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A Study on Pre-pregnancy Nutritional Status of the Pregnant Women

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Abstract:

Pregnancy represents a unique époque in life with considerable potential to influence not only maternal health but also the health of the next generation. The present study was conducted with an objective to assess the pre- pregnancy nutritional status of pregnant women in Kashmir. The study was conducted in Maternity Hospital of Sher-e-Kashmir Institute of Medical Sciences (SKIMS) Soura Srinagar. A total of 400 pregnant women were randomly selected for the study. A structured questionnaire-cum-interview schedule was devised for collecting the desired information from the respondents. Pre-pregnancy weight, height and BMI(kg/m^2) of the pregnant women was assessed at the time of registration (within 20-25days of conception) Dietary intake was assessed by 24 hrs dietary recall and FFQ at the hospital visit during the 2nd trimester. The respondents were asked to recall the food intake for the past 24 hours by interview. The results of the study revealed that the mean pre-pregnancy BMI of the respondents was 21.83kg/m^2 ± 3.04. The results also revealed that the mean intake of cereals, pulses, fruits and vegetables per day by the respondents was less than the Suggested Daily Intake (SDI) while as the mean intake of flesh foods including eggs (gm/d) was almost two times more than the SDI.

Keywords: Pre-Pregnancy, Nutrition Status, Dietary Pattern, Pregnant Women, 24hrs recall.

Introduction

Pregnancy is the state of carrying a developing foetus within the female body. It is also called the period of gestation. It starts from the moment of conception to birth. For human beings, the average length of a healthy gestation is 40 weeks. Pregnancy is often divided into three periods of three months each called trimesters (**Rolfes *et al*., 2009**).

Pregnancy represents a unique époque in life with considerable potential to influence not only maternal health but also the health of the next generation. Pregnancy is a time of tremendous physiological changes and these changes demand healthy and optimal diet. These changes occur as the result of various hormones, that are secreted by the placenta. Food choices during the course of gestation must be nutrient dense, rich in all the essential macro as well as micronutrients. (**Insel *et al*., 2007**).

Nutrition play an exceptionally major role in maternal as well as child health. The growth and development of a baby from the moment of conception to the time of birth depends entirely on nourishment from the mother. The intricate period of rapid foetal growth demands an increase

in nutrients both macro as well as micronutrients from the mother's diet. In the past, diet practices during gestation was very much restrictive in nature. They were based on assumptions and myths of the past and had no scientific base. Obstetricians earlier even supported the notion that semi starvation of the mother during the period of gestation was a blessing in disguise because it produced light weight very small baby who was very easy to deliver without facing any severe complications at the time of delivery. To this end, pregnant women were encouraged to select a diet that was restricted in calories, proteins, fats as well as other nutrients including vitamin & minerals. Advanced progress in both nutrition and medical science have totally refuted these ideas and laid a sound scientific base for positive nutrition during the course of gestation. It is now known that the mother's and the child's health depend on the pregnant woman taking a well-balanced nutritious diet with adequate essential nutrients both in terms of macro as well as micronutrients. In fact, women who have always eaten a well-balanced diet during the reproductive years are in a good state of nutrition at the time of conception. Such women have enhanced chances of having a healthy normal full term baby compared with women who have been undernourished before conception and remain so throughout the period of gestation. The nine months period between the time of conception and the birth of a fully formed baby is a period of intricate functional development as well as rapid growth. Such development requires an increased nutrient support beginning even before that time period **(Williams, 2017)**. General guidelines for these nutrient increases are provided in the comprehensive Dietary Reference Intakes (DRIs) issued by Indian Council of Medical Research **(ICMR, 2010)**.

Objectives of the Study

1. To assess the pre- pregnancy nutritional status of pregnant women.
2. To assess the dietary pattern of the Pregnant Women as per their Pre-Pregnancy Nutritional Status.

Review of Literature

Nutrition in preconception period which will determine the overall health and nutritional status of mother at the time of conception and then subsequent nutrition during pregnancy that will determine nutrition as the pregnancy progresses during different trimesters of the pregnancy as well as its impact on growing fetus in the mother.

Optimal nutrition during the entire course of gestation, which includes adequate amounts of all of the essential vitamins, minerals, body building proteins and energy-providing macronutrients begins pre-conceptually, as the developing fetus depend solely on the transfer of nutrients from their mother **(Mahan and Raymond, 2017).**

Current public health recommendations primarily promote folic acid supplementation, many other nutrients are also very important in the pre-conceptual period. Optimal intakes are associated with lower risk of growth restricted or preterm births as well as low birth weight (LBW) among the newborn **(Ramakrishnan *et al*., 2012)**.

