Assessment of dietary intake by food frequency questionnaire among pregnant women

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Pregnancy is marked by high accumulation of nutrients in the form of maternal and foetal tissue growth. Nutrition during pregnancy is of great importance because foetus draws its nourishment from mother. Child bearing imposes great strain, even it is normal physiological process it increases considerably the nutritional requirements of mother. The present study was also conducted to assess the dietary intake of pregnant women. About 60 subjects were selected randomly from Ludhiana city. Information regarding socio-economic status, medical history, food frequency consumption pattern, anthropometric measurements was recorded by filling up questionnaire. Daily nutrient intake was calculated by using 'dietcal software'. Complications were present in majority of subjects. Majority of subjects consumed wheat, milk, fats and oils, sugar and jaggery on the daily basis from all the food groups. Intake of macronutrients *i.e.* energy, protein as well as micronutrients such as folic acid, vitamin B12, iron and calcium intake was found to be inadequate as compared to RDA.

Key Words : Dietary intake, Food Frequency questionnaire, Medical history and pregnant women

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INTRODUCTION

Pregnancy is the period of dynamic change for a mother requiring a lot of care. During this period the fetus is nourished directly by the mother through placenta. Since the baby totally relies upon its mother for nourishment, the pregnant woman is to be provided with an adequate and well-balanced diet. A woman's normal nutritional requirement increases during pregnancy in order to meet the needs of the growing fetus and of maternal tissues associated with pregnancy, proper

dietary balance is necessary to ensure sufficient energy intake for adequate growth of fetus without drawing on mother's own tissues to maintain her pregnancy (Mridula *et al.*, 2003).

Nutritional problems associated with nutrient deficiencies have serious public health significance impacting psychological, physical, developmental, behavioural and work performance of pregnant women. Nutritional problems may be caused not only by deficiency of protein, calorie, iron, vit. C, but by other conditions like malaria, worm infestation, adverse environmental and socio-demographic factors. Association of nutritional problem with adverse maternal outcome such as puerperal sepsis, anti partum haemorrhage, post partum haemorrhage etc. are also responsible for low birth weight, premature birth, high perinatal mortality rate and decreased work capacity

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(Madhavi and Singh, 2011).

Women are regarded as the nerve centre of the family and society. Maternal nutrition and health is considered as the most important regulator of human fetal growth (Ventura *et al.*, 2008). Pregnancy is a state of physiological stress, metabolic and hormonal changes in the life of a woman. During this period a foetus develops in the uterus of the mother resulting extensive changes in maternal body composition. The development of the foetus is completely dependent on the health and well being of the mother. Consequently there is a significant increase in nutritional requirement with the advancement of pregnancy. If the mother does not have enough food, the baby may be small and weak. Caloric requirement during pregnancy is increased for growth of the foetus, placenta and maternal tissues and for the increased basal metabolism rate (Mehrotra and Tiwari, 2009).

METHODOLOGY

The present study was conducted on 60 pregnant women. Subjects were randomly selected from Ludhiana. The general information regarding age, education, occupation, religion, type and size of family, monthly income of family, dietary habits and medical history of pregnant women were collected by an interview schedule. Information regarding food consumption pattern of the subjects was collected by using food frequency questionnaire (Raghuvanshi, 2007). The average daily nutrient intake of diet was calculated by using 'Diet cal software' (Kaur, 2014). The nutrient intake was compared with recommended dietary allowances (ICMR, 2010). Anthropometric parameters such as height and weight were recorded and on the basis of this, weight gain was calculated during first, second and third trimester. The data were tabulated and analyzed statistically using frequencies, percentages and mean.

OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

General information of subjects :

A total number of 60 subjects were divided into two age groups *i.e.* 21-30 (70%) and 31-40 years (30%), respectively. Majority (48.3%) of the pregnant women

were graduate followed by matriculation (30%) and post graduation (16.7%), respectively. Only 5 per cent were studied upto secondary level. It was observed that 68.3 per cent of pregnant women were housewives and 31.7 per cent were involved in service and other type of occupation. The information recorded in the present investigation revealed that majority of subjects were sikh *i.e.* 65 per cent. Further it was observed that 35 per cent of subjects belonged to hindu religion. Half of the subjects belonged to nuclear and half belonged to joint families. Further, it was found that 40, 53.3 and 6.7 per cent of pregnant women were having family members upto 3, 4-5 and $\geq$ 6, respectively. The monthly income of the subjects ranged from Rs. 4000-Rs. 1,00,000 per month. It was observed that maximum number of families (51.6%) had family income Rs. $\leq$20,000 per month. It was reported that monthly income of 16.7 and 16.7 per cent ranged between Rs.40, 000-Rs. 60, 000 and $\geq$ Rs. 60,000 per month. Rest 15 per cent had family income between Rs.20, 000-Rs. 40, 000 per month, respectively. In the present study, it was observed that half of the subjects were vegetarian and 26.7 per cent were non-vegetarian, while 23.3 per cent were ova- vegetarian. Papaya is believed to be associated with abortion and 25 per cent of pregnant women restricted papaya in their

