The Pharma Innovation Journal 2019; 8(4): 1176-1181

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2019; 8(4): 1176-1181

www.thepharmajournal.com
Received: 26-02-2019
Accepted: 28-03-2019

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Nutritional status and dietary pattern during pregnancy

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Abstract
The present study entitled "Nutritional status and dietary pattern during pregnancy" was carried out with the following objective, to assess the nutritional status and dietary pattern of selected pregnant women. Nutritional status of pregnant women was assessed in terms of dietary assessment, anthropometric measurement and clinical assessment of signs and symptoms. The data collected by the pretested survey schedule and 24 hours dietary recall method from hospitals, clinic, nursing homes, and Primary health centres. The results of the study revealed that out of 250 pregnant women 70.8 per cent of respondents had normal BMI before conceiving. Mean weight gain of respondents of second trimester were 4.29 kg and first trimester were 0.93 kg respectively in their present month. Average nutrient intake of the respondents found to be less with regard to protein, iron, calcium and folic acid as compared to RDA. The difference between the intake and RDA was significant for all the nutrients except carbohydrate in moderate women of second trimester. Out of 250 respondents 41.6 per cent of respondents were preferred type C dietary pattern (four meal pattern). 53.6 per cent of respondents were vegetarian. 55.6 per cent of respondents were anaemic and 44.4 per cent of respondents had normal level of haemoglobin.

Keywords: Pregnant women, nutrient intake, dietary pattern

Introduction
Pregnancy is a high-flying event in a woman's life, which convert her life forever. Pregnancy is a physiological state, which produces several normal and expected changes in all the maternal organ systems. Pregnancy can be different from woman to woman, and even for the same mother from one pregnancy to the next. Some symptoms of pregnancy last for several weeks or months, while other discomforts are temporary or don't affect all women. Health of the neonate depends on nutritional status of the mother during pregnancy and prior to conception. A well nourished mother prior to conception who has been enters pregnancy with a reserve of several nutrients that can meet the needs of the growing foetus without affecting her own health. The babies conceived during the hunger period had higher chances of prematurity, still births and malformation than babies born during the hunger period. Nutritional status refers to the health of an individual as it is determined by the intake of nutrients and their utilization (Manna, 2012) [15]. Diet of mother during pregnancy has a direct influence on foetal growth and hence, the size and health of the neonate. Inadequate diet of mother during this period gives birth to Low Birth Weight (LBW) babies weighing less than 2,500g. Nutrients requirement at the time of foetus growth are high,

Materials and methods
This study was a community based cross- sectional study with descriptive and analytical components on selected pregnant women of hospitals of Allahabad District.

- **Height measurements:** Height (cm) of the subjects was measured in standing position to the nearest 0.1 cm using a non-stretchable steel tape.
- **Weight measurements:** The personal digital weighing machine of maximum capacity of 180kg was used to weigh all the subjects. The respondents were made to stand erect on the weighing scale, without footwear, not leaning against or holding anything and the weight was recorded in kg.
- **Weight gain during pregnancy:** Gaining weight is a positive and healthy sign. The ICMR India recommends that overall weight gain of 10-12 kilograms during pregnancy is optimal, however up to 16 kg is alright. The weight that the mother gains helps in assessing the level of nutrition and growth of baby in the womb.
- **Body Mass Index (**BMI**):** Body Mass Index (BMI) of each subject was calculated from

the recorded height and weight measurement using the following formula.

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

- **24 hours dietary recall:** A dietary survey was conducted as described by Food habits and daily dietary intake were recorded during the diet survey. 24 hours dietary recall method is one of the most cost effective methods to characterize the average intake of large group. The respondents were asked about frequency intake of various food groups during interview of session. Frequency of consumption of non-vegetarian foods was also noted.

Average nutrient intake per day was calculated and compared with Recommended Dietary Allowances (RDA) for this age group using the food consumption tables given by.

- **Clinical Signs and Symptoms:** It is important practical method for assessing the nutritional status of community and the method is based on examination for changes during pregnancy.
- **Biochemical Profile:** Data pertaining to haemoglobin (g/dl) were recorded during the visit from the pathological reports of pregnant women.
- **Living Pattern:** Daily routine of pregnant women contain six items i.e. woke up time, sleeping time, meal skipping habit, exercise, smoking and alcohol consumption for the determination of living pattern or lifestyle habits of pregnant women.