Women with poor pre-conception nutritional status had adverse gestational outcomes including delivering a LBW infant (Birth weight of < 2.5kg), condition still a grave concern in many developing countries including India **(Roseboom *et al*., 2011)**.

Oxidative stress such as free radical formation, inflammation & metabolic stress increases the risk of preterm delivery. Pre-conceptual under nutrition /malnutrition is more important than nutrition later in gestation. Pre-pregnancy underweight, combined with low weight gain during the period of gestation, has an additive effect on preterm and LBW risk. Even for those women of normal weight, low weight gain doubles the risk of preterm delivery and weight loss triples the risk **(Bloomfield, 2011).**

The nutritional status of women should be evaluated during preconception to optimize maternal health and reduce the risk of gestational complications, birth defects and chronic disease in their children in later years of adulthood. Proper nutrition should begin before gestation together with use of vitamin supplements such as folic acid. Ideally women who are underweight, overweight or obese should be seen for pre-pregnancy dietary counseling to optimize weight prior to conception and therefore reduce associated risks during gestation. A pre-gestational body mass index (BMI)> 25 kg/m^2 and excessive weight gain are risk factors for fetal macrosomia, birth trauma, C section, obesity and metabolic disorder in childhood **(Papachatzi *et al*., 2013).** Instead, a pre-gestational BMI < 18.5kg/m^2 and poor weight gain are linked with Low birth Weight, increased risk of preterm birth and perinatal mortality and morbidity among the neonates **(Schieve *et al*., 2000)**.

Nutrition in the Preconception Period

Nutrition in the preconception period is vital in order to meet pregnancy needs and high nutrient requirements during the period of lactation. In addition, nutrition is important for the healthy growth and development of the fetus.

The Federation of International Gynecologists and Obstetricians (FIGO) recommendations, "Think Nutrition First" have listed the top 6 essential nutrients women need for future Healthy and Safe motherhood. These include Folic acid, iron, iodine, vitamin B12, and vitamin D. It also highlights the role of antioxidants in pregnancy outcomes **(Hanson *et al*., 2015)**.

Folic Acid lowers the danger of birth defects. (**Czeizel *et al*., 2013**) Cohrane in his review article (**De-Regil *et al*., 2015**) revealed that folic acid supplementation prevents the occurrence of neural tube defects (NTD). 400mcg of folic acid are recommended for women of reproductive age group.

It has been found that Women with higher folic acid levels have lower risk of miscarriage **(Gaskins *et al*., 2014)**, whereas insufficient maternal folate status is associated with delivering LBW babies, preterm delivery and fetal growth retardation **(Fekete *et al*., 2012)**.

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Vitamin B12 in the pre-conception period with folic acid was associated with a reduced risk of con genital malformations **(Botto *et al*., 2004; Sutton *et al*., 2011)**.

Cochrane review revealed that iron supplementation during gestation reduced the risk of delivering LBW babies (birth weight <2.5kg) and prevented iron deficiency anemia in pregnancy **(Pena-Rosas *et al*., 2012)**.

Iodine is very important for normal brain development of the fetus. Moderate iodine deficiency during gestation results in developmental delay in children. For example, a study conducted in UK revealed that older children were more likely to have low level of IQ, if their mothers had mild iodine deficiency in early stage of gestation than children of mother with normal iodine levels during gestation **(Bath *et al*., 2013)**.

Calcium supplementations before or during early stage of pregnancy prevents mothers from pre-eclampsia/toxemia, reduces maternal mortality and morbidity, as well as showed to improve fetal & neonatal outcomes. **(Hofmeyr and Manyame, 2017)**.

Vitamin D deficiency during gestation promotes the development of fibroids as well as endometriosis, as in Humans it has been observed that the vitamin D receptor is expressed in the ovary, endometrium and myometrium **(Buggio *et al*., 2016)**.

Vitamin A as well as vitamin E and zinc can also affect pregnancy outcome. WHO recommends vitamin A supplementation during the period of gestation only in areas where there is endemic vitamin A deficiency. This will improve maternal and fetal outcomes such as mortality and morbidity. Prevent anaemia, infection as well as xeropthalmia **(WHO, 2009).** The risk of pregnancy complications involving oxidative stress such as pre-eclampsia is reduced by antioxidant supplementation taken by the pregnant women.

