically inherited haemoglobinopathies such as thalassaemia. According to the Nutrition Impact Model Study's 2011 estimates, the worldwide prevalence of anemia in pregnant women was 38 per cent globally (WHO, 2011).

Women with haemoglobin levels below 7g/dl are considered to be severely anaemic. Recommended therapeutic dose for women in the reproductive age group is one tablet of iron thrice daily for a minimum of 100 days. This will provide equivalent to 180 mg elemental iron and 1500µg of folic acid per day (Srilakshmi, 2013).

Haemoglobin concentrations and packed cell volume are the indicators of anemia. Both iron and folic acid stores may be reduced transiently during twin pregnancy and causes anemia. Women in developing counties who often have inadequate or absent iron stores may be susceptible to iron deficiency during a multiple pregnancy and giving supplementation can improve the risk of anemia (Hall *et al,* 2010).

Gastric esophageal reflux is a common occurrence during the latter part of pregnancy, and it often occurs at night. In most cases this is an effect of pressure of the enlarged uterus on the intestine and stomach which in combination with the relaxation of the esophageal sphincter, may result in regurgitation of stomach contents into the esophagus. Relief occurs only taking of small frequent meals and drinking fluids between meals (Bailit, 2009).

Pregnancies without vascular disease can result in fetal macrosomia which is caused by in utero hyperglycemia from maternal blood. The fetus responds to maternal hyperglycemia by increasing its own insulin production leading to excessive growth and adiposity. Infants born to women with long-standing type I diabetes who also have vascular disease may not be larger than those born to women without diabetes. After delivery infant's pancreas continues to produce elevated amount of insulin. The maternal supply of glucose is no longer available; many infants of mothers with diabetes rapidly develop hypoglycemia requiring a glucose infusion (Krause, 2011).

Gestational diabetes is usually diagnosed after 24 weeks of gestation and it affects 5 to 25 per cent of all pregnant women. Symptoms are similar to those of diabetes mellitus, including glycosuria elevated blood glucose.

Infants whose mothers have gestational diabetes are at increased risk for perinatal mortality and prematurity. Unless mother's glucose is not well controlled, the infant is at the risk of macrosomia (carline, 2011).

Pregnancy Induced Hypertension (PIH) includes gestational hypertension and preeclampsia/eclampsia. Gestational Hypertension is a maternal blood pressure equal to greater than 140/90 with no proteinuria that develops after mid-pregnancy. These may develop preeclampsia, which is defined by the systolic blood pressure of 140 or more and diastolic blood pressure of 90mm Hg. In severe preeclampsia is defined as a systolic blood pressure of 160 or more and diastolic blood pressure of 110 mm Hg. Later preeclampsia is associated with decreased uterine blood flow, owing to vasopasm, leading to reduced placental size (Erick, 2009).

The incidence of gestational hypertension preeclampsia and eclampsia is again greater in twin pregnancies. Preeclampsia was more commonly associated with monochromic placentation. Because of frequency of severe disease and it's associated with growth retardation for both mother and babies. Additionally proteinuria may present at lower diastolic blood pressures than in singleton pregnancy and women with proteinuria only in multiple pregnancy should be treated as having preeclampsia (Patel *et al.,* 2009).

Blood volume expansion is well documented in multiple pregnancies with greater relative increase in plasma volume than in red cell volume, this leads to physiological anemia with lower haemoglobin level and lower haematocrit values in multiple pregnancies (Grennert*et al.,* 2009).

The adaptation of the mother to multiple pregnancies is thus sufficient to enhance absorption of nutrients from to optimum levels for fetal growth of the twins. Nutrient handling and metabolism is influenced by the mother's hormone changes. While broadly similar to those of singleton pregnancies these are enhanced to favour optimal placental transfer of nutrients to the

developing fetuses with adequate supply of essential factors and energy. There is a slower rate of glucose dispersal after a glucose load in twin pregnancies compared to singletons (Campbell and Gillivary, 2010).

Because of increased placental size, uterine over distention, greater tendency to uterine atony is generally agreed that postpartum haemorrhage is a main problem to mother with multiple pregnancies. Studies show that intrapartum management in multiple pregnancies does not the incidence of primary postpartum haemorrhage (Wood and Pinkerton 2011)

There will be poor appetite and satiety in multiple pregnancies. These are common in the third trimester as an expanding uterus reduces stomach capacity. Women with twins should require more amount energy, high protein nutritional supplements drink, usually from around 28–30 weeks gestation. A very small percentage of women will experience vomiting after eating. This occurs mainly in the third trimester due to a reduced stomach capacity. In multiple pregnancies women with lower intake of macronutrients made fetus malnourished (Lantz *et al*., 2010)

There is a growing body of evidence that indicates weight gain is an important factor in perinatal outcome in multiple pregnancies. It hasbeen suggested that this may be due in part to the fact thatoverweight and obese women already have the additionalfat stores that are part of the physiologic weight gain duringpregnancy for underweight and normal weight women,diminishing the effect of their gains on birth weights(Luke et al., 2009)

The maternal physiological adaptation to singleton pregnancy is considerable and an even greater response is necessary in twin pregnancy to ensure good sized healthy babies. Problem to maternal physiological due to increased production of hormones (both steroid and protein) from placental unit during twin pregnancy (Masson, 2009)

Weight gain in twin pregnancy is greater than in singleton pregnancy with the average total weight gain in twin pregnancy 3.5 kg more than in singleton pregnancies. The pattern of weight gain in multiple pregnancies in the early part of gestation and weight gain in singleton pregnancy in mid pregnancy (Campbell, 2010)

Caesarian section has been steadily increased in cases of multiple pregnancies than in singleton pregnancy with the rate of 50%. A rise in operative deliveries is due to both elective and emergency cases. Operative deliveries lead to increased maternal mortality and morbidity post delivery with more complications such as venous thrombosis and embolism (Cetrulo 2009)

2.5) Nutritional Management of Single and Twin Pregnancies

Good nutrition is the central for achieving optimal fetal growth and development, and for maintaining maternal health and wellbeing. For multiple pregnancies, there will more intakes of nutrients for good birth weight. Deficient in nutrients leads to low birth weight and longer gestation. Nutritional counseling can help women improve and maximize their intake of “at risk nutrients” such as iron, folate, essential fatty acids, calcium and ensure adequate energy intake to meet weight gain targets. Recommended optimal weight gains range from 16–20kg for twin pregnancies. (Krause, 2011).

Pregnancy increases the demand for many nutrients, particularly iron, folate, essential fatty acids, calcium, vitamin D and energy. Women with multiple pregnancies need to pay particular attention to these nutrients. Deficient in nutrients leads to low birth weight (Agarwal, 2010).

Demands for both iron and folate are significantly greater for multiple pregnancies in order to meet the needs of mother and fetus. In this stage deficient of these nutrients leads to maternal anemia. The incidence of megaloblastic anemia, folate deficiency was eight times greater in multiple pregnancies than in single pregnancy. Iron deficiency anemia was three

times greater in multiple pregnancies than in singleton pregnancy (Spellacy*et al.,* 2011).

Maternal iron deficiency anemia was associated with adverse outcomes such as preterm delivery, higher maternal mortality, poorer maternal immune status, lower birth weight and delayed psychomotor development in infants (singla*et al.,* 2012).

Folate required for DNA synthesis and cell division, it plays a major role in fetus development. Low folate status may increase the risk of preterm delivery, low birth weight and fetal growth restriction. Supplementation with folate in deficient cases was 300µg/day (Scholl, 2010).

Essential fatty acids (EFA) are important structural elements of cell membranes and therefore instrumental in the formation of new tissues. They are vital components of the brain and retina cells and play a potentially important role in the development of mental and visual function. Certain long chain polyunsaturated is also required for the synthesis of prostaglandins. Studies have found lower levels of essential fatty acids in women with multiple pregnancies, leads to impaired growth and neurological development to the fetus (Krause, 2011).

Calcium accretion during pregnancy approximately 30g in singletons, mostly in the fetal skeleton and it deposited during the last trimester. It has been found that the concentration of 1, 25-dihdroxyvitamin D3 is raised during pregnancy, increasing net calcium absorption. Calcium excretion during pregnancy decreases. The requirement for calcium during pregnancy might be partly or entirely hinder by these mechanisms. However the extent to which calcium absorption increases and excretion decreases to support the developing skeletons of more than one fetus is not known. Additional calcium may be required in order to meet requirements. As well as consuming the 2 to 3 serves of dairy foods a day suggested for singleton pregnancies, it is recommended women with multiples take a calcium supplement (Levitin, 2009).

Vitamin D is important for calcium absorption and utilization during pregnancy. Normally, the body's requirements for vitamin D are supplied through exposure to sunlight it should be increased during multiple pregnancies. A risk factor for poor vitamin D status in maternal resulting in an inadequate transfer of vitamin D to the fetus. Babies born with low vitamin D levels are at a high risk of developing rickets. Women at particular risk of vitamin D deficiency include dark skinned. In a recent study conducted in India, vitamin D deficiency was detected in up to 60per cent of dark-skinned (IDA, 2010).

Macronutrients provide greater energy during the pregnancy period. Additional energy is required during pregnancy because of increases in maternal tissues (especially the uterus and breasts) and the growth and development of the fetus and placenta. The extent of additional requirements in multiple pregnancies is 2 times greater than normal adult woman RDA. Energy requirement is needed for daily life activities. Protein requirement is also additionally needed for maintain the tissue development and for synthesis of body mechanism. Deficient in macronutrients made the fetus malnourished and hinder the metabolism activities (Carlson, 2010).

There will be poor appetite and satiety in multiple pregnancies. These are common in the third trimester as an expanding uterus reduces stomach capacity. Women with twins should require more amount energy, high protein nutritional supplements drink, usually from around 28–30 weeks gestation. A very small percentage of women will experience vomiting after eating. This occurs mainly in the third trimester due to a reduced stomach capacity. In multiple pregnancies women with lower intake of macronutrients made fetus malnourished (Lantz *et al.,* 2010).

III METHODOLOGY

Designing a suitable methodology is an important for meaningful analysis of any problem. In this chapter, the materials used and the sampling procedure adopted are given in the following headings,

3.1. Selection of Study Area and Respondents

3.2. Formulation of the Tools

3.3. Socio-Economic and Dietary Survey

3.4. Assessment of Nutritional and Health Status

3.5. Analysis and Interpretation of Data

3.1. Selection of Study Area and Respondents

Before conducting any study related to evaluation of nutritional status the area or place, period and number of respondents should be preplanned and the data on the nature and background of the place and respondents should be systematically collected. The area chosen for the conduct of the study was in Kayalpattinam, Mannapadu, Kulaserapattinam, Thiruchendur, and Udangudi of Thoothukudi District in Tamil Nadu, due to the familiarity of the investigator with these areas.

Using systematic purposive sampling technique, the target groups of pregnant adult women were selected from the fishery area of Kayalpattinam, Mannapadu, Kulaserapattinam, Thiruchendur, and Udangudi of Thoothukudi District for the study. Every house having pregnant woman in the target area was surveyed. Pregnant women in the selected houses were included in the study, till the required number of the subjects was obtained. A total of 100 subjects were identified and included for household survey.

3.1.1. Ethical Clearance of the study

The application form explaining the experimental design and protocols used in the research study was submitted to the Institutional Human Ethics Committee and Ethics Clearance (IHEC). The approval

number for the present study AUW/IHEC-13-14/XPD-03 and was obtained (Appendix II)

3.2. Formulation of the Tools

According to Kolhari (2010),the interview schedule is a proforma containing a set of questions and is very useful in gathering information. It is generally by the researcher or the enumerators who are specially appointed for this purpose. Therefore, interview schedule I (Appendix I) was used for household survey.

Household survey was conducted among 100 families in Thoothukudi District, to gather information on socio economic and dietary pattern and also the nutritional and health status of the selected subjects. The investigator visited the subjects personally and collected information using the interview schedule (Plate I). Depending upon the convenience and time availability of the target subjects, they were either interviewed directly by the investigator or the forms were distributed and collected after specified time duration.

PLATE I – CONDUCT OF THE HOUSEHOLD SURVEY

3.3. Socio-Economic and Dietary Survey

As the socio- economic status formed the main non nutritional causative factor for defining or affecting the nutritional status of the population. Socio-economic status of the selected target group was elicited using the household survey. The household survey was conducted by interview method using the questionnaire which was specially designed for the study. The questionnaire developed by Anjana (2011), and Kumar (2012), were used in designing the schedule for household survey. The respondents were contacted individually and the objectives of the study were explained to them commencing the data collection to ensure their co-operation. The respondents were used to collect the information regarding socio economic profile in terms of age, nature of the family, family size, educational status, occupation, income and wealth and household expenditure, dietary and their life style pattern.

Information on methods of cooking, additional information on preparation techniques and dietary pattern was collected. Information related to food habits, food intake, nature and frequency of their physical activity, food pattern during healthy and illness conditions were noted.