The data collected were tabulated and analyzed statistically with the help of approved statistical techniques.

Results and discussion

Table 1: Distribution of respondents according to their BMI and pregnancy trimesters

S. No.	BMI category	(n) Number of respondents	(%) Percentage of respondents	Average weight gain(kg)	Reference weight gain(kg)
1.	First trimester	104			
a.	<18.5	7	2.8	1.45	0.7-1.4
b.	18.5- 24.9	78	31.2	0.94	
c.	25.0-29.9	20	8.4	0.77	
2.	Second trimester	146			
a.	<18.5	7	2.8	4.5	5.6 -6.4
b.	18.5- 24.9	99	39.6	4.35	
c.	25.0-29.9	36	14.4	4.24	
d.	>30.0	4	1.6	2.5	

Total selected pregnant women divided according to trimester and in every trimester selected respondents divided according to their BMI. Table 1 shows that every selected pregnant woman in each and every trimester had weight gain which was very important and very good symptom. In first trimester there were normal increase in weight but table showed that in trimester second there were less increases in weight gain in comparison to reference average weight gain.

Table 2: Distribution of selected pregnant women according to their clinical examinations

Clinical Survey			
	Percentage (%)		**Percentage (%)**
General appearance		Eye colour	
Good	32	Normal	92.8
Fair	58	Pale	7.2
Poor	10	Skin colour	
Appetite		Normal	92.8
Good	27.6	Pale	7.2
Fair	39.6	Fatigue	
Poor	32.8	Present	71.6
Morning Sickness		Absent	28.4
Yes	34.0	Behavioural implication	
No	66.0	Normal	59.6
Abdominal pain		Irritable	40.4
Yes	42.0		
No	58.0		

Table 2 shows the clinical examinations of respondents. Majority of respondents (58%) had fair general appearance, 32 per cent of respondents belong to good general appearance and only 10 per cent of respondents had poor general appearance. Most of respondents (39.6%) had good appetite, 32.8 per cent of respondents had poor appetite. There are some pregnant women which are belonging to first trimester of pregnancy in which morning sickness, nausea, vomiting, constipation and heart burn occurs so because of that they do not had good appetite. After second trimester they feel well and her appetite increases due to increase in her blood volume and also increase in weight of fetus so 27.9 per cent of respondent had good appetite. Eye colour and skin colour of respondents were normal in 92.8 per cent of respondents and pale in 7.2 per cent of respondents because some pregnant women were anemic. About 71.6 per cent of respondents felt tired during pregnancy because they carried extra weight which affects their posture. 28.4 per cent of respondents felt normal. Maximum percentage (66%) of respondents had not symptoms of morning sickness because they completed her first trimester and about 34 per cent of respondents had morning sickness i.e. nausea and vomiting due to their first

trimester of pregnancy but also some women who had completed her first trimester had vomiting and nausea because some pregnant women had symptoms of morning sickness throughout pregnancy. Majority of respondents (58%) had no abdominal pain but about 42 per cent pregnant women had abdominal pain. Abdominal pain during pregnancy can be a normal part of the process of body changes to accommodate growing baby. Some abdominal aches are quite common and generally pose no threat to mother and baby but some may be more serious. Behavioural implication was normal with 59.6 per cent of respondents and irritable with 40.4 per cent of respondents. During pregnancy women become irritated because hormonal changes occur and they also bear extra weight and also because of nausea, vomiting morning sickness etc.