Methodology:

In the present study both the primary as well as secondary sources of data were used to obtain the desired information.

Primary Data

The present study was conducted in a hospital based setting. The sample was primarily collected from Maternity Hospital of Sher-e-Kashmir Institute of Medical Sciences (SKIMS) Soura Srinagar. A structured questionnaire and an interview schedule was devised and used for collecting the primary information from the Pregnant Women. The Questionnaire was prepared in accordance with the latest standards. A non stretchable measuring tape and a digital weighing scale were used to collect information regarding the height and weight of the respondents. Pre-pregnancy weight, height and BMI(kg/m^2) of the pregnant women was assessed at the time of registration (within 20-25days of conception) by using standard weighing machine and recorded in scientifically designed questionnaire.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 12, 2022

Secondary Data

Data collected from secondary sources represented the information obtained from books, published research papers, medical and public health journals and latest information from internet etc.

Sample Size

A minimum sample size of 350 pregnant women was required as study participants. An additional sample size of 150 (30%) was added to take care of attrition (follow up loss),in order to get power of test 80% and as such the sample size including follow up loss was 500. Out of the total ten districts of Kashmir Valley, five districts were selected randomly keeping in view both urban and rural areas. The sample size was calculated with the help of the following formula:

$$n = \frac{NZ^2_{\alpha/2}p(1-p)}{d^2(N-1) + NZ^2_{\alpha/2}p(1-p)}$$

Where,

n =minimum sample size required for the study

N= population size.

Z = 1.96 at level of significance 5%

α = level of significance (5%).

p= proportion of registered Pregnant women in Kashmir valley

d = margin of error at 5%.

The present study included a total no. of 400 pregnant women and their neonates. Out of them 211 were from urban area and 189 from rural area. Pregnant women were selected purposively from the hospital until the desired number of subjects was reached.

Sample Selection Procedure

Pregnant women attending the department of Obstetrics and Gynecology SKIMS hospital situated in Srinagar district were selected for data collection. Pregnant women who visited the hospital within 20-25 days of conception, with confirmed pregnancies were identified and selected by purposive sampling method. From among all pregnant women attending the OPD, randomly every 3rd pregnancy was included.

A well formulated interview schedule was used to elicit the information pertaining to socio-demographic characteristics, anthropometric assessment and dietary assessment of the selected pregnant women. Dietary intake was assessed by 24 hrs dietary recall and FFQ at the hospital visit during the 2nd trimester. The respondents were asked to recall the food intake for the past 24 hours by interview. The consumption of daily diet was calculated in terms of eight major food groups viz., cereals, pulses, flesh foods, vegetables, fruits, milk, oil and sugar and were compared with Suggested Daily Intake given by ICMR.

ISSN PRINT 2319 1775 Online 2320 7876
, UGC CARE Listed (Group -I) Journal Volume 11, Iss 12, 2022

All respondents were given an information sheet detailing the objective and nature of the study. Informal consent was obtained from the selected pregnant women prior to their participation.

Tools Used

The tool used in the present study devised as per objectives of the study was essentially a questionnaire supplemented by an interview schedule. After a thorough and detailed study of the problem and the review of literature, a preliminary questionnaire was framed. This was pre-tested on 10% of the sample size to ensure the validity and feasibility and was then used in the study. The questionnaire was administered to the pregnant women through face-to-face interview during the morning hours.

Results

Table: 1.1 Distribution of Respondents as per Age

(N=400)

Variable	Category	N	%	Mean±SD
Age(Years)	≤20	67	16.8	24.32±3.72
	20-25	227	56.8	
	25-30	85	21.2	
	30-35	21	5.2	

Table 1.1 shows that the overall mean age of pregnant women was 24.32±3.73 years. Majority i.e.56.8% of the respondents were in the age group of 20-25years at the time of marriage and only 5.2% were in the age group of 30-35years.

