International Journal of Theoretical & Applied Sciences, 13(1): 19-25(2021)

ISSN No. (Print): 0975-1718
ISSN No. (Online): 2249-3247

Dietary and Nutrient Intakes of Rural and Urban Women: A Study from South India

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(Received 27 January, 2021, accepted 14 April, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Diet plays crucial role in determining the nutrition and health status of individuals. The present study was focused on dietary and nutrient intakes of Tirupati rural and urban women. The dietary survey was conducted in four age groups viz., 35 to 44, 45 to 54, 55 to 64 and 65 to 74 years. The sample size comprised of 60, 80, 80 and 40 women in the four respective age groups. Thus total study sample size was 520 women with 260 members each of rural and urban area. Dietary survey was carried out from the average food intakes for three alternative days in a week, and by one day weighing method and calculated nutrient intakes. The data provided poor dietary intakes in rural women and at moderate level in urban women except cereal intakes. More than half of the deficits were observed and in fact nearly three fourth deficits in aged and elderly women. The nutrient intakes were poor in rural women with the calorie, protein, calcium and iron. In case of urban women not much calorie gap was noticed. However, nutrient intakes were lesser than the recommended allowances except phosphorus. The findings demonstrated an immediate need to educate women on the importance of appropriate diet in maintaining optimal health. There is a big challenge to establish the preliminary database on the dietary intakes among the Indian women. The investigator had put maximum efforts in identifying the existing nutritional gaps both in rural and urban women.

Keywords: Dietary intakes, Nutrient Intakes, Rural, Urban, South India, Women, Diet survey

I. INTRODUCTION

The assessment of diets to arrive the nutrient intakes in women found to be the beneficial indicator to determine the health condition of the society. The nutritional status differs from one region to other and wider gaps exist between rural and urban women [2, 10, 11, 22, 25]. Gradually, Indian economic growth was being increased but still the complete food security was not attained and the women and children were noticed as the vulnerable groups for the access of better food and qualitative diets. Women in majority focus on the well-being of the family members including the food intakes by neglecting their own dietary needs which lead to deprived food and nutrient intakes among Indian women [4, 8, 9, 12, 16, 17, 24, 26]. The poor intakes eventually influence the nutritional status of women and experienced a major threat towards various nutritional problems mainly related to micronutrient deficiency and the condition awakened the essential need of evaluating nutrient intakes among women to examine the deficiency state and to educate them [1, 3, 6, 13, 14,15, 21].

The rural women play crucial role in agriculture farming as agricultural labors and extensively extend their support to their husbands in farming operations as partners [15]. Not only in farming have they always engaged in other agricultural allied activities of dairying, poultry, and aquaculture. Majority of the urban women became self-sufficient by taking up various types of jobs and occupational works. Apart from these the women basically involve in the domestic activities both in rural and urban areas. The key point of protecting health lies on eating healthy food through enjoying variety of five food groups [19]. In this context, nutrition found to be the essential which need to study in-depth through dietary assessment.

The diet surveys on rural and urban women of different age groups in India are not well established. The cross sectional studies in different regions pertaining to dietary and nutrient intakes may be helpful to arrive at data base necessary for undertaking measures for better health at regional level. Based on this back ground a cross sectional study was conducted among rural and urban women residing in South India. The study was further segregated into young, middle age, aged and elderly women for comprehensive understanding on consumption patterns of food and nutrient intakes in relation to age and demographic area. “In view of limited availability of extensive dietary survey reports, the current investigation emphasized on field survey to direct the researchers and policy makers to undertake preventive measures at regional level and to promote positive health”.

II. MATERIALS AND METHODS

Chittoor district of Andhra Pradesh state located at South India was purposively selected as the study area. Five mandals viz., Chandragiri, Renigunta, Puttur, Srikalahasthi and Tirupati rural were chosen for the research. From each mandal, three villages i.e., a total of fifteen villages served as the major area of the study. The women from the villages constituted the rural sample and from the main Tirupati town as urban sample. Four different age groups Viz., 35-44 years (n=60,); 45-54 years (n=80); 55-64 years (n=80) and 65-74 years (n=40) both from rural (n=260) and urban (n=260) areas with total sample of 520 members constituted the study sample.

The dietary intakes were assessed in terms of food intakes of various food groups like cereals, pulses and legumes, dairy products, roots and tubers, green leafy vegetables, other vegetables, fruits, sugar and fat. The dietary and nutrient intakes were provided in relation to type of work. The rural women belong to the category of moderate work and the urban sample to sedentary work. Dietary Assessment was conducted in the study population from the average food intakes for three alternative days in a week, and by one day weighing method. Standard measuring cups and spoons were used to obtain the quantities of cooked weights consumed in a day and expressed in terms of raw food equivalents. Based on the mean dietary intakes, essential nutrient intakes such as energy, protein, fat, carbohydrate, calcium, phosphorus and iron were assessed.

The means of the dietary and nutrient intake were calculated and compared against Recommended Dietary Allowances, 2010 (RDA) provided by Indian Council of Medical Research (ICMR).