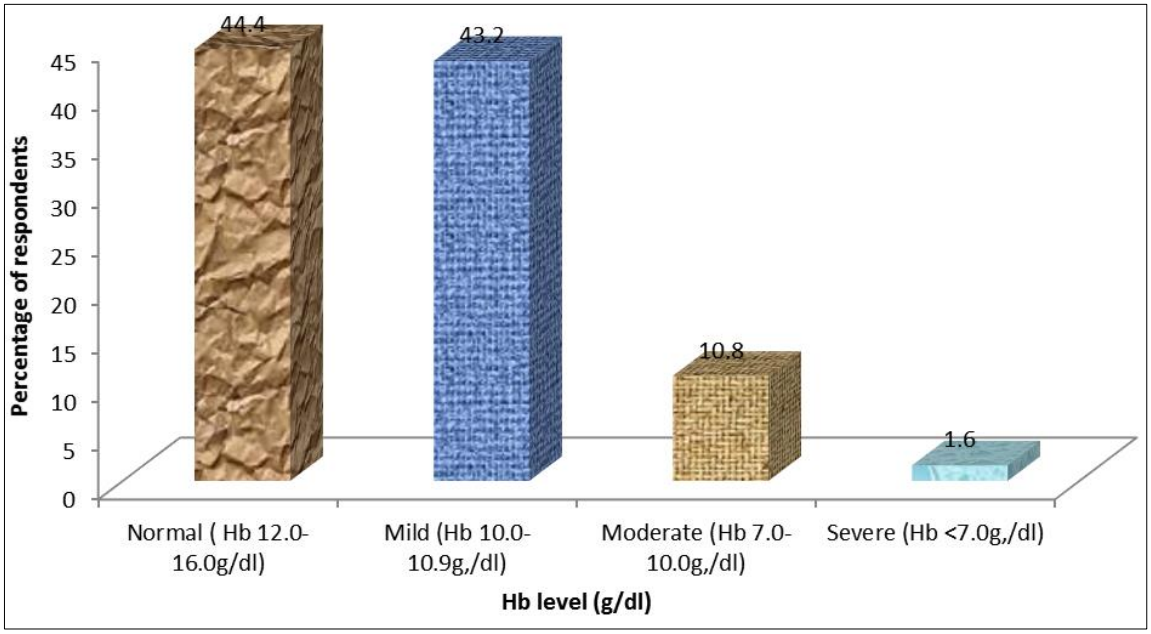

Fig 1: Distribution of respondents according to the haemoglobin level.

Figure 1 shows the distribution of respondents according to haemoglobin level of respondents. Most of respondents (44.4 %) were belonging to normal level of haemoglobin **(**Hb 12.0-16.0g/dl**).** About 43.2 per cent of respondents were belonging to the mild anaemic group (Hb 10.0-10.9g/dl), 10.8 per cent of respondents were belonging to the moderate anaemic group (Hb 7.0-10.0g/dl), only 1.6 per cent of respondents were belonging to the severe anaemic group (Hb <7.0g,/dl). Out of 250 respondents 111 respondents were non- anaemic and 139 respondents were anaemic because of lack of knowledge. They don't have any idea for what kind of foods they include in their diet for increasing haemoglobin. Somewhere they include all green leafy vegetables but don't take vitamin C rich foods so proper absorption of iron doesn't take place. Some pregnant women take iron supplements with milk because they do not know milk is a rich source of calcium and calcium is a big inhibitor of iron absorption. Calcium and iron rich foods never taken simultaneously due to inhibitor property. For better absorption of iron always taken with vitamin C rich foods and calcium taken with vitamin D rich foods. Anemia in pregnant women detrimental to fetal growth and pregnancy outcomes. Anemia in pregnancy is associated with increased rates of maternal and perinatal mortality, condition of hypoxia, premature delivery, low birth weight, and other adverse outcomes. During pregnancy, anemia increased more than fourfold from.

Table 3: Distribution of selected pregnant women according to their living pattern

Living Pattern	Percentage (%)
Duration of sleep	
8-10 hours	34
5-7 hours	66
Exercise	
Yes	33.2
No	66.8
Smoking	
Yes	0.0
No	100
Alcohol	
Yes	0.0
No	100
Meals Skipped	
Yes	70.8
No	29.2