All the subjects were personally interviewed with the help of traditional health workers and the relevant data were collected. Maximum reliability of the data was ensured by questioning and cross questioning the subjects. These traditional health workers are capable of attending delivery, taking care of newborn babies and are aware of immunization against infective diseases.

3.4. Assessment of Nutritional and Health Status

Assessment of nutritional status is a comprehensive evaluation of a person’s health status using socio economic, health, drug and diet history, anthropometric measurements, biochemical estimation and clinical examination.

For the present study, nutritional status of respondents was assessed by Anthropometric Measurements (height, weight, body mass index), Clinical Examination (clinical signs and symptoms, diet survey, illness and treatment), Biochemical estimation and Biophysical Examination. Anthropometry and clinical indicators can be used to assess nutritional status were considered as a measure of health status.

Data was collected based on their health, choice of treatment, presence of disorder like diabetes, hypertension, or any deficiency illness such as anemia, fatigue and so on and their remedial measures were noted.

3.4.1. Anthropometric Measurements

Anthropometric measurements mean body measurements and provide information on body muscle mass and fat reserves. Human body reflects the changes in morphological variation due to inappropriate intake food and nutrients. Information on this aspect is therefore important and has practical applications. Anthropometric measurements namely height and weight for the pregnant women were taken as described by ICMR (2010) and Body Mass Index was also calculated. Two trained investigators took each anthropometric measurement, twice separately and the mean value was considered for documentation (Plate II).

3.4.1. a. Height

Height of an individual is principally a measure of skeletal bony tissue (Jelliffe and Jelliffe, 1989) and also consider as the measure of long standing nutritional deprivation. Each of therespondents was made to stand erect on the ground level with heels together and arms hanging without foot wear. Therespondent was made to lean on a smooth wall in which markings up to 0.1cm, accuracy was made. The occiput Shoulder, buttock and hell were made to be in the same plane and perpendicular to the ground. The rod was held on the back of the respondent name and it was held vertical and parallel to the mid-sagital plane. Thereading was taken by keeping a head

piece (wooden) gently on the head (vortex region). The line coinciding the wooden piece and reading were recorded accurately up to 0.1 cm.

3.4.1. b. Weight

Body weight is the most unduly used simplest, reproducible anthropometric measurement for the evaluation of nutritional status of the population (Jelliffe and Jelliffe, 1989). It is more sensitive measure of nutritional adequacy than that of height reflects recent nutritional status. Weight also provides a crude evaluation of overall fats and muscle stores (Brahman, 2005). An accurate portable balance was used to record the weight of the respondents. If any person is retaining fluid or is dehydrated, the assessment of body weight can be misleading and were avoided at the point of recording time. The subject stood straight on the balance, bare footed without touching anything knees straight and looking forward. The readings were carefully recorded with accuracy of 0.1 kg.

Recording Height of

The Respondents

Recording Weight of

The Respondents

PLATE II - ANTHROPOMETRIC MEASUREMENTS OF THE RESPONDENTS

3.4.1. c. Body Mass Index

The condition of adult malnutrition was assessed by specifying the different degrees of underweight expressed as the Body Mass Index (BMI). After the cessation of linear growth around 21 years, weight indicates muscle and fat mass in the adult body. The ratio of weight in kg/ height ^{2} in meter is referred as Body Mass Index (BMI). BMI has good condition with fatness. It may also used as an indicator of health risk. The weight and height were recorded to calculate BMI of the respondents. This ratio is commonly used in evaluating obesity and underweight states in relation to risk factors, the procedure followed by WHO(2010) was used and given in the Table I

Table I

WHO classification for BMI

Classification	**BMI (Kg/m²)**
Under weight	<18.5
Normal	18.5-24.9
Over Weight	**≥25.00**
Obese	**≥30.00**
Grade I obesity	30.00-34.99
Grade II obesity	35.00-39.99
Grade II obesity	>40.0

3.4.1. d. Waist Circumference

Although BMI provides a sample, convenient measurement of obesity, more important aspect of obesity is the regional distribution of excess fat. Methods for evaluating abdominal fat include waist circumference (Bagchi and Preuss, 2007). According to Bray and Rayan (2006), measuring the change in waist circumference is a god tool for indicating the progress of weight loss. Waist circumference of the selected respondents was carefully recorded.

3.4.1. e. Waist – Hip Ratio

Morris (2010) revealed that waist to hip ratio differentiates between android obesity (apple shape) where there is an accumulation of fat in the abdominal area and gynoid obesity (pear shape) where fat is concentrated in the hips and thighs. The distance around the smallest girth below the rib cage and above umbilicus (belly button) is a measure of waist circumference. Waist circumference was measured by using a non stretchable fibre glass tape around the body the upper hip bone .Hip circumference should be measured around the widest portion of the buttocks, with the tape parallel to the floor.

The predominant distribution of fat in an person, whether in the upper part or the lower part of the body, may determine the disease pattern. Table II gives the waist hip ratio and health risk

Table II

Waist Hip Ratio and Risk

Waist Hip Ratio	Health Risk
< 0.80	Low risk
0.81 -0.85	Moderate risk
>0.85	High risk

3.4.2. Clinical Examination

Clinical examination is based on examination for changes believed to be related to inadequate nutrition that can be seen or felt in superficial epithelial tissues, skin, eyes, hair, buckle, muscles or in organs near the surface of the body (Jelliffe and Jelliffe, 1989). Clinical examination was conducted for the selected respondents using the questionnaire prescribed by Indian Council of Medical Research, New Delhi, India. Clinical Examination is a very important aspect to determine the nutritional status of individual. Data on general appearance of the respondent, condition of eyes, mouth, teeth, tongue, lips, gums, hair, skin and bones were recorded for each respondent during the study period.

3.4.3. Diet Survey

Individual dietary intake by was recorded 24 hours recalls method. According to Bamji et, al (2013), diet is a vital determinant of health and nutritional status of an individual. Precise information on food consumption pattern of people through application of appropriate methodology of often needed, not only for assessing the nutritional status of the population but also for calculating the relationship of nutrient intakes with deficiency as well as degenerative diseases. The data on dietary intake was collected through

24 hours recall method from each of the respondent for three consecutive days. To know the actual intake of foods, dietary survey was conducted during the study period excluding holidays, festivals and other special occasions.

The quantities of various food items consumed for each meal (breakfast, lunch, snack items and dinner) by each subject was obtained by interviewing the respondent. The respondents were asked to repeat the menu items a couple of times and the collected data was checked. Leftover portions and amounts of foods wasted were also considered in order to know the exact amount of food consumed by the respondents. Food eaten outside the home, for instance, in the tea stall, cafeteria, theatre and other place was also recorded. Information was collected on how often certain foods were eaten. Food items consumed outside by the respondent were purchased separately from the shop of the same area and were weighted and recorded. Any food eaten in between breakfast, lunch, tea or dinner was also recorded which were not always regarded as food. Data on consumption of coffee, tea and other beverages were also included. “Nutritive Value of Indian Foods” by Gopalan*et al* (2013), the nutrient intake of each individual was computed for three consecutive days. From these values, the mean food and nutrient intake was calculated and compared with the RDA suggested by ICMR to assess the excess/deficit of food and nutrient intake by the selected respondents.

3.4.4. Biochemical Estimation

According to Gordon (2010), biochemical tests are the most objective and sensitive measures of nutritional status. Biochemical tests helped to detect deficiencies before symptoms are clinically evident. Biochemical estimation helps to confirm clinical and dietary data, so that diagnosis can be made and nutritional and medical care and be planned and implemented effectively.

Blood is the primary tissue examined because it is the means of transporting nutrients, metabolites and waste products. Ten milliliter of

venous blood was drawn using separate disposable syringe by qualified medical technician and transported to the laboratory where analysis were done. Standard methods used for the analysis of the following blood parameters.

3.4.4. a. Haemoglobin Estimation

Determination of iron is an useful index of overall status of nutrition irrespective of its significance in anemia. Hemoglobin concentration (g/dl) by standard cyanomethaemoglobin method as suggested by Varley (1998)

3.4.4. b. Estimation of Blood Glucose level:

Determination of glucose level in blood is a useful index of overall status of nutrition irrespective of its significance in diabetes. The blood sample is collected the respondents and blood glucose level is estimated by using Glucometer method by (Kimberley, 2010).

Estimating Haemoglobin Level of the Respondents

Estimating Blood Glucose Level of the Respondents

PLATE III – BIOCHEMICAL ESTIMATION OF THE RESPONDENTS

3.4.5. Bio Physical Examination

3.4.5. a. Blood Pressure

Blood pressure (BP), referred to as arterial blood pressure, is the pressure exerted by circulating blood upon the walls of blood vessels. "Blood pressure" usually refers to the arterial pressure of the systemic circulation. During each heartbeat, blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure. Mean blood pressure decreases as the circulating blood moves away from the heart through arteries and capillaries due to viscous losses of energy. Mean blood pressure drops over the whole circulation, although most of the fall occurs along the small arteries and arterioles. Blood pressure without further specification usually refers to the systemic arterial pressure measured at a person's upper arm and is a measure of the pressure in the brachial artery, the major artery in the upper arm. A person’s blood pressure is usually expressed in terms of the systolic pressure over diastolic pressure and is measured in millimetres of mercury (mmHg), and given in Table III

Table III

Categories for Blood Pressure Levels in Adults

Category	**Systolic pressure (mmHg)**	**Diastolic pressure (mmHg)**
Hypotension	< 90	< 60
Desired	90–119	60–79
Prehypertension	120–139	80–89
Stage 1 Hypertension	140–159	90–99
Stage 2 Hypertension	160–179	100–109
HypertensiveEmergency	≥ 180	≥ 110

PROCEDURE

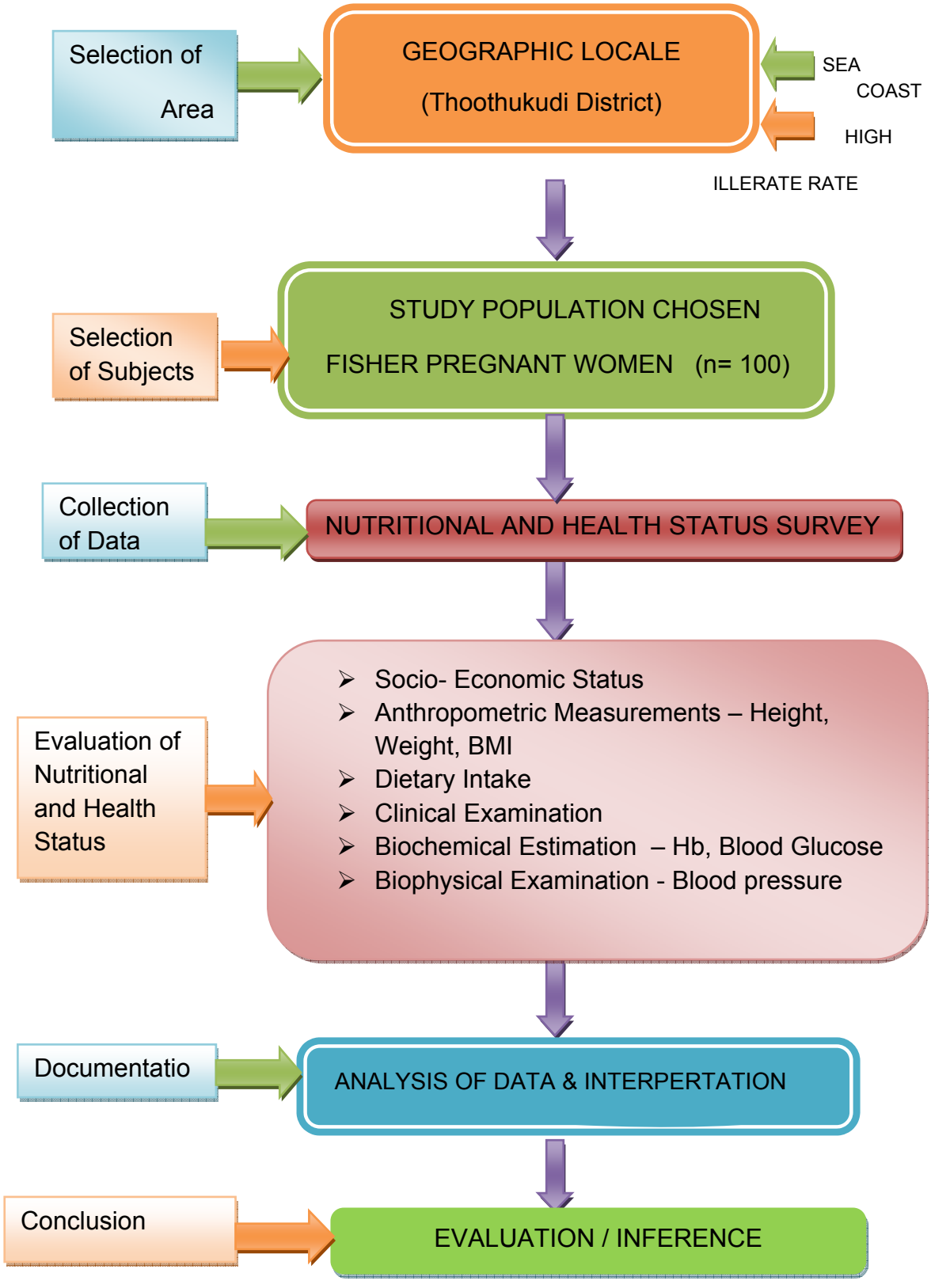
By observing the mercury in the column while releasing the air pressure with a control valve, one can read the values of the blood pressure in mm Hg. The peak pressure in the arteries during the cardiac cycle is the systolic pressure, and the lowest pressure (at the resting phase of the cardiac cycle) is the diastolic pressure. A stethoscope is used in the auscultatory method. Systolic pressure is identified with the first of the continuous Korotkoff sounds. Diastolic pressure is identified at the moment the Korotkoff sounds disappear. Misrin, (2012) and blood pressure of the selected respondents were recorded carefully to assess the health status.