Table 1 : Medical history of pregnant women		(n=60)
Parameters	Frequency	Percentage
Family history		
Diabetes	25	41.7
Cardiovascular disease	17	28.3
Hypertension	41	68.3
Anaemia	3	5.0
Complications during pregnancy		
Nausea	56	93.3
Vomiting	48	80.0
High BP	20	33.3
Ges.dia	3	5.0
Cramps	38	63.3
Thyroid	3	5.0
Supplements taken		
Folic acid	22	36.7
Calcium	19	31.6
Iron	35	58.3
Multivitamin	18	30.0
Frequency to visit to doctor		
Weekly	12	20.0
Monthly	48	80.0

daily diet. The data of the present study reported that 56.7, 21.6 and 16.7 per cent of the subjects were in the habit of taking meals six, seven and five times a day, whereas only 5 per cent of the subjects' preferred to eat eight times a day, respectively. Morsy and Alhady (2014) reported that pregnant women differed in their ages (18.25%) from very young mothers (15-25 years old) to (81.75%) very old women (more than 50 years old). Satho and Fujimori (2012) reported that 66.6 per cent of pregnant women were studied upto matriculation. Sahoo and Panda (2006) reported that majority (93.3%) of the respondents was housewives and 6.7 per cent were self independent. Kavitha *et al.* (2011) reported that 43 per cent families had 1-3 members, 55 per cent had 4-7 members and only 2 per cent had above 7 members which were almost similar to the present study. Mehrotra and Tiwari (2009) reported that nearly two third of pregnant women were vegetarian, followed by ovatarian (22.37%) and non-vegetarian (12.72%).

Medical history :

The present study reported that 41.7, 28.3, 68.3 and 5 per cent of subjects had family history of diseases like diabetes, cardiovascular disease, hypertension and anemia, respectively (Table 1). Majority (93.3%) suffered from nausea followed by vomiting (80%), cramps (63.3%) and high blood pressure (33.3%), respectively, while only 5 per cent each suffered from gestational diabetes and thyroid. Results showed that 58.3 per cent of pregnant women had taken only iron supplements followed by folic acid (36.7%), calcium (31.6%) and multivitamin (30%), respectively. Most number of subjects *i.e.* 80 per cent visited to doctor monthly, whereas 20 per cent of pregnant women visited weekly for check up. Salima *et al.* (2011) observed that 40 per cent of pregnant women suffering from several diseases such as anemia, hypertension, diabetes and inflammatory diseases. Madhavi and Singh (2011) reported that 58.97 per cent of rural pregnant women of Karnataka received iron and folic acid tablets.

Food frequency of pregnant women :

The results of the present study revealed that majority of subjects *i.e.* 96.7 and 50 per cent of subjects consumed wheat flour *chapatti* and whole pulses daily. It was observed that cereals were also consumed in the form of maize flour *chapatti* and rice was common in 55

and 65 per cent, monthly and weekly. It was reported that 8.3 and 21.7 per cent, 1.7 and 15 per cent each consumed oats, jowar and bajra weekly and monthly among pregnant women, respectively. The results in the Table 2 revealed that 41.7 and 33.3 per cent consumed legumes and split pulses daily, while 51.7 per cent each consumed weekly and only 5 and 10 per cent consumed legumes and split pulses monthly, respectively. The data in the present study revealed that majority of the subjects consumed milk (96.7%) and curd (81.7%) daily, while 71.7 and 51.7 per cent preferred milk in the form of cheese and butter milk weekly, respectively. Further, consumption of milk in the form of butter was common in 41.7 and 55 per cent daily and weekly among pregnant women. Only 1.7, 16.7 and 10 per cent of subjects