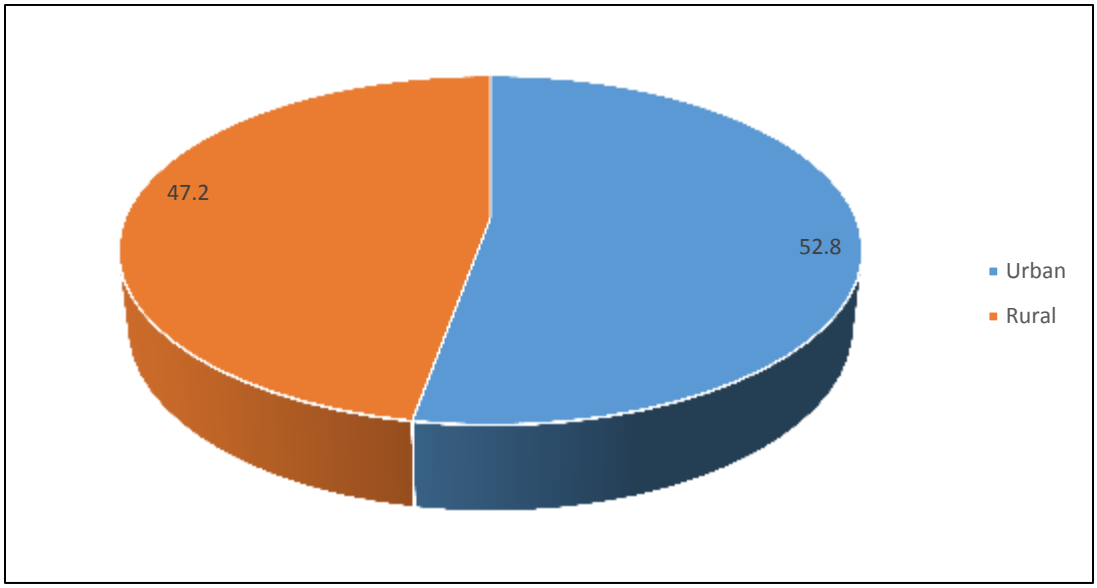

Fig. 1.1: Distribution of Respondents as per Habitat

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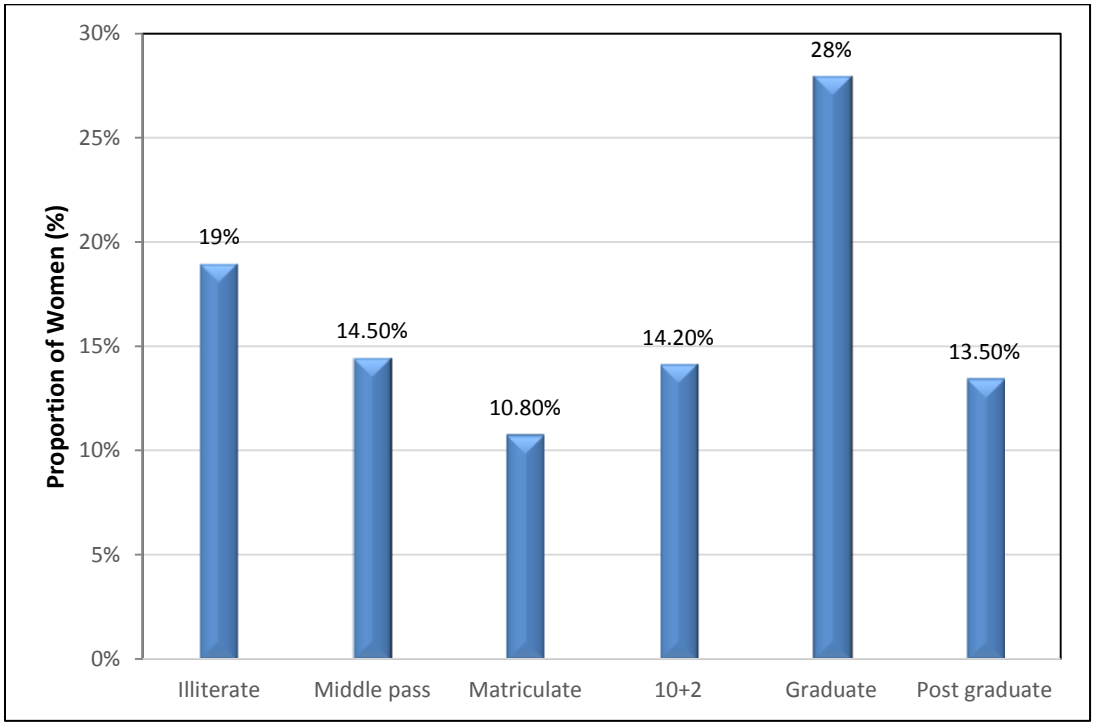
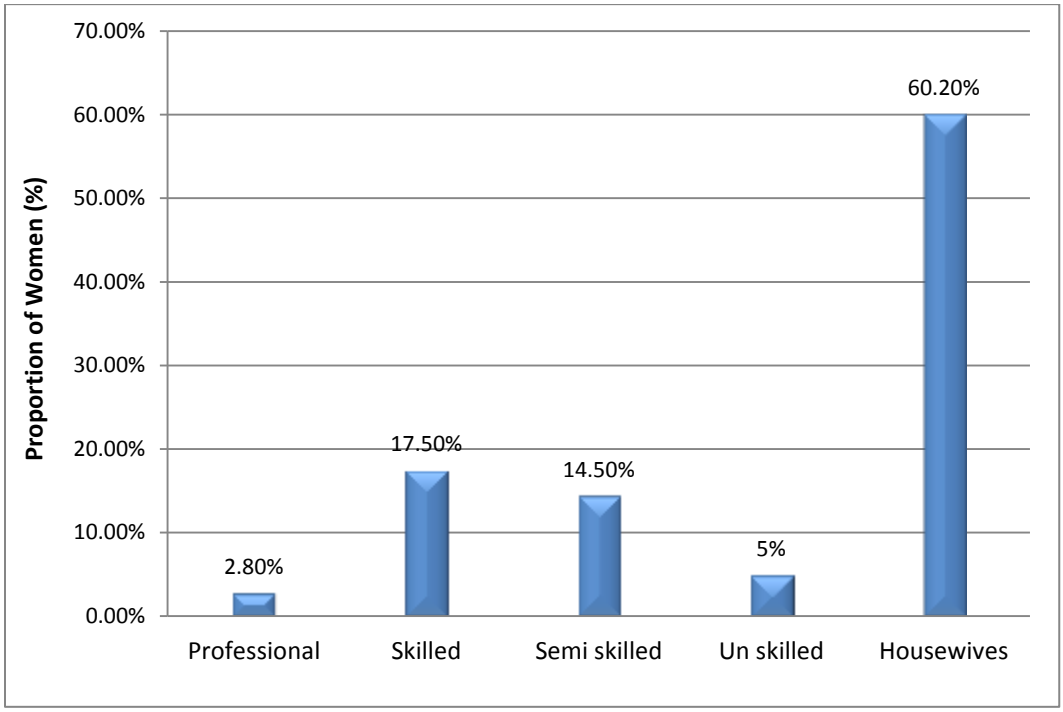