The per cent differences against RDI and RDA were evaluated for the gaps in dietary intakes and nutrient intakes respectively to understand the deficits existing in the selected rural and urban women.

III. RESULTS AND DISCUSSION

The data was gathered on dietary intakes and accordingly the calculated nutrients were discussed separately for rural and urban women under different sub-heads. The results obtained were interpreted and tabulated separately to understand thoroughly for both dietary and nutrient intakes.

A. Dietary Intakes

Rural. The dietary intakes of rural women of four different age groups were arrived at from the mean intakes of the major food groups. The gaps in the dietary intakes were expressed as percent differences against ICMR- RDI (Indian Council of Medical Research- Recommended dietary Intakes.), 2010. The data obtained were tabulated and presented in the Table 1. The results on dietary intakes from the table clearly indicated that the rural women were consuming much lower food intakes against the recommended intakes except cereals. The percent deficit gaps with the various food intakes represented to be increased with the progressive age from younger to elderly. The intakes of cereals were found to be nearer to the RDI.

Table 1: Mean Dietary intakes and per cent dietary gaps of rural women in different age groups.

S. No.	Food group	ICMR-RDI	35-44 Years		45-54 Years		55-64 Years		65-74 Years	
			Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap
1.	Cereals (g)	330	338	2	326	-1	311	-6	308	-7
2.	Pulses (g)	75	44	-41	40	-47	37	-51	35	-53
3.	Dairy Products (g)	300	102	-66	87	-71	80	-73	76	-75
4.	Roots & Tubers (g)	200	34	-83	31	-85	28	-86	24	-88
5.	Green leafy Vegetables (g)	100	42	-58	39	-61	38	-62	31	-68
6.	Other vegetables(g)	200	103	-49	92	-54	88	-56	82	-59
7.	Fruits (g)	100	32	-68	29	-71	27	-73	25	-75
8.	Sugar (g)	30	15	-50	15	-50	10	-67	10	-67
9.	Fat (g)	25	15	-40	15	-40	10	-67	10	-67

Thus the dietary gaps with the cereal intakes were not much wider probably due to the reason that Indian diets typically noticed to be cereal based diets. On the other hand, the pulse intakes revealed a deficit range of 41 to 53 percent as the age advanced from younger to elderly. The percent deficit gap noticed to be more than half in aged (55 to 64 years) and elderly (65 to 74 years) rural women.

The gap seemed to be much wider with the intakes of dairy products with a range of 66 to 75 percent deficits in spite of better availability of the milk at the village.

Pathetically, majority of the rural women considered the dairy as commercial means without any focus on beneficial aspects of dairy milk consumption. The vegetables and fruits played a crucial role in the human diet being considered as protective foods. The intakes of vegetables revealed much higher gap of more than half of the RDI.

On the other hand, the fruit intakes were very meager representing a gap of 68 to 75 percent deficits. The data also denoted lower intakes of both sugars and fats as compared to the daily recommended dietary intakes. The gap found to be increased with the progressive age.

The data indicated a definite need of appropriate nutrition education representing the importance of plenty of vegetable and fruits consumption as part of regular meal.

Particularly in the aged and elderly, though the low sugar and fatty foods were recommendable, inclusion of optimal sugars and fats were also required except to be restricted in the conditions of metabolic disorders such as diabetes, cardio vascular diseases, obesity etc.

The findings thus well demonstrated poorer dietary intakes of all the major food groups except cereals representing the mere fulfillment of hungry stomach without any focus on intake of balanced diet. The results enlightened the challenging task to bring awareness on the role of balanced diet in promoting the well being of rural women and perform better healthy functioning.

Urban. Similar to that of rural women, dietary intakes of urban women in four different age groups were expressed in terms of food intakes of different important food groups. Dietary gaps were identified based on the percent differences against Recommended Dietary Intakes (RDI). The results were interpreted and denoted in Table 2.

Table 2: Mean food intakes and per cent gaps of urban women in different age groups.

S. No.	Food group	ICMR-RDA	35-44 Years		45-54 Years		55-64 Years		65-74 Years	
			Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap
1.	Cereals (g)	270	262	-3	257	-5	253	-6	246	-9
2.	Pulses (g)	60	52	-13	49	18	41	-32	38	-37
3.	Dairy Products(g)	300	207	-31	186	-38	168	-44	162	-46
4.	Roots & Tubers (g)	200	43	-79	38	-81	31	-85	27	-87
5.	Green Leafy Vegetables(g)	100	6	-38	57	-43	51	-49	43	-57
6.	Other Vegetables(g)	200	146	-27	132	-34	108	-46	89	-56
7.	Fruits (g)	100	147	47	135	35	129	29	120	20
8.	Sugar (g)	20	18	-10	15	-25	15	-25	10	-50
9.	Fat (g)	20	25	25	20	0	15	-25	15	-25

The most important finding to be noted that the dietary intakes of urban women found to be far better than rural women in respect to all food groups except cereal intake which was also nearer to the RDI of sedentary women. However, the trend of decrease in dietary intakes was observed with the advancing age from younger to elderly. The gap in pulse intake was observed from slightly above one tenth (13 percent) in younger to above one third (37 percent) in elderly. The other crucial factor required to be highlighted that the gaps in dairy products intakes was larger with a range of 31 to 45 percent. Though the gap in vegetable intake was lesser compared to rural women, as per the suggested RDI, the urban women also consumed lower than the optimal quantity.