3.5. Analysis and Interpretation of data

The data collected from the formulated tool (questionnaire) for this study was first consolidated. The consolidated data was subjected to various statistical analysis. The statistical tests used to analyse the data were standard deviation, mean and percentage.

The results of the above tests were interpreted and were then graphically represented in a systematic manner using pie and bar graph as diagrammatic representation of data to understand and interpret the results easier and faster.

RESEARCH DESIGN



IV RESULTS AND DISCUSSION

In this chapter, the results of the present investigation**, "Nutritional and Health Status of Pregnant Fisher Women in Thoothukudi district"** are highlighted and discussed under the following headings.

4.1 Socio – Economic Status

4.2. Food and Nutritional Profile

4.3. Health Status

4.4. Assessment of Nutritional Status

4.1. Socio – Economic Status

The socio – economic status of selected respondents family was assessed by the questionnaire developed for this study. The type of the family, family size, educational and occupational status, income, and other personal information of the respondents families were collected and clearly interperated.

4.1.1. Age range of the selected respondents

Information on the age of the selected respondents were observed and given in Table. IV

Table IV

Age range of the selected respondents

Age Range (yrs)	Number (n = 100)	Per cent
20-23	35	35
24-27	43	43
28-31	22	22

It could be seen from the Table IV that the age range of the selected respondents were 35, 43 and 22 per cent of them were in the age range of 20-23, 24-27, and 27-31 categories respectively. Hence majority of the respondents fall in the age group of 24 to 27 and their mean age was 24.7 years.

4.1.2 Type and size of family of the selected respondents

Details of type and size of the families of the selected respondents are given in Table V

Table V

Type and Size of the families

Type and size of family	Number (n = 100)	Per cent
Types of family		
Nuclear Family	67	67
Joint Family	33	33
Size of family		
1-4	57	57
5-9	43	43

It could be seen from Table V that 33 per cent of the respondents were in joint family system and 67 per cent of the respondents lived in nuclear families. It denotes the urbanization of the society and privacy of the people. It is clearly shown that the nuclear families were the most predominant among the families survey.

Studiesconducted in all over India reported that 72 per cent of Indian women prefered to live in a nuclear family (The Times of India, 2013)

Fifty seven per cent of the families had 1-4 members and 43 per cent of families comprised 5-8 members. These data coincided with type of families in which majority of them were in nuclear family. This data was also related withthe study of Gibson (2009).

4.1.3. Family income

Family income is an important factor which influences the dietary and health profile of an individual. Family income is also considered as a primary measure of a nation's financial prosperity

Table VI

Family income of the selected respondents

Income of the Family (Rs)	Number (n = 100)	Per cent
>5000	25	25
5000-10000	63	63
<10000	12	12

Table VI shows that 63 per cent of them had the monthly income ranging from Rs. 5000 – 10000 and 25 per cent of the respondents had an income of below Rs. 5000 whereas 12 per cent of them had an income of above Rs.10000. Hence it was concluded that most of the families were belonged to lower middle income group (HUDCO, 2011)

4.1.4. Expenditure pattern

Monthly expenditure pattern of the families is the real reflection of their economic status. Monthly expenditure incurred by the families is shown in Table VII.

Table VII

Expenditure Pattern

Expenditures	**Number(n= 100)**	**Per cent**
Food		
a) Rs. 0 - 1000	40	40
b) Rs.1001- 2000	38	38
c) Rs.2001- 4000	19	19
d)Rs. 4001- 5000	3	3
Education		
a) Rs. 0 - 1000	60	60
b) Rs.1001- 2000	29	29
c) Rs.2001- 4000	11	11
Clothing		
a) Rs. 0 - 500	68	68
b) Rs.501- 2000	22	22
c) Rs.1001- 2000	10	10
Rent / House Tax		
a) Rs. 0 - 1000	79	79
b) Rs.1001- 2000	11	11
c) Rs.2001- 4000	6	6
d) Rs. 4001- 5000	4	4
Medicine Expenditure		
a) Rs. 0 - 1000	74	74
b) Rs.1001- 2000	16	16
c) Rs.2001- 4000	10	10

It is clearly seen that 40 and 38 per cent families had spent Rs. 0 – 1000 and Rs.1001- Rs.2000 respectively per month for purchasing food items whereas 22 per cent of the families had spent more than 2000 per month for food. This denoted the Engel's Law of Consumption "As the income increases, the proportion of the income spends for purchasing food decreases"

For Education, the majority of the families had spent 60 and 29 per cent of the families had spent Rs. 0 – 1000 and Rs.1001-Rs.2000 respectively per month for their children education.

For clothing, majority of the families (68 per cent) had spent Rs. 0 - 500 per month for their clothing purposes. For housing purposes, the majority of the families had spent Rs. 0 – 1000 per month on rent and rest of the families (21 per cent) had their own houses and paid house taxes. For medicine, all the families had spent Rs. 0 – 1000 on medicine and most of them availed medicines from the Government hospitals/ Primary health centres.

4.2 Food and Nutritional Profile

For pregnant women whose diet has conformed to the "Basic Five Food" pattern, it is merely a matter of emphasizing the more nutrient dense foods within each of the five food groups. Adequate nutritional status and good dietary intake during preconception and pregnancy have been recognized as major contributors to healthy birth outcomes(Srilakshmi, 2013)

4.2.1. Type of diet

The collected data indicates that 97 per cent of the selected respondents were non vegetarians and only three per cent of them were vegetarians. The reason for this type of dietary pattern was accounted to geographic locale as it is near to the sea shore. Abundant availability of sea foods is easier and cheaper manner, made to consume more sea foods items especially fish and dried fish. As the results the selected subject were

not concentrated to consume plant origin food items like green leafy vegetables, other vegetables, fruits and so on.

4.2.2. Food intake pattern

Most of the respondents included nonvegetarian foods especially sea foods (95%) in their daily diet. They also expressed that the non vegetarian foods are more nutritious than vegetarian foods and also pointed out their poor socio economic status also permitted to purchase locally available low cost sea foods. At the same time they were not willing to spend more money to purchase plant food items. In these conditions, intake of vegetables and GLV was comparatively (60%) lower than the ICMR – RDA (2010)

Majority of them liked to have spicy foods in their daily diet. They did not have a habit of nibbling between the meals. In their meal pattern they adopted three meals pattern daily. It is also interesting to note that none of them were taking food from outside food lets and did not skip their meals.

4.2.3. Special foods consumed during pregnancy

All the pregnant women of the low income group reported that though they were aware that nourishing foods such as milk, pulses, fruits and vegetables were essential for healthy pregnancy but they could not incorporate any of these items in their diets due to their financial constraints and not easy availability. However, the pregnant women had taken extra quantities of sea foods as the protein rich food.

4.2.4. Food cravings and aversions during pregnancy

Food cravings and aversions are common during pregnancy irrespective of the different income groups. Seventy per cent of pregnant women expressed craving for sour and sweets while respect of them preferred to have savoury food items. Nearly 90 per cent of them reported to had aversion towards egg, meat and pulses.

4.2.5. Omission of foods due to beliefs

Although modernization and education have clearly played some role in changing the dietary pattern of the pregnant women traditional dietary patterns and beliefs are still evident in many pregnant women irrespective of their levels of income. Eighty eight per cent of them expressed that papaya, pine apple and jack fruit were avoided in their dietaries for the fear of abortion. Mango, sesame seeds and millets thenai were omitted by 42 per cent because they believed that these are hot foods which may cause abortion.

4.3. Health Status

Assessment of nutritional status is a comprehensive evaluation of a person's health status using socio economic, health, drug and diet history, anthropometric measurements, biochemical estimation and clinical examination.

4.3.1. Information related to weight gain during pregnancy

A healthy woman gains on an average about 11-12 kg during pregnancy. The usual pattern of weight gain consists of a minimal gain of 1-2 kg during the first trimester and a more or less, linear rate of 0.4 kg/ week in the second and third trimester. While low weight gain in pregnancy is associated with higher incidence of prematurity and low-birth weight, excess weight gain is associated in the complications like pregnancy induced hypertension, termed as toxemia leading to perinatal deaths due to prematurity (Bamji *et., al* , 2012).

Table VIII

Mean weight gain during pregnancy

Mean weight gain (Kg)		
I TRIMESTER	**II TRIMESTER**	**III TRIMESTER**
0.5 – 2.0	3.0 - 6.0	6.0 - 9.0

From the data, it is evident to note that the weight gain in the first, second and third trimester were ranged between 0.5–2.0 kg, 3–6 kg, and 6–9 kg respectively. When compared to normal weight gain in pregnancy (11-12 kg) the selected respondents had only 50-75 per cent in their weight gain in pregnancy.

FIGURE II - MEAN WEIGHT GAIN DURING PREGNANCY

4.3.2. General dietary problems faced during pregnancy

Maternal height and weight affect intrauterine growth through either genetic or environmental mechanisms. Part of the mothers genetic potential would be passed on to the foetus and any deficit in her stature regardless of its foetus and any deficit in her stature regardless of its etiology could impose limitations on the growth of the uterus, placenta and foetus. Table IX highlights the common complications occurred during pregnancy of the selected respondents.

Table IX

General dietary problems faced during pregnancy

Dietary problems	**NO**	**%**	**Measures Taken**
Nausea and Vomiting	17	17	Avoiding food which induce Vomiting and Nausea and advice to take simple, dried, starchy foods and fruits
Constipation	40	40	Including fluids and fiber rich foods ,taking medications and adopt simple physical exercise
Edema	32	32	Drinking Barley water in morning and restrict sodium content of their daily dietaries
Heart burn	45	45	Not sleeping after taking food and having simple walking exercise