Fig. 1.2: Distribution of Respondents as per Educational Level



*Working Class: Social and Preventive Medicine (**Park, 2000**)*

Fig. 1.3: Distribution of Respondents as per Employment

Figure 1.1 reveals that 52.8% and 47.2% of the respondents were from urban and rural area respectively.

Figure 1.2 reveals that majority i.e. 81% of the respondents were literate and only 19% were illiterate. Among literate respondents, 28% were graduate, followed by 14.50% and 14.20% were middle pass and 10+2 respectively. Only 13.50% were post graduates. Figure 1.3 reveals that majorities i.e. 60.20% of the respondents were housewives and only 39.8% were working. Among working respondents, 17.50% and 14.50 were skilled and semi-skilled workers respectively. Only 2.8% were professional.

Table 1.2: Distribution of Respondents as per Monthly Income (Rs.) of the family

(N=400)

Variable	Category	N	%	Mean ± SD
Monthly Income (Rs)	<5000	14	3.5	20111.25±16460.80
	5000-10000	74	18.5	
	10000-20000	139	34.8	
	20000-30000	58	14.5	
	30000-40000	58	14.5	
	≥40000	57	14.2	

Table 1.2 shows the distribution of respondents as per monthly income of the family. Average monthly income of the pregnant women was 20111.25±16460.80 rupees. Majority of the respondents i.e. 34.8% were having monthly income in the range of 10000-20000, followed by 18.5% were having monthly income in the range of 5000-10000.14.5% were having monthly income in the range of 20000-30000 and 30000-40000 respectively. Only 3.5% were having monthly income of family <5000Rs.

Table 1.3 : Distribution of Respondents as per pre-pregnancy Weight, Height and Body Mass Index (kg/m^2)

(N=400)

Variable	Category	Mean±SD	Min.	Max.
Anthropometric Measurements	Weight (kg)	52.24±7.12	36	77
	Height (cm)	158.10±10.55	157.62	175.26
	BMI(kg/m^2)	21.83±3.04	13.84	41.66

Table 1.3 shows that the mean pre-pregnancy weight among the respondents was 52.24±7.12kg, with a minimum weight of 36kg and maximum as 77kg. Mean height among the

respondents was 158.10±10.55cm, with a minimum height of 157.62 cm and maximum of 175.26cm. Mean Pre-pregnancy BMI was 21.83±3.04kg/m^2,with minimum of as low as 13.84kg/m^2, it signifies chronic malnutrition and a maximum of as high as 41.66, which is very high degree of obesity.