Table 3 shows that only 34 percent of selected pregnant women took proper sleep for 8-10 hours and rest of 66 percent of selected pregnant women took rest for only 5-7 hours. Most of selected pregnant women (66.8%) did not exercise regularly whereas about 33.2 percent of selected pregnant women exercise regularly. Majority of pregnant women don't do exercise because either they wake up late in the morning or they have so many household work. Some

women have myth that exercising during pregnancy can have some complications. None of the selected pregnant women were smoking and also does not consume alcohol due to Indian custom. Because in India mostly in undeveloped and developing cities there are custom that women don't do smoking and alcohol consumption. But in metropolitan cities there are some women which take alcohol and also do smoking. About 70.8 percent of selected pregnant women skipped their meal because of the pattern of meal. They take meal only two times because they cooked in the morning and all working members take their food and go to on the work and then the respondents also take their food in the morning and then after only tea. And when working members and their husbands come back to home in the evening or night they take their food after when all members were taken their food. Only 29.2 percent of selected pregnant women were not skipped their meal.

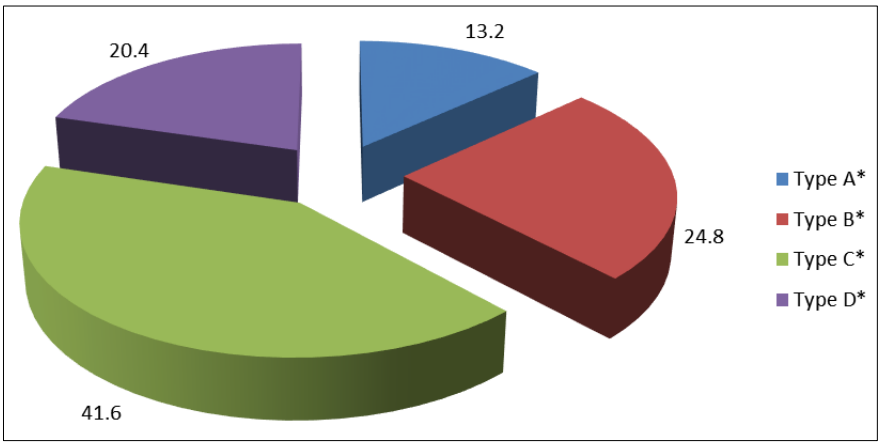

Fig 2: Distribution of selected pregnant women according to their dietary pattern

*[Type A= Brunch + Dinner]

*[Type B= Breakfast+Lunch+Dinner]

*[Type C= Breakfast+Lunch+Evening tea+Dinner]

*[Type D= Breakfast+Mid-morning+Lunch+Evening tea+Dinner+Bed time]

Figure 2 shows that dietary pattern of majority of respondents (41.6%) were preferred type C dietary pattern (four meal pattern), 24.8 percent of respondents preferred type B dietary pattern (three meal pattern), 20.4 percent of respondents were preferred type D dietary pattern (six meal pattern) which is best pattern of diet intake for any person and 13.2 percent of respondents were preferred type A dietary pattern (two meal pattern).

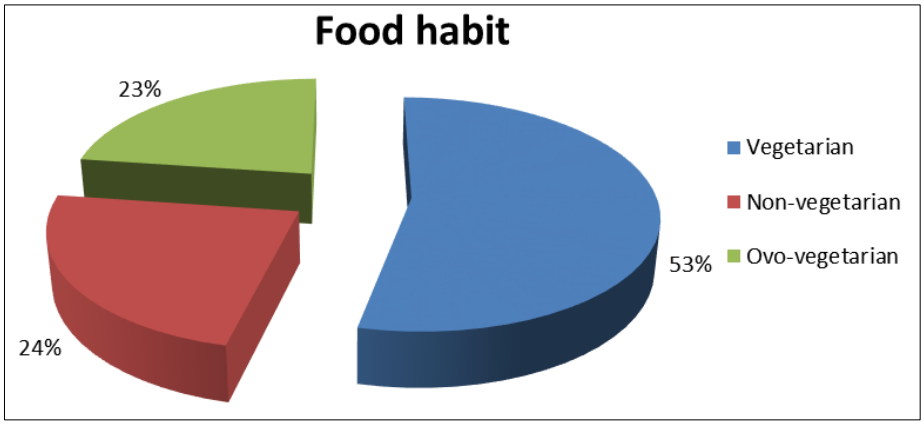

Fig 3: Distribution of selected pregnant women according to food habits

Figure 3 shows the distribution of respondents according to food habit. It was revealed that most of the respondents were vegetarian (53.6%) because most of the pregnant women are belongs to Hindu religion. About 23.6 percent of the respondents were non-vegetarian. Only 22.8 percent of the respondents were ovo- vegetarian or eggitarian. The dietary habits of individuals vary according to regional customs and tradition.