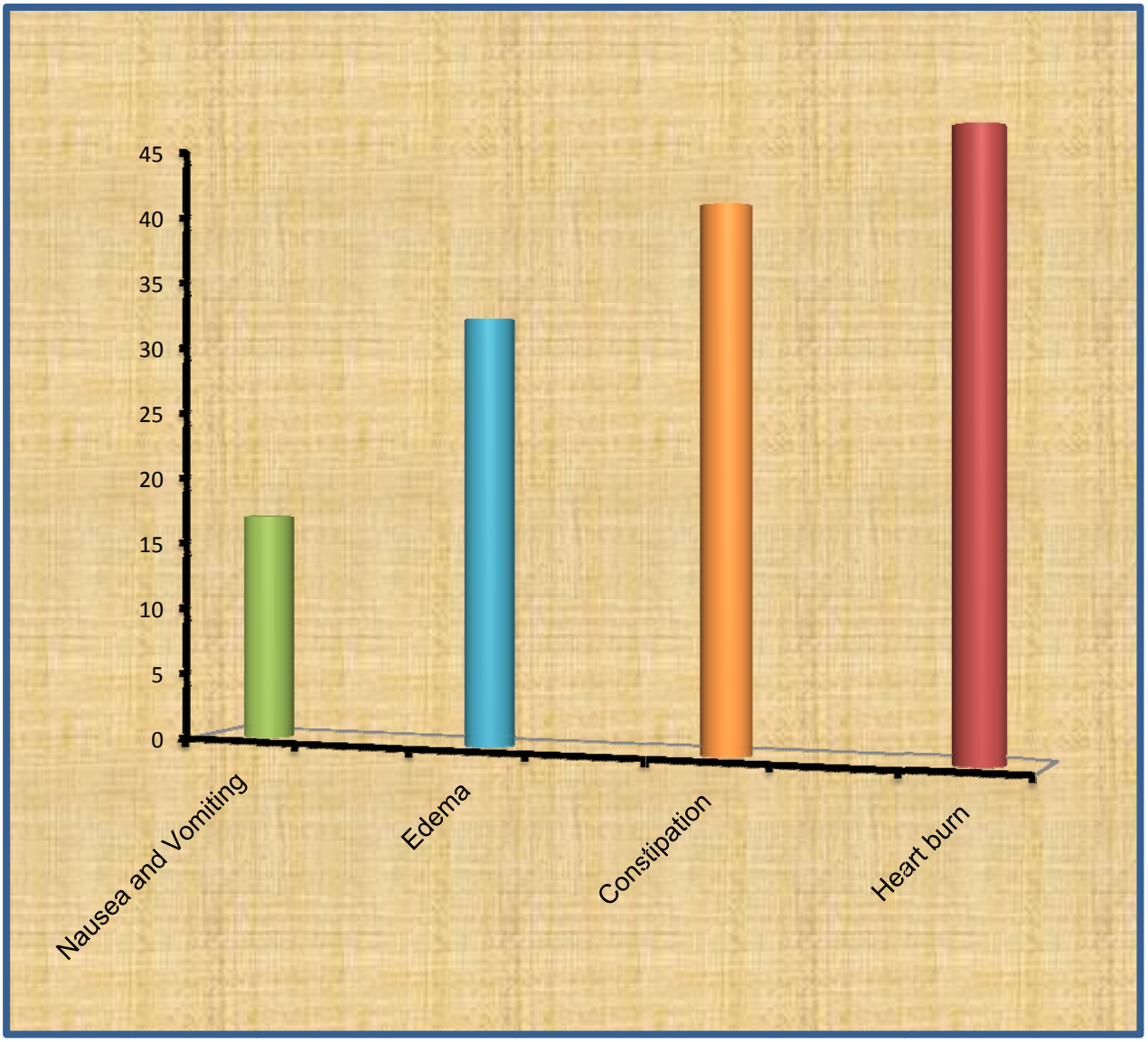


FIGURE III - GENERAL DIETARY PROBLEMS FACED DURING PREGNANCY

Primary Health Centre was located nearby their area. Pregnant women were advised to visit the PHC weekly in one day to know the details regarding their Weight gain, Haemoglobin level, Blood pressure and general check-up. Most of them (90%) were regularly visited and benefited out of these facilities. And nearly 67 per cent had normal delivery of their first babies and nearly 33 per cent had cesarean due to the complications at their delivery time.

Psychologically, the respondents were happy with their family members and community celebrations. They also expressed their happiness towards the "Valaikappu" function.

4.3.3. Foods given and avoided during illness

The following Table X shows the special foods given and avoided during their illness like fever, diarrhea and common cold and cough

Table X

Foods given and avoided during illness

ILLNESS	FOODS GIVEN	REASONS	FOODS AVOIDED	REASONS
Fever	Kanji	Easy digestion	Fired items	Digestive problems
Diarrhea	Black tea	To stop diarrhea	Fired items & milk and milk products	Digestive problems
Common cold and cough	Hot drinks	To have relief	Cold items	Aggravate infection

Above Table shows that majority of the respondents took easy digestable foods in special conditions. The alteration of the normal diet requires an appreciation of the underlying disease condition which requires a change in the diet, the possible duration of the diseases. The normal diet may be modifiedto provide change in consistency as in fluid and soft diets to increase or decrease the energy value (Srilakshmi, 2013).

4.4. Assessment of Nutritional Status

In the per cent investigation, nutritional status of respondents was assessed by Anthropometric Measurements (height, weight, body mass index), Clinical Examination (clinical signs and symptoms, diet survey, illness and treatment), Bio physical Examination and Biochemical Estimation were considered as a measure of health status.

4.4.1. Anthropometric measurements

The patterns of growth and the physical state of the body though genetically determined are profoundly influenced by diet and nutrition. A set of noninvasive, quantitative techniques (called Anthropometric measurements) for determining an individual's body fat composition by measuring, recording, and analyzing specific dimensions of the body, such as height and weight; skin-fold thickness; and body circumference at the waist, hip, and chest were taken, during the period of study.

4.4.2. Weight and Height of the respondents

Maternal height and weight affect intrauterine growth through either genetic or environmental mechanisms. Weight and Height of the selected respondents were given in Table XI

Table XI

Weight and Height of the selected respondents

Weight (Kg) and Height (cm)	**Number (n = 100)**	**Per cent**
Range of weight (kg)		
45 – 49	7	7
50 – 54	20	20
55 – 59	73	73
Range of Height (cm)		
140-150	15	15
151-160	65	65
161-170	20	20

It could be seen that seven per cent of respondents were in the weight range of 45-49 Kg and 20 per cent and 73 per cent in the range of 50-54 Kg and 55-59 Kg respectively. This indicates that the respondents were not obesed and revealed that they were under weight in their pre conception term.

The collected data revealed that height of the selected respondents was ranged from 143-168 cm. Nearly 15 Per cent were in the height range of 140-150 cm and 65 per cent of the respondents were in the range of 151-160 cm. About 20 per cent of them were in the range of 160 and 170cm. Using maternal height and weight of the selected respondents, BMI of the selected respondents were calculated and given in Table XII

Table XII

Body Mass Index of the selected respondents

Body Mass Index (Kg/m2)	**Criteria**	**Number (n= 100)**	**Per cent**
<18.5	Under Weight	14	14
18.5- 22.9	Normal	86	86
23-24.9	overweight	-	-

From the Table XII, it is interesting to note indicates that 14 per cent of the women were under weight and 86 per cent of the respondents had normal body mass index (BMI). This is an indication of normal health status. The high prevalence of underweight among pregnant women represents a competing public health problem.This ratio is commonly used in evaluating obesity and underweight states in relation to risk factors, the procedure followed by (WHO, 2010)

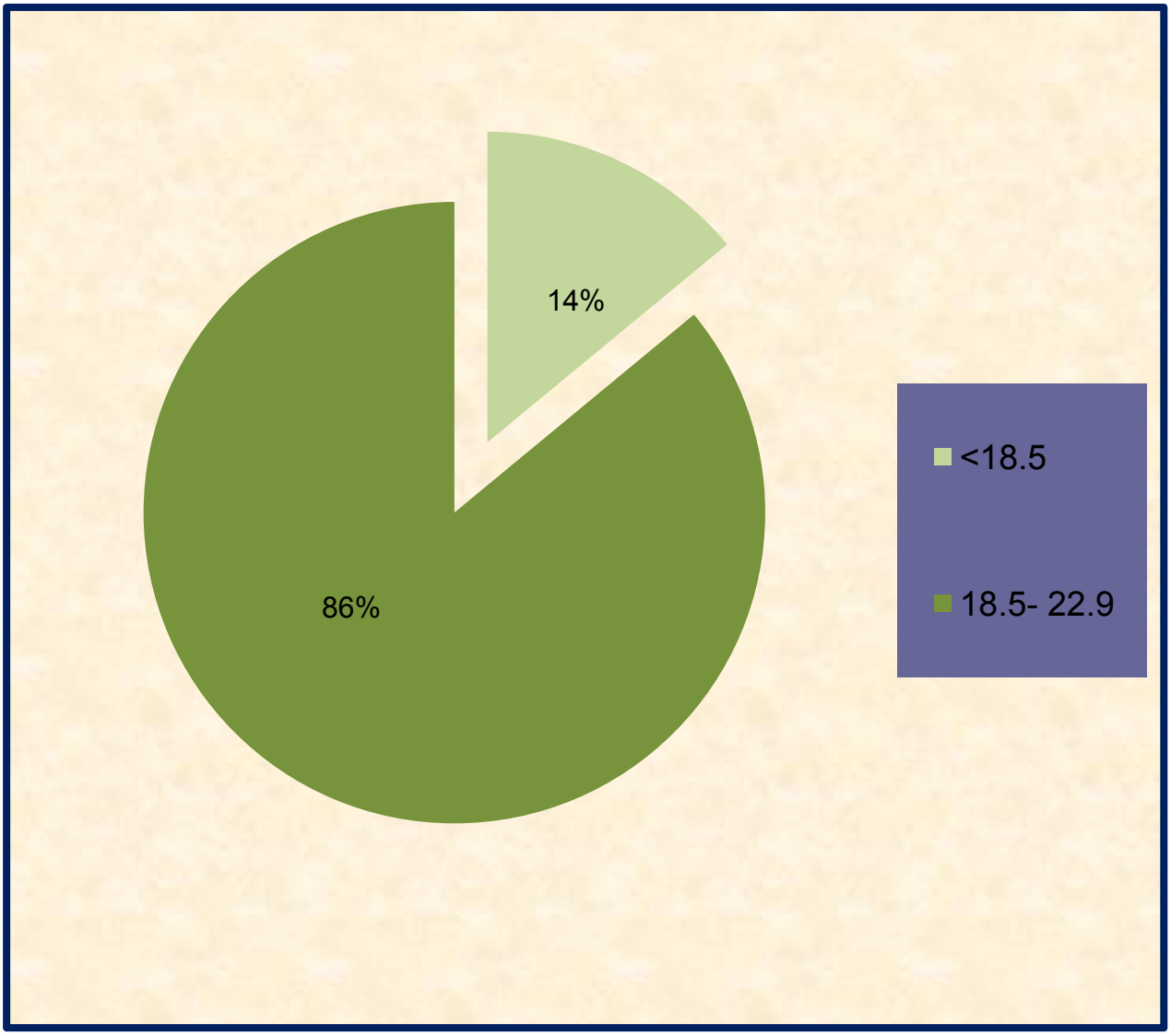


FIGURE IV -BODY MASS INDEX OF THE SELECTED RESPONDENTS

4.4.3 Food and Nutrient intake of the selected respondents

Food consumption is one of the important determinations to assess the nutritional status. Hence dietary assessment forms an integral part of nutrition surveys. The nutrient intake was summed up and the average was taken for the study. Nutrients calculated for the study were protein, energy, fat and Carbohydrate, calcium and iron. The mean actual intake of respondents was computed and compared with ICMR–RDA (2010)

Table XIII

Mean food intake pattern of the selected respondents

Food Items	ICMR- RDA (g/ml)	Actual Intake (g/ml)	Excess/ Deficit (+/-)
Cereals & Millets	270	180	-90
Pulses	60	40	-20
Milk & Milk Products	500	100	-400
Roots & Tubers	200	130	-70
GLV	150	60	-90
Other vegetables	200	100	-100
Non Vegetarian	140	200	+70
Fruits	200	100	-200
Sugar & Jaggery	20	15	-5
Fats & oils	30	20	-10

Table XIII represents the mean food intake of the selected respondents. Table XIII coincided with Table XIV nutrient intake pattern of the selected respondents.