Table 2 : Mean food frequency of pregnant women			(n=60)
Food groups	Daily	Weekly	Monthly
Cereals			
Wheat	58 (96.7)	2 (3.3)	-
Rice	19 (31.7)	39 (65.0)	2 (3.3)
Maize	4 (6.7)	6 (10.0)	33 (55.0)
Jowar	-	1 (1.7)	9 (15.0)
Bajra	-	1 (1.7)	9 (15.0)
Oats	-	5 (8.3)	13 (21.7)
Pulses			
Split	20 (33.3)	31 (51.7)	6 (10.0)
Whole	30 (50.0)	24 (40.0)	1 (1.7)
Legumes	25 (41.7)	31 (51.7)	3 (5.0)
Milk and milk products			
Milk	58 (96.7)	1 (1.7)	-
Butter	25 (41.7)	33 (55.0)	1 (1.7)
Cheese	5 (8.3)	43 (71.7)	10 (16.7)
Buttermilk	19 (31.7)	31 (51.7)	6 (10.0)
Curd	49 (81.7)	10 (16.7)	-
Fats and oils	59 (98.3)	-	-
Sugar and jaggery	59 (98.3)	-	-
Fruits and vegetables			
Roots and Tubers	32 (53.3)	27 (45.0)	-
Green leafy vegetables	11 (18.3)	47 (78.3)	-
Other vegetables	21 (35.0)	17 (28.3)	3 (5.0)
Citrus fruits	21 (35.0)	30 (50.0)	2 (3.3)
Other fruits	34 (56.7)	20 (33.3)	1 (1.7)
Non-Veg			
Chicken	-	9 (15.0)	6 (10.0)
Mutton	-	7 (11.7)	7 (11.7)
Fish	-	7 (11.7)	6 (10.0)
Egg	3 (5.0)	19 (31.7)	6 (10.0)

consumed butter, cheese and butter milk monthly. The results of the present study revealed that almost all the subjects *i.e.* 98.3 per cent used fats and oils daily. Similarly, 98.3 per cent of pregnant women consumed sugar and jaggery in daily in their diet. The results revealed in the present study that majority of the subjects consumed roots and tubers (53.3%) daily and green leafy vegetables (78.3%) weekly. Consumption of other vegetables was common in 35 and 28.3 per cent of the subjects daily and weekly, while only 1.7 per cent consumed other vegetables monthly. The results revealed in the present study that citrus fruits were common 50 and 35 per cent of the subjects daily and weekly. Only 3.3 per cent of the pregnant women consumed citrus fruits monthly. It was reported that 56.7, 33.3 and 1.7 per cent consumed other fruits daily, weekly and monthly, respectively. It was also observed that consumption of non-vegetarian foods *i.e.* chicken (15 and 10 %), mutton (11.7 and 11.7 %) and fish (11.7 and 10 %) was preferred weekly and monthly in subjects, respectively. Only 5 per cent consumed eggs daily, whereas. 31.7 and 10 per cent were consumed eggs weekly and monthly, respectively. Kavitha *et al.* (2011) reported that all the pregnant women of Ramanathapuram district, Tamil Nadu, consumed cereals and milk daily, whereas, consumption of pulses, roots and tubers and other vegetables weekly. 90 per cent of the subjects consumed leafy vegetables daily followed by 85 per cent of the subjects consumed fruits weekly.

Nutrient intake :

The average daily nutrient intake by selected pregnant women and its per cent adequacy has been presented in Table 3. The average daily energy intake among pregnant women was 1857.8 ± 269.5 Kcal. The nutrient adequacy of energy calculated against RDA of ICMR (2010) was 82.5 per cent. The data revealed in

the present study that the mean daily intake of protein was 58.9 ± 1.8 g. The results revealed that the mean intake of protein was less than RDA of 82.2 g as per ICMR recommendations (2010) and per cent adequacy was 71.6 per cent (Table 3). The results of the present study revealed that the mean daily intake of fat and carbohydrate was 47.9 ± 1.7 g and 266.2 ± 10.0 g, respectively. It was observed that the intake of fat was much higher than recommendations of 30 g by ICMR (2010). Mehrotra and Tiwari (2009) reported that energy and protein consumption was 87.7 and 77.1 per cent among rural subjects, whereas among urban women, consumption was 90.75 and 87.38 per cent of RDA.

