Nutritional status of pregnant women of Rajasthan

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■ **ABSTRACT :** The present study was conducted on 500 pregnant women residing in four district of Rajasthan *viz.,* Udaipur, Alwar, Sriganganagar and Bikaner to assess their nutritional profile. An interview schedule was developed and pre-tested before collection of data. The background information about the family and the subject was recorded for each pregnant woman. The nutritional status of the pregnant women was assessed using dietary adequacy and anthropometric measurement. Results revealed that mean height and weight of the pregnant women was 154.89 cm and 50.71 kg, respectively. Body composition calculated by skinfold thickness showed that body fat was 15.96 percent, body water 50.88 per cent and fat free mass was 84.04 percent. Dietary adequacy was assessed by 24 hour recall method using standardized cup set. The mean intake of different food stuffs consumed was computed for a day and compared with the balanced diet (NIN, 1998). The nutrient intake was calculated using nutritive value given in food composition table (Gopalan *et al.*, 1989). Mean intake of nutrients was compared with the RDA suggested by ICMR (1990). Findings revealed that diet of women was inadequate in all the food groups except fat, roots and tubers and other vegetables. The most limiting nutrients in their diet were energy, protein, iron, calcium, carotene and folic acid. Statistical analysis portrayed that intake of protein, energy, calcium and iron were significant at $p < 0.001$ level. Mean haemoglobin of the study group was 9.71 which was low as compared to WHO cut off point. Majority of women were moderately aneamic in the study.

■ **KEY WORDS :** Pregnancy, Nutritional status, Anemia, Anthropometric measurements, Dietary adequacy

Prenatal medical care is the medical and nursing care recommended for women before and during pregnancy. Pregnancy is a period of great physiological as well as psychological stress for the women. Maternal nutrition is an important determinant of the course and outcome of pregnancy and seventy five per cent of foetal growth is related to maternal nutritional status (Worthington and Williams, 1993). In India, despite improvement in life expectancy, NFHS reported that neo-natal mortality, infant mortality rate has risen from 42.1 to 49.5 per cent and 76.3 to 80.4 per cent in the year 1993 to 1999, respectively in Rajasthan (*http://www.nfnsindia.org*). Maternal mortality rate in Rajasthan is 670/lakh live birth (India, 2004). A woman who has been well nourished before conception begins her pregnancy with reserves of several nutrients so that the needs of the growing foetus can be met without affecting her health. Infants, who are well nourished in the womb, have enhanced chance of entering life in good health. Mother's diet should provide adequate nutrients so that maternal stores do not get depleted. Therefore present study was undertaken to study the nutritional status of pregnant women residing in Rajasthan.

■ **RESEARCH METHODS**

Structured interview schedule was developed to collect the information from the female, which included information about family and the subject. Nutritional status was assessed by anthropometric measurement which included height (cm), weight (kg), body mass index wt (kg)/ht m^2, skinfold thickness at various sites *i.e.* bicep, tricep, subscapular and suprailiac, These sites were used for calculating body density using the technique described by Durnin and Wormersely (1974). Body fat was calculated using Siri's equation (Siri, 1961). Dietary adequacy of each woman was assessed by 24 hr. recall method using standardized cup set. The information about raw

quantity taken for cooking as well as the cooked food by the subject was recorded in terms of household measures/number/kg to find out the quantum of raw food intake. From the cooked and raw amount consumed by each subject was calculated. The mean intake of different food stuff consumed was then computed for a day and compared with the balanced diet (NIN, 1998). The nutrient intake was calculated using nutritive value given in food composition table (Gopalan *et al.*, 1989). Mean intake of nutrient was compared with the RDA suggested by ICMR (1990).

Statistical analysis "ANOVA" was used to see the difference among the district at different levels.
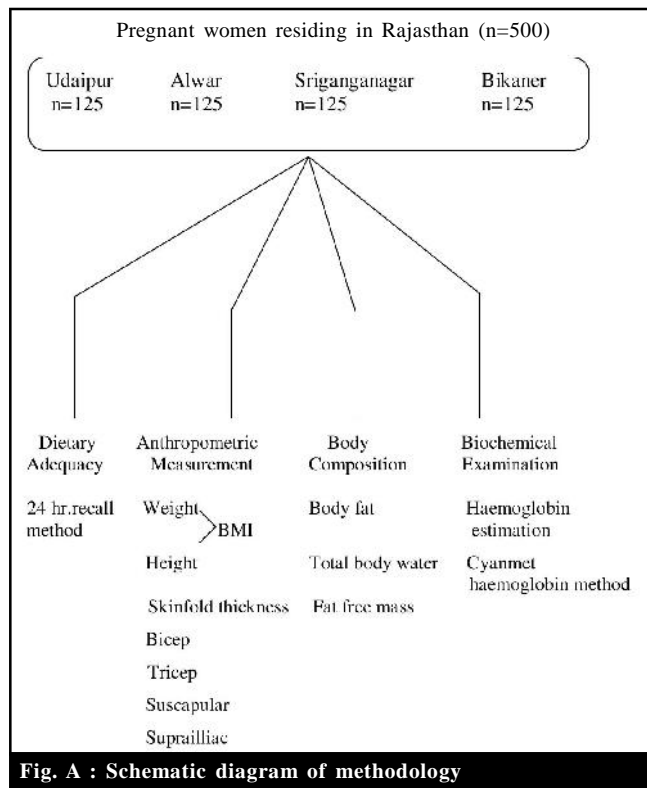