Table 1.4: Distribution of Respondents as per their Pre-Pregnancy Nutritional Status (BMI Kg/m^2)

(N=400)

Variable	Category	N	%	Mean ± SD	Min.	Max.
BMI (kg/m^2)	<18.5 (Under weight)	50	12.5	21.83 ±3.04	13.84	41.66
	18.5-22.9 (Normal weight)	227	56.75			
	23-24.9 (Over weight)	86	21.5			
	≥ 25 (Obese)	37	9.25			

Note: **WHO 2004**- Body Mass Index (BMI kg/m^2) for Asian population.

Table 1.4 reveals that the mean BMI of pregnant women was 21.83kg/m^2 ± 3.04, with majority i.e.56.75% of the respondents were having normal weight with BMI in the range of 18.5-22.9kg/m^2 at the time of registration (within 20-25 days), followed by 21.5% were overweight. Only 12.5% and 9.25% of the respondents were underweight and obese respectively.

Dietary Pattern of the Pregnant Women as per their Pre-Pregnancy Nutritional Status (BMI Kg/m^2)- Table 1.5- Table 1.9.

Table 1.5: Intake of Cereals as per Pre-Pregnancy Nutritional Status of the Respondents (BMI Kg/m^2)

(N=400)

Food Group	BMI (Kg/m^2)	N	Mean Intake ±SD
Cereals (gm/d)	**<18.5 (Under weight)**	50	214.80±21.24
	18.5-22.9 (Normal Weight)	227	224.60±23.83
	23-24.9 (Over weight)	86	229.88±28.34
	≥25 (Obese)	37	237.03±21.36

Note: Body Mass Index (BMI kg/m^2) for Asian population**(WHO 2004**).
SDI (Suggested Daily Intake)of cereals:- **300gm/d**: **Venkatachalam (2011**). Nutrition for Mother and Child, National Institute of Nutrition, (ICMR), Hyderabad.

Average Intake of Cereals on daily basis as per Pre-Pregnancy Nutritional Status of the Respondents is given in table 1.5. Perusal of the table indicates that the mean intake of cereals(gm/d) by the respondents in all the four category of BMI(kg/m^2) was less than the Suggested daily Intake (SDI). Mean Intake of cereals was 214.80± 21.24gm/d among underweight (N=50) respondents. Maximum cereal intake per day among them was 270gm and minimum was 180gm. Mean intake of 224.60±23.83gm/d and 229.88±28.34gm/d of cereals. Min. cereal intake among them was 180 & 140gm/d, whereas max. intake was 310gm/d and 350gm/d respectively. Slightly more mean intake i.e. 237.03±21.36 gm/d of cereals was found among obese respondents (N=37). Minimum cereal intake among them was 200gm/d and maximum 310gm/d.

Table 1.6: Intake of Pulses, legumes and Nuts as per Pre-Pregnancy Nutritional Status of the Respondents (BMI Kg/m^2)
(N=197)

Food Group	BMI (Kg/m^2)	N	Mean Intake	±SD
Pulses, legumes and nuts (gm/d)	<18.5 (Under weight)	18	29.44	6.39
	18.5-22.9 (Normal Weight)	106	27.64	6.52
	23-24.9 (Over weight)	52	26.44	8.36
	≥25 (Obese)	21	29.52	8.65

Note: Body Mass Index (BMI kg/m^2) for Asian population (**WHO 2004**).
SDI (Suggested Daily Intake) of pulses,legumes and nuts:- **30gm/d**: **Venkatachalam (2011**). Nutrition for Mother and Child, National Institute of Nutrition, (ICMR), Hyderabad.

Table 1.6 shows the average Intake of Pulses, legumes and nuts on daily basis as per Pre-Pregnancy Nutritional Status of the Respondents. Perusal of the table indicates that the mean intake of Pulses including legumes and nuts by the respondents in all the four category of BMI(kg/m^2) was slightly less than the Suggested daily Intake (SDI). Mean intake of Pulses including legumes& nuts was 29.44± 6.39gm/d among underweight (N=18) respondents. Maximum intake per day among them was50gm and minimum was 20gm. Mean intake of 27.64±6.52gm/d and 26.44±8.36gm/d was seen among healthy (N=106) and overweight (N=52) respondents respectively. Minimum intake among them was 10 and max. intake was50gm respectively. Highest mean intake i.e. 29.52±8.65 gm/d of pulses, legumes and nuts was found

among obese respondents (N=21). Minimum intake among them was 20gm/d and maximum 50gm/d.