Table 3 depicted that the mean daily intake of vitamin B_{12} was 0.7 ± 0.02 µg among pregnant women, respectively. It was observed that the average daily intake of vitamin B_{12} was below the RDA's of 1.2 µg (ICMR, 2010). This might be due to inadequate intake of pulses, legumes and non-vegetarian foods by the subjects in their daily diet. The per cent adequacy of intake of vitamin B_{12} was 58.3 per cent, respectively. The data revealed that the mean daily intake of folic acid was 329.7 ± 8.7 µg. It was observed that the intake of folic acid was less than the recommendations of 500 µg (ICMR, 2010). This might be due to the inadequate intake of whole grain cereals, pulses, green leafy vegetables and roots and tubers. The per cent adequacy of intake of folic acid was 66 per cent. Folic acid is needed for synthesis of essential components of DNA and RNA which increase rapidly during growth. Folic acid is essential for the development of RBC's which must increase as the mothers blood volume decreases. Deficiency or less intake of folic acid leads to neural tube defects and anencephaly in children (Srilakshmi, 2014).

Mothers with inadequate iron intake delivers child with low Hb levels which effects their intellectual development in later life. Inadequate intake of calcium

Table 3 : Average nutrient intake of pregnant women (n=60)

Food groups	Observed value	Per cent adequacy	RDA
Energy (Kcal)	1857.8 ± 269.5	82.5	2250
Protein (g)	58.9 ± 1.8	71.6	82.2
Carbohydrates (g)	266.2 ± 10.0	-	-
Total fat (g)	47.9 ± 1.7	159.6	30
Folic acid (µg)	329.7 ± 8.7	66.0	500
Vitamin B_{12} (µg)	0.7 ± 0.02	58.3	1.2
Iron (mg)	20.8 ± 3.5	59.4	35
Calcium (mg)	997.9 ± 57.1	83.1	1200

by mother also leads to poor calcification of infants bones at the time of birth which leads to rickets in children. Inadequate calcium intake also leads to muscular cramps and osteomalacia in pregnant women (Srilakshmi, 2014). The present study revealed that the mean intake of iron and calcium was 20.8 ± 3.5 mg and 997.9 ± 57.1 mg among pregnant women, respectively. The per cent adequacy of these minerals was 59.4 and 83.1 per cent, respectively (Table 3). It was further observed that the average daily intake of iron and calcium was inadequate as compared to RDA's of 35 mg and 1200 mg (ICMR, 2010).

Rao *et al.* (2010) reported that intake of all the nutrients were lower than the ICMR recommended levels among pregnant women of both the rural and tribal areas of Hyderabad. Sahoo and Panda (2006) reported that the diet of pregnant women of Balasore district, Orissa, was found to be deficient in protein (92%), calcium (80%), iron (66.1%) and folic acid (40.3%), respectively.

Anthropometric profile of pregnant women :

The height of the subjects ranged from 153.0 to 173.7 cm. The overall mean height of pregnant women was 162.8±0.5 cm. The weight of the subjects ranged from 48 to 70 kg with overall mean of 60.5±0.7 kg. The data showed that pregnant women gained weight between 0.4 – 2.8 kg in first trimester and 2.0 – 6.5 kg during second trimester of pregnancy. The overall mean weight of the pregnant women was 60.5±0.7 kg before pregnancy, but it was increase during the first and second trimester with overall mean of 62.1±0.8 and 64.6±0.8 kg, respectively. During third trimester, the weight reaches at 66.3±0.9 kg. The data (Table 4) showed that pregnant women gained weight 1.6 kg at first trimester and 4.1 kg at second trimester of pregnancy. The gain in weight during third trimester was 5.8 kg among pregnant women. Momen *et al.* (2011) studied the nutritional sttus of Bangladeshi pregnant women and reported that the mean height and weight was 152.8±3.9 cm and 51.2±3.8 kg. Satho and Fujimori (2012) studied the nutritional

status of pregnant women and reported that weight gain was insufficient for 43.4 per cent of the pregnant women.

Conclusion and recommendation:

Adequate nutrition before and during pregnancy has great potential for long term health impact. Mothers diet should produce adequate nutrients so that maternal stores do not get depleted and produce sufficient milk to nourish her child after birth. Intrauterine nutrition is highly important for the growth of central nervous system and kidneys of the foetus which mature during later part of pregnancy. Due to undernourishment of the mother the baby is at an increase risk of being premature with low birth weight and development irregularities. Nutrition deficits before birth can never be wholly reversed after birth. So, adequate nutrition is must for pregnant women in order to avoid deficiencies and ill-effects of deficient nutrients on her and foetal well being.

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Table 4 : Gain in weight during pregnancy by pregnant women (n=60)

Pregnant women	Weight (kg)	Gain in weight (kg)
Before	60.5 ± 0.7	-
First trimester	62.1 ± 0.8	1.6 ± 0.1
Second trimester	64.6 ± 0.8	4.1 ± 0.1
Third trimester	66.3 ± 0.9	5.8 ± 0.2

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