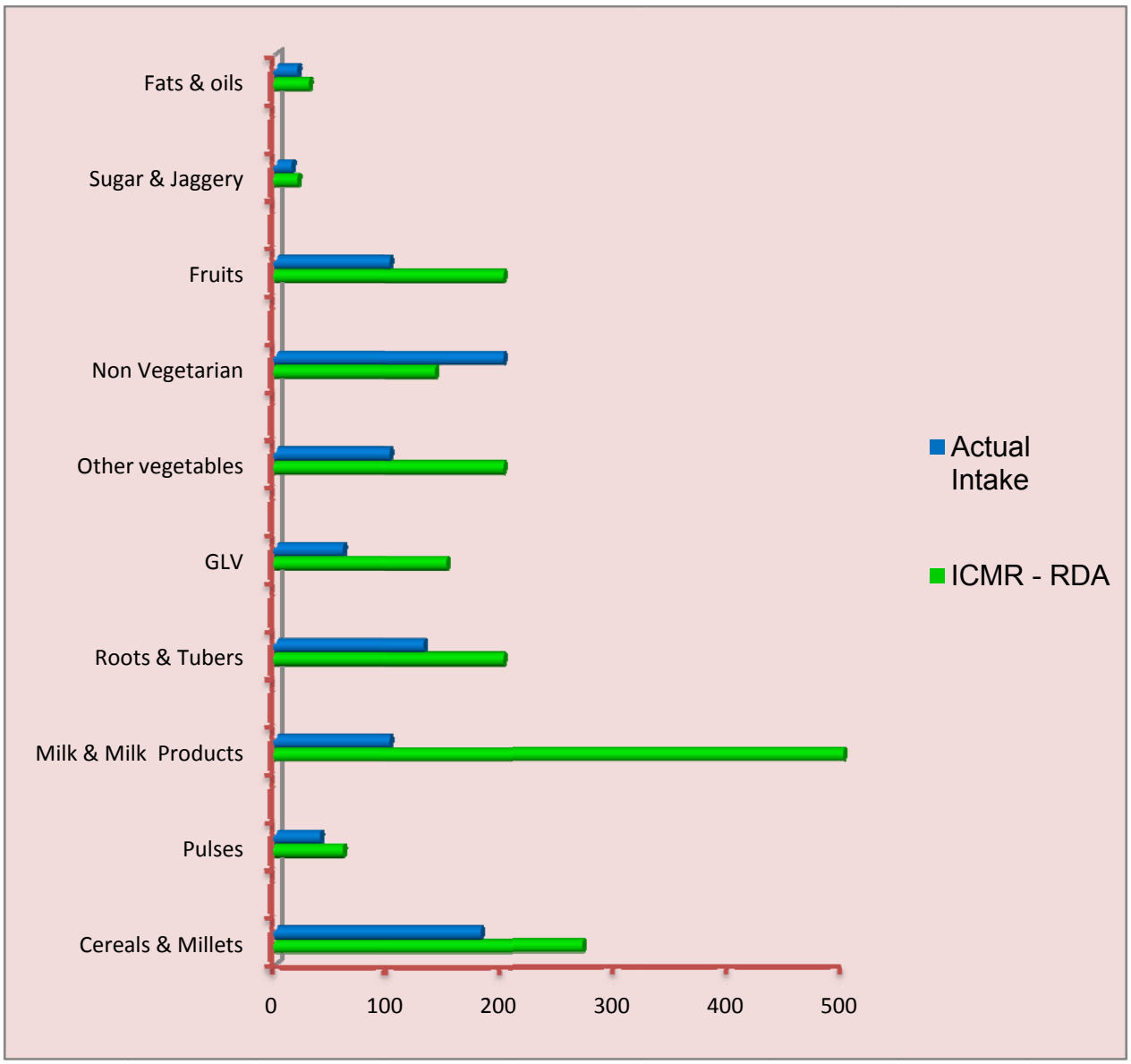


FIGURE V - MEAN FOOD INTAKE OF THE SELECTED RESPONDENTS

Table XIV

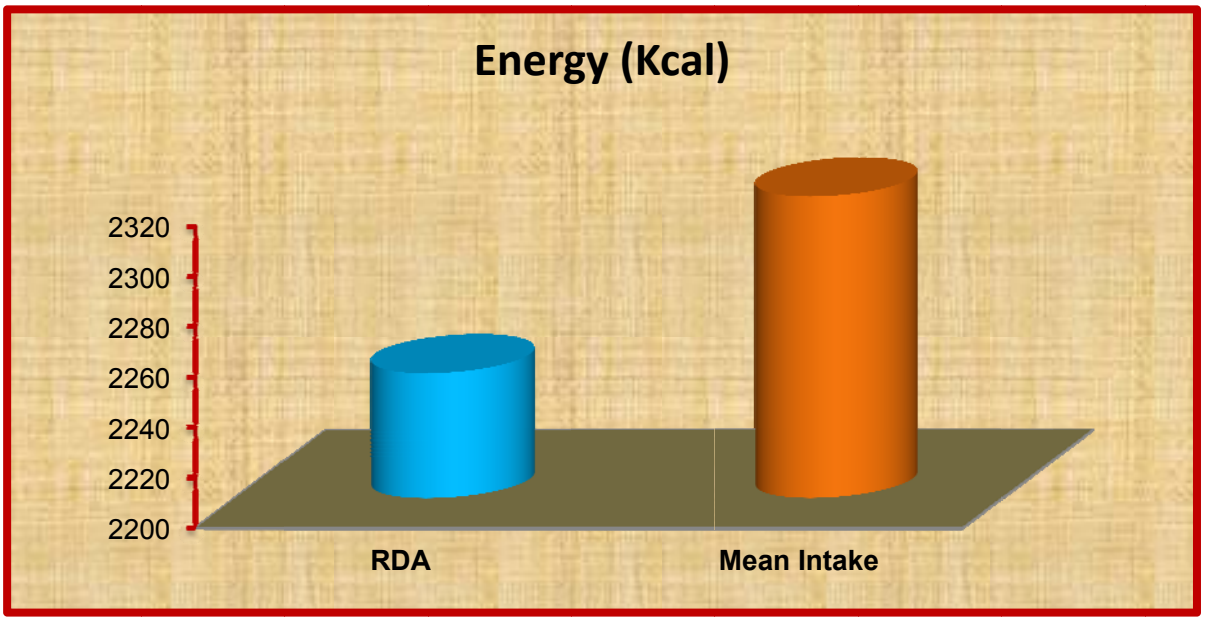
Mean Nutrient intake of the selected respondents

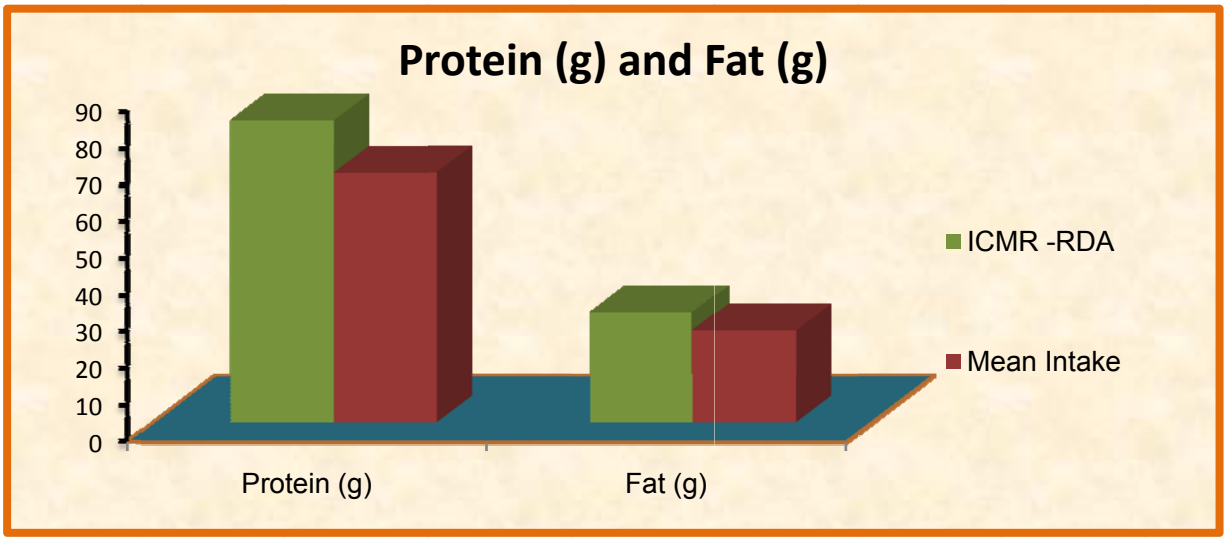
Nutrients	ICMR- RDA	Actual Intake	Excess /Deficit
Energy (Kcal)	2250	2320	+70
Protein (g)	82.2	68	-14.2
Fat (g)	30	25	-5
Calcium (mg)	1200	900	-300
Iron (mg)	35	20	-15
B- carotene (mcg)	6400	2945	-3455
Thiamine (mg)	1.2	0.93	-0.27
Riboflavin (mg)	1.4	0.98	-0.42
Vitamin B_{12} (mcg)	1.2	0.87	-0.33
Vitamin C (mg)	60	43	-17
Folic Acid (mcg)	500	297	-203

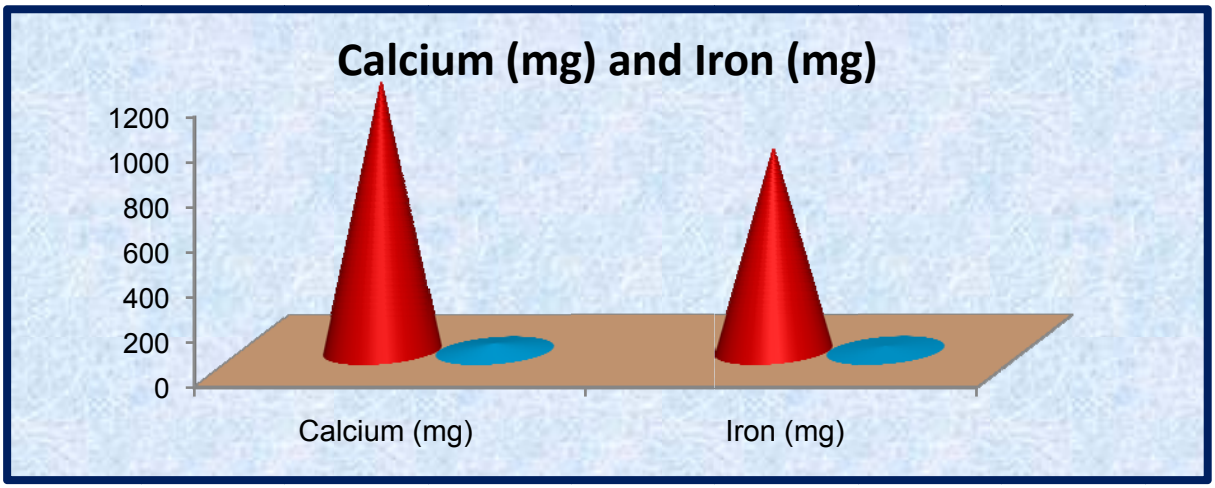
The carbohydrate provides the necessary energy to the body which is used for the body activity. The diet mean intake of the selected respondents was met by the requirements. In fact, they had excess intake of carbohydrates

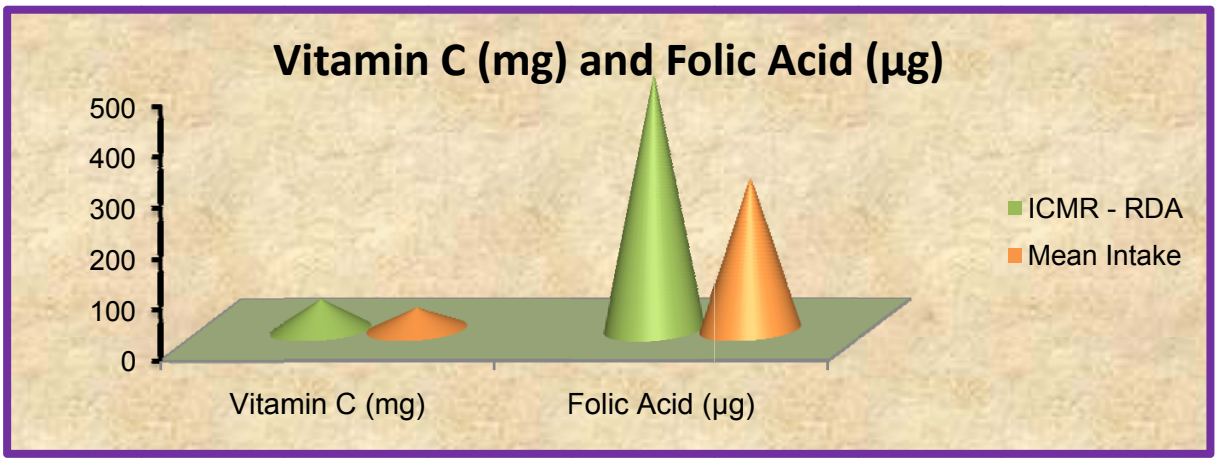
Protein plays an important role in biochemical, biophysical and physiological process in the body. Its helps to maintain tissue repairing and are called as body building foods. Protein requirement was not fulfilled the intake of the selected respondents. The intake of protein was 14 per cent lower than the ICMR suggested RDA (2010).