Fig. A : Schematic diagram of methodology

■ RESEARCH FINDINGS AND DISCUSSION

Background information revealed that majority of the families *i.e.* 76.6 per cent were Hindu and living in joint family system. Eighty two per cent were vegetarian and remaining eighteen per cent were non-vegetarian. The per capita income of the families was Rs. 7071 ± 6714. The per cent distribution of the families as per their socio-economic status revealed that 63.4 per cent families were belonging to low middle income group (Table 1).

Information about subject potrarys that majority of women were between the age group of 21 to 23 years (32.2%). About 75 per cent of the women were between the age group of 18-20 years at the time of marriage. It was surprising to note that most of the subjects of the study group were illiterate.

Table 1 : Percentage distribution of subjects by their family background		
Sr. No.	Details of family background	Total (n = 500)
Religion		
1.	Hindu	76.6 (383)
2.	Muslim	9.8 (49)
3.	Christian	3.8 (19)
4.	Jain	9.8 (49)
Food habit		
1.	Vegetarian	82.2 (411)
2.	Non- Vegetarian	17.8 (89)
Type of family		
1.	Joint	77.4 (387)
2.	Nuclear	22.6 (113)

Values in parenthesis indicates number of subjects

Specific information about the subject depicts that irrespective of district 44.8 per cent of the women had less than 32 weeks of pregnancy. It was observed that majority of women had first pregnancy of the time of study. About 56 per cent women faced the problem of nausea and vomiting during the pregnancy. Fatigue, muscle cramps, headache, general weakness, insomnia etc. were the common health problems faced by most of the women during pregnancy.

In the present study, height, weight, skinfold at bicep, tricep, subscapular and suprailic sites were measured. Body mass index and body components such as body fat, fat free mass and body water were calculated to assess the nutritional status of the subject. Mean weight and height of the subject was 50.71 kg and 154.85 cm, respectively. Mean skinfold at bicep, tricep, subscapular and suprailliac sites were 6.48, 9.68, 13.06 and 16.89, respectively. The values of skinfold were highest at suprailliac site indicating that this was a major site of fat deposition during pregnancy (Table 2).

Body weight is a composite of body water, lean tissue, adipose tissue and bone. The proportion of water, lean mass and fat changes with age but in physiciological stress *i.e.* in pregnancy, the site for fat deposition was different as gestation age progress.

Body composition was calculated using Siri's equation by skinfold at various sites (Siri, 1961). It was observed that mean body fat of pregnant women was 8.06 kg which was significant at $p < 0.01$ level while fat free mass and body water were 42.65 and 25.57 kg, respectively. Body density was also calculated by equation of Durnin and Womersely (1974) using mean sum of four skin fold and total body water was calculated. Statistical analysis indicate that weight, height, BMI, subscapular, suprailliae, total body water, fat free mass without water was significant at $p < 0.001$ level (Table 3).

In the study, site of deposition of fat was found more in suprailice region as compared to subscapular. Falkner and Tanner, (1986) in their study noted that from 20 to 36 weeks,

Table 2 : Mean ±SD (SE) values and level of significance of anthropometric measurement and indices of pregnant women

Sr. No.	Body measurements/ Indices	Total (n=500) Mean ±SD values	F-Values	C.D. (P=0.05)
1.	Age	22.88 ± 3.26 (0.15)	3.48*	0.79
2.	Weight (kg)	50.71 ± 8.33 (0.37)	6.92***	2.02
3.	Height (cm)	154.89 ± 7.57 (0.67)	7.16***	5.44
4.	BMI (kg/m^2)	21.62 ± 3.05 (0.29)	20.64***	1.90
5.	Bicep (mm)	6.48 ± 2.80 (1.26)	1.73 NS	NS
6.	Triceps (mm)	9.68 ± 5.25 (2.35)	2.86*	12.89
7.	Sub scapular (mm)	13.06 ± 6.43 (2.88)	11.71***	15.40
8.	Suprailiac (mm)	16.89 ± 8.05 (3.60)	23.57***	6.77
9.	Total of four skin fold (mm)	45.09 ± 18.56 (8.30)	13.77 ***	44.18

Parenthesis indicate SE values   P values   ** P<0.01,   *** P<0.001,   * P<0.005,   NS=Non-signifiant

there was significant increase in suprailliac skinfold values. It showed that main site for fat deposition during pregnancy was suprailliac.