Table 4: Distribution of respondents on the basis of food consumption frequency.

	Food consumption frequency											
	Daily		**4-6 times/week**		**2-4 times/week**		**1-2 times/week**		**Occasionally**		**Never**	
	(n)	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**	**(n)**	**(%)**
Cereals	250	100	-	-	-	-	-	-	-	-	-	-
Pulses	190	76	50	20	10	4	-	-	-	-	-	-
Milk and milk products	46	18.4	72	28.8	28	11.2	18	7.2	47	18.8	39	15.6

GLVs	62	24.8	76	30.4	59	23.6	22	8.8	13	5.2	18	7.2
Roots and tubers	228	91.2	22	8.8	-	-	-	-	-	-	-	-
Fruits	83	33.2	67	26.8	28	11.2	18	7.2	32	12.8	22	8.8
Egg	11	4.4			29	11.6	33	13.2	43	17.2	134	53.6
Meat and meat products	17	6.8	11	4.4	31	12.4	21	8.4	36	14.4	134	53.6
Fat and oils	250	100	-	-	-	-	-	-	-	-	-	-
Oilseeds	-	-	-	-	-	-	-	-	250	100	-	-
Sugar and jaggery	232	92.8	-	-	-	-	-	-	-	-	18	7.2

Table 5: Distribution of respondents according to their nutrient intake in first trimester

Sedentary respondents of first trimester n=77								
Nutrients	**Energy (Kcal)**	**Protein (g)**	**CHO (g)**	**Fat (g)**	**Iron (mg)**	**Calcium (mg)**	**Vitamin C (mg)**	**Folic acid (µg)**
Average Nutrient intake	1998.7±140.84	67.4±6.64	349.7±42.65	36.68±4.88	29.30±4.27	893.8±114.70	86.81±33.03	166.7±27.81
RDA	2250	78	337.5	30	35	1200	60	500
Difference	-251.3	-10.6	+12.2	+6.68	-5.7	-306.2	+26.8	-333.3
t-cal	15.656	13.927	2.512	12.024	11.680	23.417	7.124	105.099
t-tab	1.664	1.664	1.664	1.664	1.664	1.664	1.664	1.664
Result	S*	S*	S*	S*	S*	S*	S*	S*
Moderate respondents of first trimester n=27								
Average Nutrient intake	2082.7± 67.57	73.9±5.80	367.8± 6.80	35.1±3.72	31.1± 4.62	918.7± 12.75	83.48±26.72	179.62±21.40
RDA	2580	78	387	30	35	1200	60	500
Difference	-497.3	-4.1	-19.2	+5.1	-3.9	-281.3	+23.48	-320.38
t-cal	15.418	3.611	3.545	7.239	4.330	6.869	4.565	104.129
t-tab	1.703	1.703	1.703	1.703	1.703	1.703	1.703	1.703
Result	S*	S*	S*	S*	S*	S*	S*	S*

* S= Significant
*NS= Not Significant

Table 5 shows the overall intake of food in the form of nutrients was lower than the Recommended Dietary Allowances (RDA) for most of the nutrient except fat and vitamin C during the first trimester of pregnancy of the selected respondents. During the first trimester respondents were suffered from nausea, vomiting and uneasiness so they were not able to take proper meal hence their average dietary intake were lower as compare to respondents of second trimester.