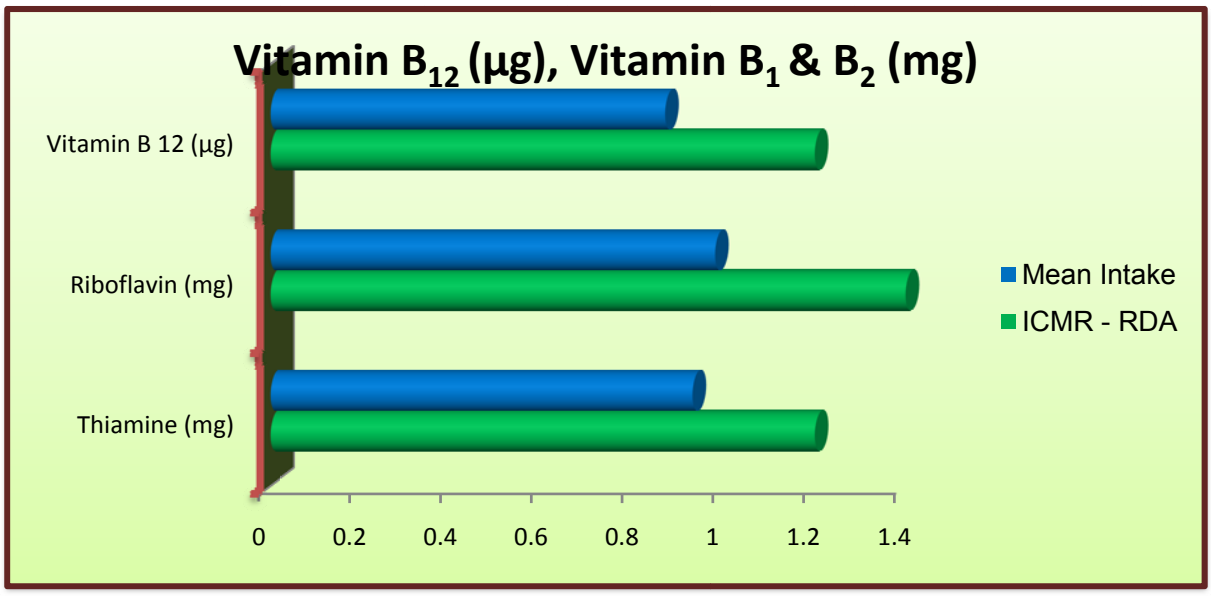
FIGURE VI -MEAN NUTRIENT INTAKE OF THE SELECTED RESPONDENTS






Calcium (mg) and Iron (mg)
1200
1000
800
600
400
200
0
Calcium (mg)
Iron (mg)


Vitamin C (mg) and Folic Acid (µg)
500
400
300
200
100
0
Vitamin C (mg)
Folic Acid (µg)
ICMR - RDA
Mean Intake


Vitamin B12 (µg), Vitamin B1 & B2 (mg)
Vitamin B 12 (µg)
Riboflavin (mg)
Thiamine (mg)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Mean Intake
ICMR - RDA

In the body, fatty acids, are used for generation of cellular energy and biosynthesis of membrane lipids and lipid mediators and are essential in development of central nervous system, modulate lipoprotein metabolism and risk for diet-related non-communicable diseases namely, coronary heart disease (CHD), diabetes and cancers. The intake of fat was 15 per cent lower than the ICMR – RDA (2010).

Water soluble vitamins have significance for optimal pregnancy outcome. Among these vitamins, folic acid requirements are increased in pregnancy in response to the demands of maternal erythropoietin, fetal and placental growth. But intake of water soluble vitamins like thiamin, riboflavin and vitamin C content of the selected respondents were lower than ICMR - RDA. Intake of Folic acid was also found to be lower than ICMR – RDA (2010). Among selected respondents, the intake of iron and calcium were lower than the ICMR-RDA (2010).

A study was carried out by Chhabra and Verma (2010), the average daily intake of cereals, pulses and vegetables was lower whereas the intake of fat, milk, milk products and fruits was higher than the suggested intakes. Mean consumption of energy, fat, thiamine, calcium was higher while that of niacin, vitamin A, vitamin C and iron was lower than ICMR-RDA (2010).

Intake of nutrient did not meet the requirement of ICMR-RDA (2010) suggested for pregnancy. Because they did not include vegetables and fruits in their diet. The selected respondents had more quantity of non- vegetarian foods in their diet. This was coincided with food consumption pattern Table XV

Table XV

Food consumption pattern of the selected respondents

Food Stuff	No. of Respondents (n = 100)					
	Daily	Alternate Days	Once in a week	Twice in a week	Once in a month	Occasionally
Cereals	100	-	-	-	-	-
Pulses	100	-	-	-	-	-
Leafy Vegetables	-	10	30	54	6	-
Other Vegetables	-	-	50	24	16	10
Roots and Tubers	-	-	70	20	10	-
Nuts & Oil seeds	100	-	-	-	-	-
Fruits	-	-	37	31	22	10
Egg, poultry, fish, meat *	95	2	-	-	-	-
Milk & milk Products	-	40	42	18	-	-
Sugar &Sugar Products	100	-	-	-	-	-
Processed Foods	-	-	-	10	22	68

(Multiple responses * Among the selected respondents 97% were non-vegetarian)

Table XV highlights frequency of food consumption pattern of the selected respondents.

4.4.4. Maternal Complications

Out of the total of 100 pregnant women, only 34 did not suffer from any maternal complications during pregnancy. The maternal complications are presented in Table XVI

Table XVI

Maternal complications of the selected respondents

Risk factors	Number (n = 100)	Per cent
No complications	39	39
Short stature	5	5
Short stature with anemia	7	7
Anemia	28	28
Anemia and Toxemia	4	4
Oedema and Hypertension	8	8
Urinary infection	9	9

Maternal complications commonly associated with low birth weight are malnutrition, poor antenatal care, anemia, toxemia, maternal family history of low birth weight or previous delivery of a low birth weight infant (Abrams and Newman, 2001)

In the present study, only 39 per cent of the women were found to be healthy with optimum stature, body weight and haemoglobin content and did not have any complications, whereas the remaining 61 per cent suffered from one or the other complications. The mothers had suffered from anemia as a single risk factor or in combination with toxemia, hypertension or short stature, urinary infection was found among nine per cent. It is predicted that women with either poor nutritional status (short stature, low maternal weight,

inadequate weight gain and anemia) or reproductive infections or other infections during pregnancy are more likely to deliver low birth infants (WHO and UNICEF, 2002).

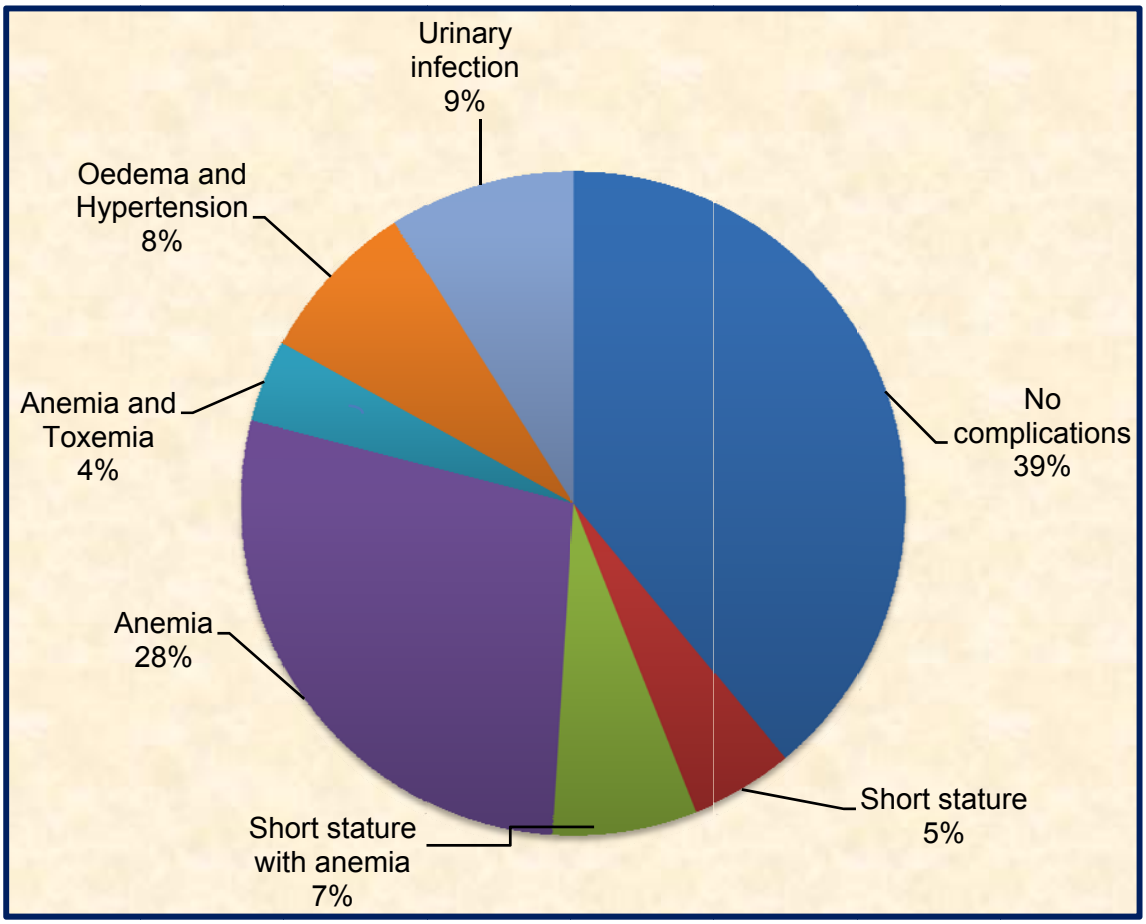


FIGURE VII - MATERNAL COMPLICATIONS OF THE SELECTED RESPONDENTS

4.4.5. Bio – Chemical Estimation

Biochemical estimation helps to confirm clinical and dietary data, so that diagnosis can be made and nutritional and medical care and be planned and implemented effectively. Blood is the primary tissue examined because it is the means of transporting nutrients, metabolites and waste products. Ten milliliter of venous blood was drawn using separate disposable syringe by qualified medical technician and transported to the laboratory where analysis were done. Standard methods used for the analysis of the following blood parameters.

4.4.5.1. Hemoglobin level of the selected respondents

Iron is a mineral that has long been known to be important during pregnancy. It's essential to making hemoglobin, the molecule that carries oxygen to the cells and tissues of the body. During pregnancy, blood volume increases by 30%, which means women need more iron to make more hemoglobin. This is especially true during the 2nd and 3rd trimester. If a woman enters pregnancy without sufficient iron stores, she will become anemic during the later stages of pregnancy. This is why the Recommended Daily Allowance (RDA) 2010 for iron goes from 21 mg/d in non-pregnant women to 35 mg/d in pregnant women.

Table XVII

Hemoglobin level of the selected respondents

Level of Hemoglobin(g/dl)	Mode of Severity	Number (n=100)	Per cent
8.5-9.5	Mild	10	10
9.6-10.6	Moderate	33	33
10.7-11.7	Severe	6	6
> 11.9	No anemic and Healthy	51	51

Table XVII indicates that 10 per cent of the selected respondents were mildly anemic, 33 per cent were moderately anemic and six per cent were in severe conditions and only 51 per cent of women were healthy and non anemic having normal values. Forty nine per cent of selected respondents suffered from different grades of anemia because of their poor dietary intake, life style pattern and unhygienic practices.

4.4.5.2. Blood glucose level of the selected respondents

Glucose is the main source of energy for the body's cells, produced by the digestion of dietary carbohydrates, and is transported by the blood to all parts of the body. Changes in blood glucose levels are an indicator of abnormal digestion process. Women are at an increased risk of diabetes during pregnancy called gestational diabetes. During pregnancy, the body makes more hormones and goes through other changes, such as weight gain. These changes cause the body's cells to use insulin less effectively, a condition called insulin resistance. Insulin resistance increases the body's need for insulin. If the pancreas can't make enough insulin, you will have gestational diabetes (http://diabetes.niddk.nih.gov)

Table XVIII

Blood glucose level of the selected respondents

Blood glucose level (g/dl)	Number (n = 100)	Per cent
<80	-	-
80 – 120	94	94
>120	6	6