Dietary adequacy revealed that there was no significant difference found among the study group for cereals, roots and tuber, fruits and milk. There was significant difference for intake of pulses, other vegetables and sugar at p < 0.001 level. Results compared with per cent RDA portrays that pulse consumption was only 33 per cent. Although per cent RDA for fruits and green leafy vegetable was 166 and 138 (Table 4 and 5).

Protein intake was only 85 per cent as compared to RDA and was significant at p < 0.001 level. Mean intake of iron and folic acid was 50 and 46 percent, respectively of RDA which are the main components for haemoglobin formation. This may be a contributing reason of higher prevalence (94%) of anaemia in Rajasthan. Statistical analysis reveals that protein energy, carbohydrate, calcium, iron, carotene, thiamin, riboflavin and vitamin C values were significant at p < 0.001, level while that of niacin was significant at p < 0.01 (Table 6 and 7). Mean haemoglobin level of pregnant women was 9.71 g/dl in the study.Out of five hundred pregnant women, only twenty nine were normal (Table 8). Okafor *et al*. (2001) studied 100 pregnant women residing in ogun (Nigeria) and reported that mean haemoglobin was 9.75 g/dl of all the study, group which supports the present study. In the present study moderate type of aneamia was prevalent similar results were also observed by the study done by Srihareni and Lakmi (1999) who noted 50.4 per cent of expectant mothers were suffering with moderate anaemia. Present study concludes that nutritional status of pregnant women was poor.

The poor nutritional status of pregnant women in present

Table 3 : Mean ± SD values and range of body composition of pregnant women

Sr. No.	Details	Overall (n = 500)	F value	C.D. (P=0.05)
1.	Body fat %	15.96 ± 2.08	5.096**	-
	Range	(13.43-19.27)		
2.	Total body water %	50.88 ± 2.78	6.413***	-
	Range	(43.8-59.8)		
3.	Fat free mass %	84.04 ± 2.08	5.096**	-
	Range	(44.73-86.57)		
4.	% FFM without water	33.16 ± 3.78	6.838***	-
	Range	(23.57-42.79)		
5.	Body fat (kg)	8.06 ± 1.55	5.143**	0.377
	Range	(5.27-30.40)		
6.	Total body water (kg)	25.57 ± 2.75	6.925***	0.66
	Range	(19.73-35.90)		
7.	Fat free mass (kg)	42.65 ± 7.33	7.091***	1.11
	Range	(24.60-70.99)		
8.	FFM without water	17.08 ± 4.64	7.234***	0.88
	Range	(2.39-35.09)		

P values ** P<0.01,   *** P<0.001,   * P<0.005,   NS=Non-signifiant

investigation can be attributed to dietary inadequacy resulting due to illiteracy, ignorance and low income as majority of the study group belonged to lower middle class. Dietary intake of micronutrients was assessed by Pathak *et al.* (2004) and the results revealed that the consumption of food groups rich in micronutrient (pulses, vegetables, fruits, nuts and oil seeds, flesh foods) was inadequate and similar results were obtained in present study also. Study done by Mridula *et al.* (2003) on 120 expectant mother where the average energy intake was 1954 k-cal and protein was 44g per day which was lower as compared to RDA. Another study conducted by Pallavi and

Usha (2002) on 30 expected mothers found that protein intake was 44.6g/day which was low as compared to RDA. Several studies have stated lower intake of iron by expectant mothers (Chandrashankar *et al.*, 1980, Lawwang, 1980, Kaur *et al.*, 1982, Pallavi *et al.*, 2002, Mridula *et al.*, 2003). Reason for less intake of folic acid was that most of the food stuff's folic acid content was not calculated and also rich source of folic acid such as flesh foods, green leafy vegetable and daily products were consumed in less amount by the study group.