Table 6: Distribution of respondents according to their nutrient intake in second trimester

Sedentary respondents of second trimester n= 127								
Nutrients	**Energy (Kcal)**	**Protein (g)**	**CHO (g)**	**Fat (g)**	**Iron (mg)**	**Calcium (mg)**	**Vitamin C (mg)**	**Folic acid (µg)**
Average Nutrient intake	2069.8±147.97	72.1±7.89	367.5±37.44	34.6±4.91	30.3±4.67	937.4±169.74	78.52±17.43	177.4±21.26
RDA	2250	78	337.5	30	35	1200	60	500
Difference	-180.2	-5.9	+30	+4.6	-4.7	-262.6	+18.52	-322.6
t-cal	13.722	8.314	9.050	10.627	11.127	17.432	11.974	170.905
t-tab	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660
Result	S*	S*	S*	S*	S*	S*	S*	S*
Moderate respondents of second trimester n= 19								
Average Nutrient intake	2203.5± 45.96	75.3±6.65	393± 14.67	36.7±2.97	31.7±4.76	923.4± 51.11	78.7±13.38	197.7±7.33
RDA	2580	78	387	30	35	1200	60	500
Difference	-376.5	-2.7	+6.0	+6.70	-3.3	-276.6	+18.6	-302.3
t-cal	35.703	1.707	0.015	9.870	2.991	23.581	6.101	179.539
t-tab	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729
Result	S*	S*	NS*	S*	S*	S*	S*	S*

Table 6 shows that the average dietary intake of the sedentary respondents of second trimester. Most of the nutrients except carbohydrate, fat and vitamin C were lower than the RDA. There were increases showed in the average dietary intake of respondents of second trimester as compare to respondents of first trimester. Due to increase in overall calories there were increases in their weight accordingly. The average dietary intake of the moderate respondents of second trimester were lower than the Recommended Dietary Allowances (RDA) for the nutrients except carbohydrate, fat and vitamin C but higher than the sedentary women whose belongs to first trimester. The average intake of energy (2203.5±45.96 kcal) was lower than the RDA with difference of 376.5 kcal. Average protein intake (75.3±6.65 g) was lower with 2.7g than the RDA. The mean intake of fat (36.7±2.97 g) was higher than the RDA. Recommended iron intake during pregnancy is 35 mg per day but the mean intake of iron (31.7±4.76 mg) of respondents was lesser by 3.3 mg. The average daily intake of calcium (923.4±51.11 mg) was also lower than RDA. Mean intake of vitamin C (83.3± 13.38mg) was excess by 23.3 mg than RDA. The average intake of folic (197.7±7.33µg) was deficit than RDA.

Conclusion

From present study it is concluded that out of 250 pregnant women 70.8 per cent of respondents belongs to normal body mass index category, 22.4 per cent of respondents belongs to overweight category, 1.6 per cent of respondents belongs to obese category and 5.2 per cent belongs to underweight category of body mass index. Respondents were showed

significant weight gain in different trimester. Mean weight gain of respondents of second trimester were 4.29 kg and first trimester were 0.93 kg respectively in their present month.

Average nutrient intake of the respondents found to be less with regard to carbohydrate, protein, iron, calcium and folic acid as compared to Recommended Dietary Allowances (RDA). During first trimester average nutrient intake showed significant difference in both women of sedentary and moderate category. In second trimester mean intake showed significant difference for sedentary women but mean intake of carbohydrate of moderate women showed no significant difference. During third trimester there were significant differences in mean intake of respondents of sedentary women but average intake of carbohydrate showed no significant difference in moderate women. Majority of respondents (41.6%) were preferred type C dietary pattern (four meal pattern), 24.8 percent of respondents preferred type B dietary pattern (three meal pattern), 20.4 percent of respondents were preferred type D dietary pattern (six meal pattern) which is best pattern of diet intake for any person and 13.2 percent of respondents were preferred type A dietary pattern (two meal pattern). It was revealed that most of the respondents were vegetarian (53.6%) Maximum percentage (66%) of respondents were not had symptoms of morning sickness because they completed her first trimester and about 34.0 per cent of respondents had morning sickness. Majority of respondents (58%) had no abdominal pain but about 42 per cent pregnant women had abdominal pain. Most of the respondents (55.6%) were anaemic and 44.4 per cent of respondents had normal level of haemoglobin. Most of the respondents (41.6%) follow three meal patterns. Maximum percentages (53.6%) of respondents were vegetarian. Most of selected pregnant women (66.8%) did not exercise regularly whereas about 33.2 percent of selected pregnant women exercise regularly.

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