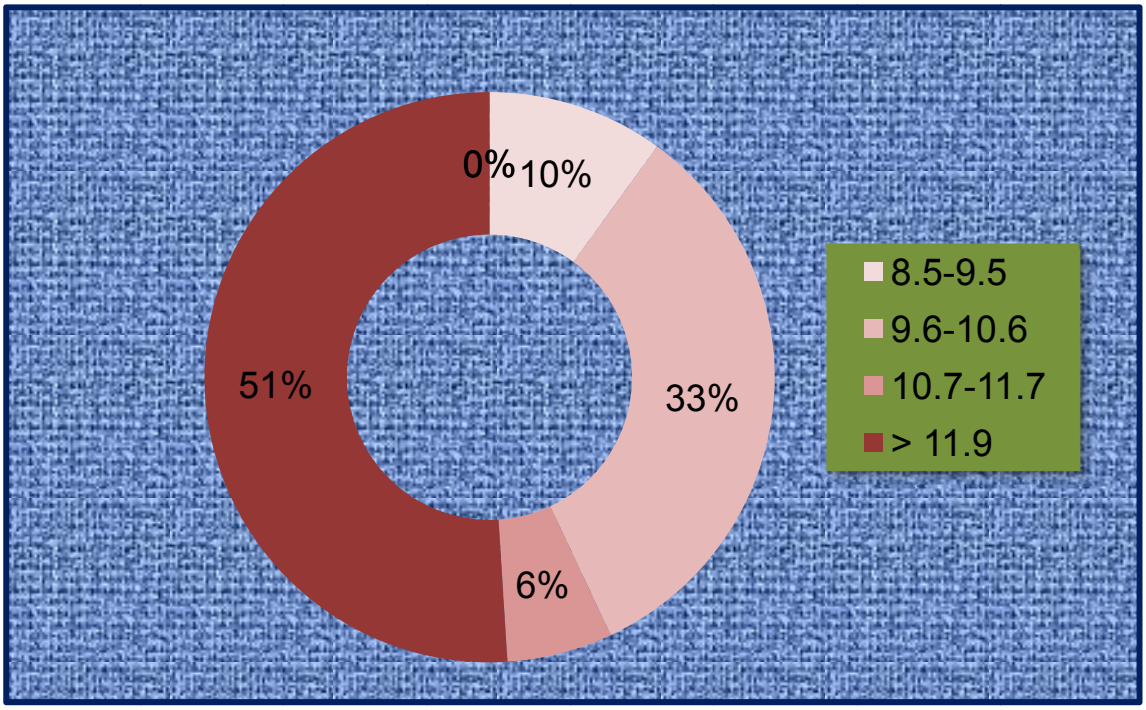


FIGURE VIII - HEMOGLOBIN LEVEL OF THE SELECTED RESPONDENTS

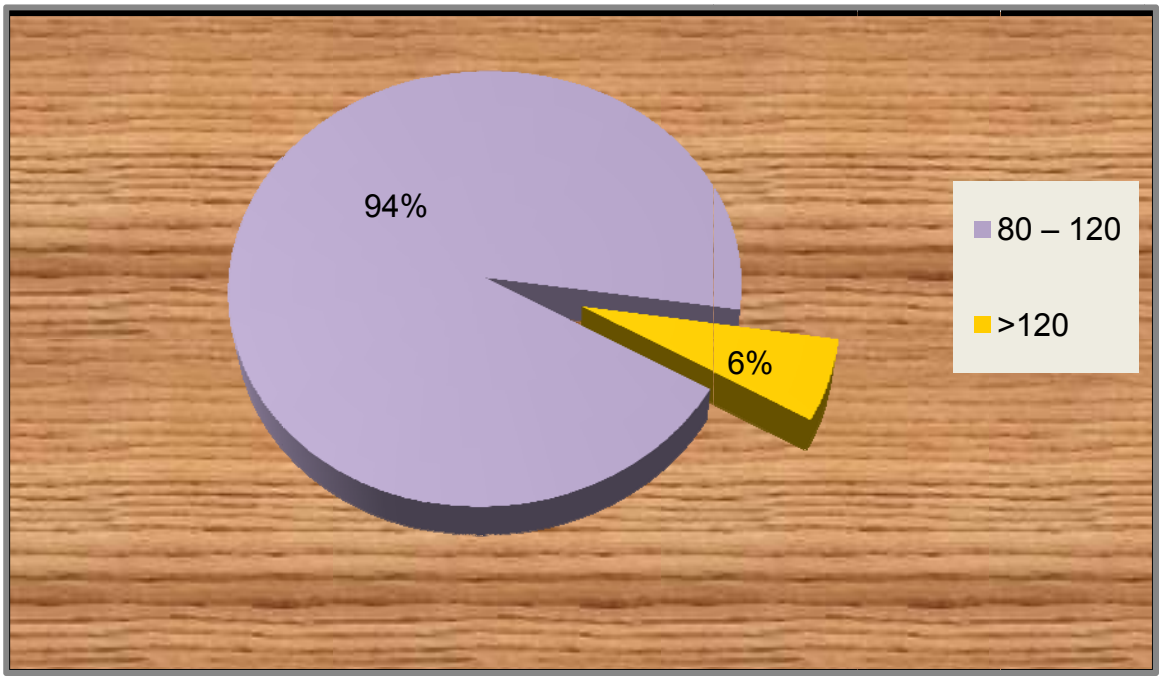


FIGURE IX -BLOOD GLUCOSE LEVEL OF THE SELECTED RESPONDENTS

Ninety four per cent of the selected respondents had normal blood glucose level and rest of six per cent had gestational diabetes with blood glucose level >120g/dl.

4.4.6. Bio Physical Examination

Blood pressure (BP), referred to as arterial blood pressure, is the pressure exerted by circulating blood upon the walls of blood vessels. "Blood pressure" usually refers to the arterial pressure of the systemic circulation. During each heartbeat, blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure.

High blood pressure in woman with preeclampsia retains excessive fluid and spills protein into her urine. Preeclampsia is dangerous because it can affect the blood flow from the mother to the baby through the placenta. The placenta is the connection between the pregnant mother and the infant and a health placenta is critical to providing the developing baby with vital nutrients and oxygen.

Table XIX

Blood pressure of the selected respondents

Blood Pressure (mm/Hg)	Number (n = 100)	Per cent
<90 /<60	12	12
90-120 / 60-80	80	80
>120	8	8

It is heartwarming to note from the Table XIX that 80 per cent of the respondents had normal range between 90-120 / 60-80 mm/Hg, 12 per cent of the respondents had hypotension (<90 /<60 mm/Hg) and Eight

per cent of the respondents had hypertension above 120 mm/ Hg. The same trend was observed in the study conducted by Vaughns (2013)

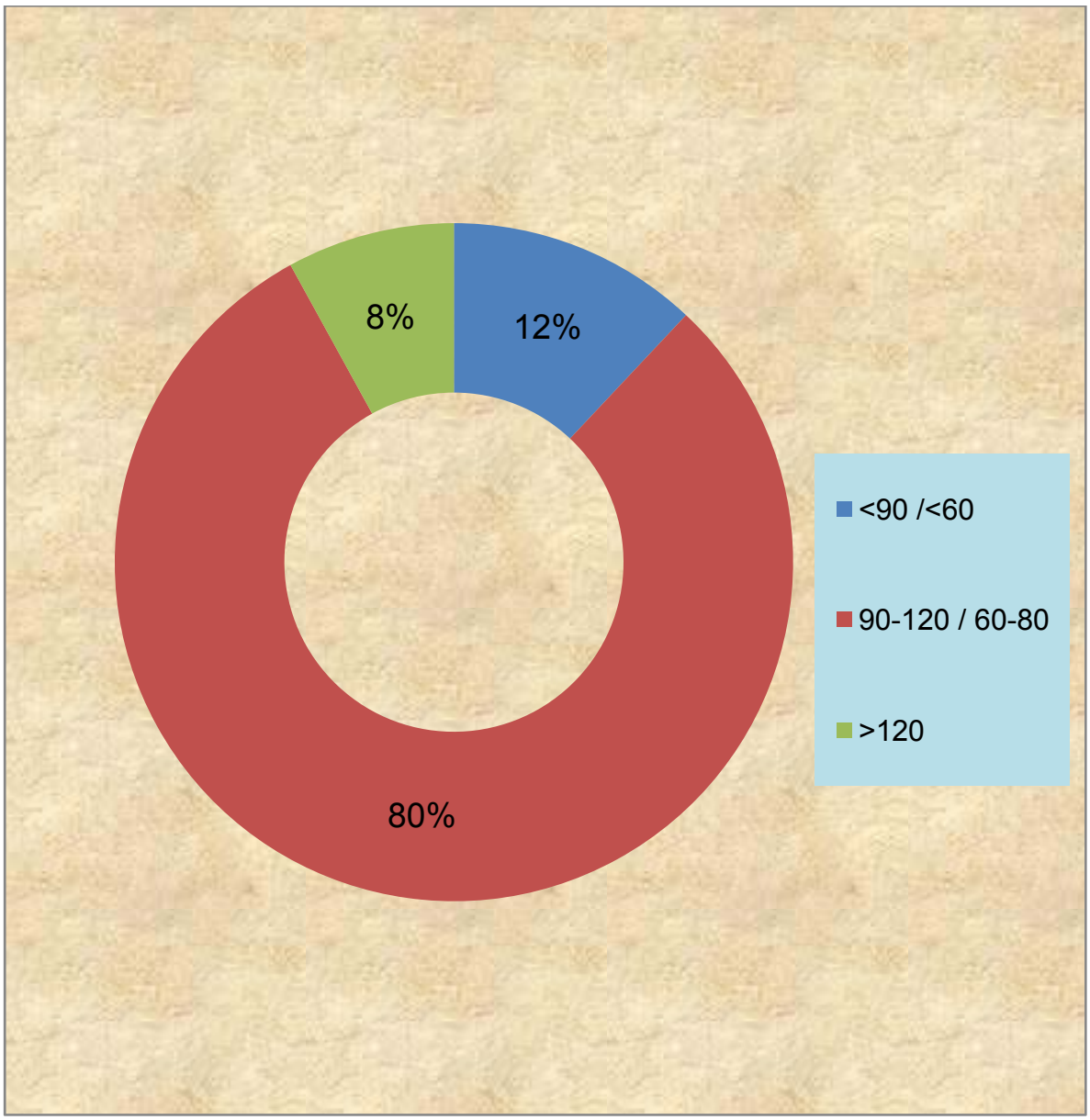


FIGURE X - BLOOD PRESSURE OF THE SELECTED RESPONDENTS

V SUMMARY AND CONCLUSION

Nutrition before and during pregnancy have a significant effect on the long-term health of both infants and their mothers. The potential impact of nutrition is greater at this time than during any other stage of life. Infants who are well nourished in the womb have an increased chance of beginning their life in good physical and mental health. Infants who are undernourished in the womb are at risk of a variety of undesirable consequences, ranging from low-birth-weight to severe mental and physical retardation and death. The effect of under nutrition during pregnancy depends on the nutrients and nutrients involved and the stage at which undernutrition occurs. The nutritional and health of both mother and child can be also affected by the intake of such substances as alcohol, nicotine and various drugs. Other factors involved in determining the success of pregnancy includes the mother's age the physical and emotional stresses to which she is subjected and the presence of any other infection and other diseases.

With these backdrops, the present study was designed on **"Nutritional and Health Status of Pregnant Fisher Women in Thoothukudi District** "and conducted with the following objectives and are,

- Eliciting information regarding socio economic profile of the selected respondents.
- Analyzing food and nutrients consumption of the selected respondents and
- Assessing nutritional and health status of the selected respondents

In the initial stage of the study, household survey was conducted to identify hundred pregnant fisher women using systematic purposive sampling technique from the fishery area of Kayalpattinam, Mannapadu, Kulaserapattinam, Thiruchendur, and Udangudi of Thoothukudi District for the further study. In the household survey, information's related to socio economic and dietary pattern and nutritional and health status was gathered with the help of the traditional health workers. These health workers are capable of guiding the pregnant is avail all kind medical care provided in

PHC, attending delivery, taking care of the new born babies and so on. Giving suitable education and guidelines for better pregnancy are the need of the hour. Nutritional and health status was assessed by anthropometric measurements, biochemical estimation, clinical examination and biophysical examination.

The salient findings of the present study were given below:

5.1. Socio – Economic Status

- Majority of theselected respondents were in the age range of 20 – 31 years and most of them were in age range of 24 to 27 years and their mean age was 24.7 years.
- Majority of the selected respondents (67 per cent) were in nuclear family system. Nearly 57 per cent of the families had 1-4 members and 43 per cent of families comprised 5-8 members and none of the families had more than eight members in their families.
- Family income is an important factor which influences the dietary and health profile of an individual. Sixty threeper centhad the monthly income ranging from Rs. 5000 – 10000 and 25 per cent of the selected respondents had an income of below Rs. 5000 whereas 12 per cent had an income of above Rs.10000. Gathered data concluded that majority of the families were belonged to lower middle income groups.
- Monthly expenditure pattern of the family is the real reflection of their economic status. Nearly 40 per cent families had spent Rs. 0-1000 and 38 per cent families had spent Rs. 1001-2000 and rest of 22 per cent families had spent more than Rs. 2000 per month.
- Sixty per cent families had spent less than Rs. 1000 and 22 per cent spent Rs. 1001- 2000 per month for their children's education. Most of their children were studied in Government School and availed free educational benefits.
- For clothing, majority of the families (68 per cent) had spent Rs.0 – 500 per month for their clothing purposes.

- For their shelter, the majority of the families (21 per cent) spent Rs. 0 – 1000 per month towards their house rent and rest of the families had their own houses and also spent some amount of money towards their house tax.

5.2 Food and Nutritional Profile

Adequate nutritional status and good dietary intake during preconception and pregnancy have been recognized as major contributors to have healthy birth outcomes.

- Collected data indicated that 97 per cent of the selected respondents were non vegetarians and only three per cent were vegetarians. The reason for this type of dietary pattern was accounted to geographic locale as it is near to the sea shore
- Most of the respondents included nonvegetarian foods especially sea foods (95%) in their daily diet. Because of abundant availability of sea foods, made them to consume more sea foods items especially fish and dried fish. These foods were easily available in cheaper cost.
- Among the selected respondents, intake of vegetables and GLV was comparatively (60%) lower than the ICMR – RDA (2010). It might be due to cost and unavailability of vegetables and fruits in that area.
- Majority of selected respondents liked to have spicy foods in their daily diet. They did not have a habit of nibbling between the meals.
- All the selected respondents adopted three mealpattern daily. None of them took food from outside food lets and also did not skip their meals.
- Seventy per cent of pregnant women expressed that they were craved for sour and sweets while rest of them preferred to have savoury food items and nearly 90 per cent of them reported to have aversion towards egg, meat and pulses.
- Eighty eight per cent of the selected respondents expressed that papaya, pine apple and jack fruit were avoided in their dietaries for the fear of abortion. Mango, sesame seeds and millets like thenai

were omitted by 42 per cent because they believed that these are hot foods cause abortion.