Table 1.7:Intake of Flesh Foods including eggs as per Pre-Pregnancy Nutritional Status of the Respondents (BMI Kg/m^2)

(N=234)

Food Group	BMI (Kg/m^2)	N	Mean Intake	±SD
Flesh Foods including eggs (gm/d)	<18.5 (Under weight)	17	50.59	6.59
	18.5-22.9 (Normal Weight)	135	59.85	15.01
	23-24.9 (Over weight)	54	60.65	14.28
	≥25 (Obese)	28	57.68	14.99

Note: WHO Body Mass Index (BMI kg/m^2) for Asian population (**Lancet, 2004)**
SDI (Suggested Daily Intake) of flesh foods including eggs:- **30gm/d**: Dietary Guidelines for Indians-A Manual. National Institute of Nutrition (NIN).Indian Council of Medical Research (ICMR) Hyderabad (2011)

Perusal of the table 1.7 indicates that the mean intake of Flesh foods including eggs (gm/d) by the respondents in all the four category of BMI(kg/m^2) was almost two times more than the Suggested daily Intake (SDI). Highest mean intake of flesh foods per day was seen among overweight respondents followed by healthy weight, obese individuals and lastly underweight respondents. Mean Intake of flesh foods was 50.59± 6.57gm/d among underweight (N=17) respondents. Maximum flesh food intake per day among them was 70gm and minimum was 40gm. Mean intake of 59.85±15.01gm/d and 60.65±14.28gm/d of flesh foods was seen among healthy (N=135) and overweight (N=54) respondents respectively. Min. flesh food intake among them was 40 & 30 gm/d, whereas max. intake was 120gm/d and 100gm/d respectively. Mean intake i.e. 57.18±14.99 gm/d of flesh foods was found among obese respondents (N=28). Minimum flesh food intake among them was 30gm/d and maximum 90gm/d.

Table 1.8: Intake of Fruits as per Pre-Pregnancy Nutritional Status of the Respondents (BMI Kg/m^2)

(N=383)

Food Group	BMI (Kg/m^2)	N	Mean Intake	±SD
Fruits (gm/d)	<18.5 (Under weight)	45	133.56	66.30
	18.5-22.9 (Normal Weight)	219	158.68	72.34

	23-24.9 (Over weight)	84	191.67	82.79
	≥25 (Obese)	35	194.29	80.23

Note: Body Mass Index (BMI kg/m^2) for Asian population (**WHO 2004**).
SDI (Suggested Daily Intake)of fruits:- **200gm/d:Venkatachalam (2011**). Nutrition for Mother and Child, National Institute of Nutrition, (ICMR), Hyderabad.

Table 1.8 reveals average Intake of Fruits on daily basis as per Pre-Pregnancy Nutritional Status of the Respondents (N=383). Perusal of the table indicates that the mean intake of fruits(gm/d) by the respondents in all the four category of BMI(kg/m^2) was less than the Suggested daily Intake (SDI). Minimum fruit consumption among the respondents was 50gm/d and maximum was 400gms/d which is twice more than the SDI of fruits per day. Highest mean intake of fruits per day was seen among obese respondents followed by overweight, healthy weight and lastly underweight respondents. Mean Intake of fruits was 133.56±66.30gm/d among underweight (N=45) respondents. Maximum fruit intake per day among them was 310gm which is more than the SDI of 200gm/d and minimum was 50gm. Mean intake of 158.68±72.34gm/d and 191.67±82.79gm/d of fruits was seen among healthy (N=219) and overweight (N=84) respondents respectively. Min. fruit intake among them was 50gm/d, whereas max. intake was 350 gm/d and 400gm/d respectively. Mean intake i.e. 194.29±80.23 gm/d of fruits was found among obese respondents (N=35). Obese individuals were slightly taking less fruits per day than the SDI. Minimum fruit intake among them was 50gm/d and maximum 400gm/d.