The main reason for low consumption of protective food by study group is that most of the females were belonging to

Table 4 : Mean ± SD values and range of food intake by pregnant women

Sr. No.	Food groups	Total (Intake g/day)	F Values
1.	Cereal	344.01 ± 49.21 120-510 (500)	0.914 NS
2.	Pulses	29.97 ± 26.29 0-200 (287)	1.823 NS
3.	Green leafy vegetable	138.75 ± 41.52 20-250 (56)	8.46 ***
4.	Roots and tubers	126.35 ± 54.58 50-350 (244)	1.164 NS
5.	Other vegetable	109.47 ± 68.22 50-350 (244)	5.35 ***
6.	Fruits	166.08 ± 105.64 20-500 (157)	1.34 NS
7.	Milk	212.73 ± 165.13 50-750 (460)	.245 NS
8.	Sugar and jaggery	15.62 ± 12.88 5-75 (477)	6.16 ***
9.	Visible fat	32.28 ± 6.76 10-55 (500)	1.50 NS
10.	Flesh food	- 0-100 (11)	-

P values ***P< 0.001, **P < 0.01, * P < 0.005, NS=Non-signifiant ** Values in parenthesis indicates number of subjects

Table 5 : Mean ± SD and range of percent intake to RDA of balance diet by pregnant women

Sr. No	Food groups	RDA	Overall		F value
			%RDA	Range	
1.	Cereals	395	87.01	30-129	.914NS
2.	Pulses	75	33.29	0-222	1.967 NS
3.	Milk	400	53.18	50-188	8.467***
4.	Green leafy Vegetable	100	138.75	50-250	1.164 NS
5.	Root and tubers	100	26.55	50-350	5.35***
6.	Other Vegetable	100	109.47	50-350	1.34 NS
7.	Fruits	100	166.08	30-500	.245 NS
8.	Sugar	35	44.64	7-214	6.166***
9.	Fat	30	107.59	33-167	1.50 NS

NIN, 1998 `P values ***P< 0.001, **P < 0.01, * P < 0.005, NS=Non-signifiant

Table 6 : Mean ± SD value and range of nutrient intake by pregnant women

Sr. No.	Food group	Total intake (g) day (n = 500)	F values
1.	Energy (kcal)	1868± 421 (829-4873)	9.77 ***
2.	Protein (g)	55.50± 13.81 (16-152)	12.14 ***
3.	Fat (g) Visible	32.28± 6.76 (10-358)	2.76 *
	Invisible	17.21± 18.52	
	Total fat	49.49±10.66	
4.	Carbohydrate (g)	300.45± 66.67 (155-665)	10.61 ***
5.	Calcium (mg)	491.22± 285.48 (105-1447)	10.47 ***
6.	Phosphorus (mg)	1538.56±376.05 (344-4129)	14.13 ***
7.	Iron (mg)	19.10±4.33 (2-49)	8.55 ***
8.	Carotene (mg)	1197.54±2224.68 (56-15365)	6.21 ***
9.	Fibre (g)	8.14±2.97 (2-45)	6.30 ***
10.	Thiamin (mg)	1.99±0.45 (.27-5.3)	12.06***
11.	Riboflavin (mg)	1.10±0.46 (.25-3.8)	11.48***
12.	Niacin (mg)	16.70±3.45 (3.5-33)	5.68***
13.	Folic acid (µg) (total)	186.92±64.09 (14-534)	3.50*
14.	Vitamin C (mg)	48.69±63.83 (0-433)	10.39***

P values   ***P< 0.001,   **P < 0.01, * P < 0.005,   NS=Non-signifiant   ICMR (1990)

Table 7 : Percentage to RDA of nutrient intake by pregnant women

Sr. No.	Nutrients	RDA	Overall % RDA	F value
1.	Energy	2525 kcal	74.01	9.7**
2.	Protein	65g	85.38	12.14**
3.	Fat (Visible)	30g	164.96	2.76*
5.	Calcium	1000mg	49.12	10.47**
6.	Iron	38mg	50.27	8.55**
7.	Carotene	2400mg	49.90	6.2**
8.	Thiamin	1.3mg	153.02	12.06**
9.	Riboflavin	1.5mg	73.53	11.48**
10.	Niacin	16mg	104.37	5.68**
11.	Folic acid	400mg	46.5	3.74**
12.	Vitamin C	40mg	121.73	10.39**

P values   ***P< 0.001,   **P < 0.01,   * P < 0.005,   NS=Non-signifiant

Table 8 : Percentage prevalence of anemia in pregnant women

Sr. No.	Hemoglobin level (g/dl)	Total (n = 500)
1.	< 7 Severe anemia	7.2 (36)
2.	7-10 moderate anemia	74.2 (371)
3.	> 10 -10.9 mild anemia	12.6 (63)
4.	< 11 anemia	0.2 (1)
5.	> 11 non -anemia	5.8 (29)

Values in parenthesis indicates number of subjects

low middle income group socio-economic group and due to low purchasing power they have to stick on cereal based diet.

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