5.3 Health Status

Assessment of nutritional status is a comprehensive evaluation of a person's health status using socio economic, health, drug and diet history, anthropometric measurements, biochemical estimation and clinical examination.

- All the selected respondents had normal weight gain in all three trimester. An average weight gain about 6-9 kg during pregnancy.
- Constipation and heart burn were the most common dietary problems faced by 50 per cent of the selected respondents during their pregnancy.
- It is interesting to note that ninety per cent pregnant women were regularly visited to Primary Health Centre and benefited the medical care available over there and their Weight gain, Haemoglobin level, Blood pressure and General health check-up were monitored periodically and necessary nutritional and health care were adopted
- Nearly 67 per cent had normal delivery of their first baby and 33per cent had cesarean due to the complications at the time of their delivery.
- Psychologically, all the selected respondents were happy with their family members and the community celebrations.
- Majority of the selected respondents took easilydigestable foods in their special conditions and also in disease conditions.

5.4 Assessment of Nutritional Status

Nutritional status of respondents was assessed by Anthropometric Measurements (height, weight, body mass index), Clinical Examination

(clinical signs and symptoms, diet survey, illness and treatment), Bio physical Examination and Biochemical Estimation.

- Seventy three per cent of the respondents were in the weight ranged between 55- 59 kg.This indicates that the selected respondents were not obesed and also revealed that they were under weight in their pre conception term.
- Height of all selected respondents was ranged from 143-168 cmand majority 65 per cent were in the range of 151-160 cm.
- BMI of the selected respondents showed that about 86 per cent were normal and 14 per cent were underweight. The high prevalence of underweight among pregnant women represents a competing public health problem.
- Food consumption is one of the important determinations to assess the nutritional status. Dietary assessment forms an integral part of nutrition survey. Food intake pattern of the selected respondents including cereals and pulses, GLV, vegetables and fruits except non-vegetarian foods were lower than the ICMR suggested RDA (2010).
- Among the selected respondents, the mean intake of energy was higher (70%) than ICMR – RDA (2010).Protein intake was not fulfilled to meet protein needs of the selected respondents. Intake of protein was 14 per cent lower than ICMR suggested RDA (2010). Intake of fat was 15 per cent lower than the ICMR – RDA (2010) whereas intake of water soluble vitamins like thiamin, riboflavin and vitamin C content of the selected respondents were lower than ICMR – RDA (2010). Intake of Folic acid was also found to be lower than ICMR – RDA (2010). Among selected respondents, the intake of iron and calcium were lower than the ICMR-RDA (2010).
- Only 39 per cent of the women were found to be healthy with optimum stature, body weight and haemoglobin content and did not have any complications, whereas the remaining 61 per cent suffered from one or the other complications.

5.4 Biochemical Estimation

Biochemical tests are the most objective and sensitive measures of nutritional status. Biochemical tests helped to detect deficiencies before symptoms are clinically evident. Biochemical estimation helps to confirm clinical and dietary data, so that diagnosis can be made and nutritional and medical care and be planned and implemented effectively

- Tenper cent of the selected respondents were mildly anemic, 33 per cent were moderately anemic and six per cent were in severe conditions and only 51 per cent of women were healthy and non anemic, having normal values.
- Forty nine per cent of selected respondents suffered from different grades of anemia because of their poor dietary intake, life style pattern and unhygienic practices.
- Ninety four per cent of the selected respondents had normal blood glucose level and rest of six per cent had gestational diabetes with blood glucose level >120g/dl.

5.4 Biophysical Examination

- Nearly 80 per cent of the respondents had normal range between (90-120 / 60-80 mm/Hg), 12 per cent of the respondents had hypotension (<90 /<60 mm/Hg) and Eight per cent of the respondents had hypertension above 120 mm/ Hg.

In all these efforts, the role of traditional health workers is very important since these people from the backbone of the rural set-up. Today, they are the most easily accessible health personal especially for the women in the rural area. Training of village health workers and traditional birth attendants with respect to immunization against infective diseases, hygiene and environmental sanitation, safe delivery and care of the new born may go a long way in reducing maternal and child morbidity and mortality and promoting an effective pregnancy outcome.

The following recommendations emerged for further study are:

- Further study should be needed to find out the role of tradition birth attendants and train them in an effective manner.
- Maternal and child health centres must be equipped to provide more of dietary counseling with special reference to nutrients to ensure adequate intake and reduce the incidence of the low birth weight and intra uterine growth retardation.

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NUTRITIONAL AND HEALTH STATUS OF PREGNANT FISHER WOMEN IN THOOTHUKUDI DISTRICT

QUESTIONNAIRE

I Personal Details:

1. Name of the respondent :

2. Age :s

3. Education Qualification :

4. Occupation :

5. Type of Work : Sedentary ☐ Moderate ☐ Heavy ☐

II Family Background:

1. Nature of the family : Joint/Nuclear

2. Size of the family : < 4 ☐ 4-8 ☐ >8 ☐

III STRUCTURE OF THE FAMILY:

No.	Name of the Family Members	Marital Status	Age	Sex	Education	Occupation	Income

IV. MONTHLY EXPENDITURE:

No.	Items	Value/ Monthly (Rs)	%
1.	FOOD		
2.	EDUCATION		
3.	CLOTHING		
4.	RENT		
5.	MEDICINE		
6.	FUEL/ LIGHT		
7.	TRANSPORT		
8.	REMITTANCE		
9.	RECREATION		
10.	SAVINGS		
11.	OTHERS		

V Dietary Habits:

1. Type of Diet : Vegetarian/ Non-vegetarian

2. Meal pattern of the respondent : a) One meal b) Two meal c) Three meal

d) Four meal e) Five meal

3. Food Intake Pattern:

Food Stuff	Daily	Alternate Days	Once in a week	Twice in a week	Once in a month	Occasionally
CEREALS: Rice Wheat Ragi Semolina Maida						
PULSES: Bengal gram Green gram Peas Red gram Black gram						
LEAFY VEGETABLES:						

Agathi Amaranth Cabbage Ponnankani Drumstick leaves						
OTHER VEGETABLES: Beans Bitter gourd Brinjal Cucumber Drumstick Ladyfinger Pumpkin Plantain flower						
ROOTS AND TUBERS: Potato Carrot Beetroot Yam						
NUTS AND OIL SEEDS: Coconut Ground nut Refined oil Sesame oil Coconut oil Ground nut Oil Vanaspathi						
FRUITS: Apple Banana Dates fresh Grapes Guava Sweet lemon Papaya Pine apple						

EGG, MEAT, FISH AND POULTRY: Fish Crab Prawn Egg Poultry Goat meat Pork						
MILK AND MILK PRODUCTS: Milk Curd Butter milk Butter Ghee						
SUGAR AND SUGAR PRODUCTS: White sugar Jaggery Palm sugar						
PROCESSED FOODS: Pickles Jam Vathal Instant powder Instant Mix						

4. Do you think that Non-Vegetarian foods are nutritional than vegetarian foods? Yes/No Give Reasons:

5. What type of foods do you like to have? a) Spicy b) With more salt c) Fried d)Boiled e) Steamed f) With just enough g)Any others

6. Do you include fibre rich foods regularly in our diet? Yes/No

7. Are you having the habit of nibbling between meals? Yes/No

8. What do you do with left over foods? a) Thrown away b) prepare it into new

Items c) Give it to animals d) Eat myself e) Others

9. Do you take food from outside? Yes/No

10. If yes a) Daily b) Once in two times per week c) Once in a week

d) For nightly e) Once in a month

11. Do you skip meals? Yes/No

12. If yes a) Breakfast b) Lunch c) Night

13. What type of food would you like to take in between meals?

14. Do you have fewer than 5 servings of fruits and vegetables per day on average ? Yes/No

15. Do you consume citrus fruits daily ? Yes /No

16. Do you drink 3 or more cups of coffee per day on average? Yes/ No

17. Are you currently on a diet to lose weight or on a calorie-restricted program? Yes/ No

18. Do you consume sea foods? Yes/No

19. Mention the type? Frequency? Quantity?

20.Details regarding food fads &taboos:

PERIOD	FOOD INCLUDED	GIVE REASONS	FOOD AVOIDED	GIVE REASONS
I				
II				
III				

VI. HEALTH STATUS:

1. Do you suffer from infection? a) Often b) Sometimes c) Rare

2. If yes a) Throat b) Skin c) Respiratory d) GIT

3. What type of treatment do you prefer? a) Allopathy b) Homeopathy c) Aurvedic d) Acupuncture

4. Information related to pregnancy

PHYSIOLOGICAL CHANGES	NORMAL	I TRIMESTER	II TRIMESTER	III TRIMESTER
Gain in Weight (Kg)				

5. Complications during pregnancy:

COMPLICATIONS	YES/NO	MEASURES TAKEN
Nausea		
Vomitting		
Constipation		
Edema		
Heart burn		
Hypertension		

6. Do you have Gestational Diabetes? Yes/No

HEREDITY	PROBLEMS RELATED TO GDM	DIET MODIFICATION	MEDICAL CARE	EXCERCISE

7. Do you feel tensed / nervous? a) Often b) Sometimes c) Rare

8. If often what remedial measures do you take?

9. Do you have undisturbed sleep? Yes/ No

10. Do you often feel faint or have spells of severe dizziness? Yes/ No

11. Is there any Primary Health Centre near by your area? Yes/No

12. Are you visiting to it regularly? How often?

13. Whether your panchyat board conduct any special camp for pregnant people? Yes/No

14. Are you visting it regularly? Yes/ No

15. Is your first baby or second baby?

16. Delivery of first baby is normal / cesarian

17. Weight of your first baby?

18. what are the measures you taken for normal delivery?

19. Are you happy with your family members ? Yes/No

20.Is there any community celebration for pregnant women? Yes/ No

21. Diet during illness:

ILLNESS	FOODS GIVEN	REASONS	FOODS AVOIDED	REASONS
Fever				
Diarrhoea				
Chicken Pox				
Cold				
Constipation				

VII. NUTRITIONAL STATUS:

i)Anthropometric Measurements of Respondents:

Age	Height (m)	Weight (kg)	BMI (Kg/m2)

ii) CLINICAL EXAMINATION:

1. General appearance:

a) Height: b) Weight:

2. Eye : a) Corneal b) Conjunctival c) Bitot's spot d) Osteomalacia

e) Night blindness f) Follicular hyperkeratosis

3. Pigmentation: a) Normal colour b) Slight discolouration c) Moderate browning in patches d) Severe earthy discolourations

A) Mouth	B) Tongue	C) Lips condition
1. Normal 2. Angular stomatitis (Mild) 3. Angular stomatitis (Mod) 4. Angular stomatitis (Severe)	1. Normal 2.Pale but not coated 3.Red 4. Red and raw	1.Normal 2.Cheilosis

D) Gums	E) Teeth	F) Caries
1.Normal 2.Bleeding / Gingivitis 3.Pyorrhoea 4.Retracted	1.Flurosis Absent 2.Chalky teeth 3.Pitting of teeth 4.Mottled & Discoloured teeth	1.Absent 2.Slight 3.Marked

G) Hair	H)Skin	I)Elasticity
i) General Appearance 1. Normal 2. Loss of colour 3.Discoloured & Dry 4.Sparse & Barbital	**i)General Appearance** 1. Normal 2. Loss of luster 3. Dry & Rough Hyperkeratosis 4.Phrynoderma	1. Normal 2.Diminished 3. Wrinkled Skin

iii) DIET SURVEY:

Meals	Menu	Ingredients	Quantity (gns)
I Day			
Breakfast			
Lunch			
Dinner			
II Day			
Breakfast			
Lunch			
Dinner			
III Day			

Breakfast			
Lunch			
Dinner			

iv) BIOCHEMICAL ESTIMATION:

1. Hb (g) ☐ In % ☐

2. Blood Glucose ☐

v) BIOPHYSICAL EXAMINATION:

1. Blood pressure ☐

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam
Institute for Home Science and Higher Education for Women
University
(Estd. u/s 3 of UGC Act 1956)

2nd January 2014

To
Ms. Krishnapriya KP
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore - 641 043

Dear Madam,

Ref : Your proposal No. AUW.IHEC.2013:14 entitled "Nutritional and health status of pregnant fisher women in Thoothukudi district" submitted for approval of the IHEC on 6th December 2013

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No.AUW.IHEC.2013:14 entitled "Nutritional and health status of pregnant fisher women in Thoothukudi district" submitted by you. The Approval number for the same is AUW/IHEC-13-14/XPD-03.

We wish you all the best in your research endeavours.

Regards,

Dr.P.R.Padma
Member Secretary

Institutional Human Ethics Committee