Table 1.9: Intake of Vegetables as per Pre-Pregnancy Nutritional Status of the Respondents (BMI Kg/m^2)

(N= 374)

Food Group	BMI (Kg/m^2)	N	Mean Intake	±SD
Vegetables(gm/d)	**<18.5 (Under weight)**	50	101.20	70.93
	18.5-22.9 (Normal Weight)	207	96.14	60.89
	23-24.9 (Over weight)	81	109.63	64.13
	≥25 (Obese)	36	155.28	73.11

Note: Body Mass Index (BMI kg/m^2) for Asian population (**WHO 2004)**
SDI (Suggested Daily Intake)of vegetables :- **350gm/d**: **Venkatachalam (2011**). Nutrition for Mother and Child, National Institute of Nutrition, (ICMR), Hyderabad.

Table 1.9 indicates that the mean intake of vegetables (gm/d) by the respondents in all the four category of BMI(kg/m^2) was less than the Suggested daily Intake (SDI). Minimum vegetable consumption among the respondents was 30gm/d and maximum was 350gm/d. Mean Intake of vegetables was 101.20±70.93gm/d among underweight (N=50) respondents. Maximum vegetable intake per day among them was 350gm and minimum was 50gm. Mean intake of 96.14±60.89gm/d and 109.63±64.13gm/d of vegetables was seen among healthy (N=207) and overweight (N=81) respondents respectively. Min. vegetable intake among them was 30gm/d, whereas max. intake was 300 gm/d and 350gm/d respectively. Mean intake i.e. 155.28±73.11 gm/d of vegetables was found among obese respondents (N=36). Minimum vegetable intake among them was 50gm/d and maximum 300gm/d.

Conclusion

From the present study it is concluded that:

- Majority of the pregnant women studied had average age at marriage as 24.32 ± 3.72 yrs and average age of conception as 27.19 ± 4.52yrs, with less than half being in the age group of 25-30 yrs.
- Respondents from urban and rural back ground formed 52.8% and 47.2% respectively.
- The mean pre-pregnancy weight among the respondents was 52.24±7.12kg, with a minimum weight of 36kg and maximum as 77kg.
- Mean height among the respondents was 158.10±10.55cm, with a minimum height of 157.62 cm and maximum of 175.26cm.
- Mean Pre-pregnancy BMI was 21.83±3.04kg/m^2,with minimum of as low as 13.84kg/m^2, it signifies chronic malnutrition and a maximum of as high as 41.66, which is very high degree of obesity.
- Mean intake of cereals(gm/d) by the respondents in all the four category of BMI(kg/m^2) was less than the Suggested daily Intake (SDI). Mean Intake of cereals was 214.80± 21.24gm/d among underweight (N=50) respondents. Maximum cereal intake per day among them was 270gm and minimum was 180gm. Mean intake of 224.60±23.83gm/d and 229.88±28.34gm/d of cereals. Min. cereal intake among them was 180 & 140gm/d, whereas max. intake was 310gm/d and 350gm/d respectively. Slightly more mean intake i.e. 237.03±21.36 gm/d of cereals was found among obese respondents (N=37). Minimum cereal intake among them was 200gm/d and maximum 310gm/d.
- The mean intake of Pulses including legumes and nuts by the respondents in all the four category of BMI(kg/m^2) was slightly less than the Suggested daily Intake (SDI). Mean intake of Pulses including legumes & nuts was 29.44± 6.39gm/d among underweight (N=18) respondents. Maximum intake per day among them was50gm and minimum was 20gm. Mean intake of 27.64±6.52gm/d and 26.44±8.36gm/d was seen among healthy (N=106) and overweight (N=52) respondents respectively. Minimum intake among them was 10 and max. intake was50gm respectively. Highest mean intake i.e. 29.52±8.65 gm/d of pulses, legumes and nuts was found among obese respondents (N=21). Minimum intake among them was

20gm/d and maximum 50gm/d.

- The mean intake of Flesh foods including eggs (gm/d) by the respondents in all the four category of BMI(kg/m^2) was almost two times more than the Suggested daily Intake (SDI). Highest mean intake of flesh foods per day was seen among overweight respondents followed by healthy weight, obese individuals and lastly underweight respondents.
- Mean intake of fruits(gm/d) by the respondents in all the four category of BMI(kg/m^2) was less than the Suggested daily Intake (SDI). Minimum fruit consumption among the respondents was 50gm/d and maximum was 400gms/d which is twice more than the SDI of fruits per day. Highest mean intake of fruits per day was seen among obese respondents followed by overweight, healthy weight and lastly underweight respondents.
- The mean intake of vegetables (gm/d) by the respondents in all the four category of BMI(kg/m^2) was less than the Suggested daily Intake (SDI). Minimum vegetable consumption among the respondents was 30gm/d and maximum was 350gm/d.

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