The desirable observation that would be considered was the surplus intakes of fruits even more than that of RDI which was an added advantage in promoting good health. The deficits in sugar intake was noticed as one tenth to fifty percent which might be allowable in aged and elderly women to overcome the problems of age related metabolic disorders such as diabetes, obesity, cardiovascular diseases etc. The fat intake was in surplus amounts among younger women as evidenced by one fourth more than that of RDI.

The fat intake was exactly met by the middle aged women and in contrast one fourth lesser intakes among aged and elderly against recommended fat intakes. Whatever the differences noticed, the data highlighted the need of educating women on balanced diet encouraging the minimal intakes of all kinds of food groups as per the RDI. The dietary survey carried out illustrated that the diets of both rural and urban women were typically cereal based as explained by the adequate cereal intakes nearer to the recommended dietary intakes.

Pulses on the other hand were essential in body repairing process during adulthood to withstand the biological and physiological changes associated with ageing. Unfortunately, the intake of pulses and legumes seemed to be significantly poor in rural women and at modest level in urban women. The gap between actual intakes and RDI noticed to be very high and significant. The data revealed that at least minimum of one third of RDI of pulses was not reached by rural women irrespective of age. The urban women relatively had better intakes but still consume 13 to 37 percent less.

Even though a cattle rearing was more common in rural segments and milk was available at home, the total milk produced was sold for dairy corporations and only little milk was fed to children. Women were not consuming milk as such, even if they consumed, it was in the form of coffee, tea and curds. Significantly poor intakes were observed for milk and dairy products by all the age groups of rural women. On the other hand, though the urban women had high earning capacity, the consumption of dairy milk was also at lower rate compared to recommended dietary intakes. The

consumption found to be between 160 to 210 ml only against the 300 ml of RDI. The existing situation demanded the bare need of educating women to encourage milk consumption in view of the role of milk protein and calcium in maintaining and promoting health status in general and bone health in particular.

The green leafy vegetables were known to be rich sources of calcium which was of very important mineral in the formation and strengthening of bone and also iron to reduce the common problem of anemia among women. Unfortunately the leafy vegetables were not consumed daily but consumed hardly around only once or twice in a week and in fact lesser against 100 g of daily requirement. Urban women were comparatively better in their intakes than rural women of all age groups. The important issue in this regard need to be focused that utilization of unconventional sources of leafy vegetables available in and around the fields might be better means of increasing leafy vegetable consumption at affordable cost and mitigating micronutrient malnutrition. Similar trend was noticed with the consumption of other vegetables. Even with vegetable consumption, it was noticed that as the age increased the consumption levels were decreased. This might be attributed to reduced capacity of digestion and absorption after 50 years of age.

The fruit consumption might be encouraged as they protect against diseases by providing sufficient vitamins and minerals. The fruits were also useful in enhancing the absorption of the various essential nutrients in the body. However, the fruits were available at higher costs and not at accessible level to the rural community and probably resulted in lower consumption of fruits in rural women with very high percent deficits of 68 to 75 percent. Even if they were consumed they might be purchased once in a while confined to certain fruits only like bananas and seasonal fruits available at village level like papaya, mango, guava etc. The fruit intake was much better in urban women than the requirement of 100g in surplus as 120 to 150 g daily. This probably due to the availability of all fruits at market and their purchase capacity might be relatively far better.

The intakes of sugar in the selected women groups were also found to be relatively low. The percent deficits ranged from 33 to 67 in rural women groups and in urban women with a deficit of 25 to 50 percent. Urban women were meeting the requirements by consumption of tea, coffee (with sugar) and once in a way eating sweets. Whereas, the fat intake was lesser among rural women varied from 10 to 15g compared to 20g of daily requirement. On the other hand urban young women consumed surplus of fat intake of 25 g and middle aged women met the exact amount against RDA. However, low fat intake about one fourth deficit was observed in aged and elderly urban women.

B. Nutrient Intakes

Based on the above food intake data, the nutrient intakes were calculated for the essential nutrients viz., energy, protein, calcium, phosphorus and iron using Nutritive value of Indian foods [7]. The nutrient gaps were identified by comparison between intakes and

The consumption of roots and tubers observed to be very poor where 80 to 90 percent deficits were noticed in the diets of all women groups. Roots and tubers were not commonly cultivated in rural areas, even if they consumed, it was only once or twice in a week and the consumption was poor since they need to buy from urban markets.

Recommended Dietary Allowances (RDA) as per cent differences. The RDA was not provided for phosphorus intakes by ICMR and hence the RDA given by Food and Drug Administration (FDA) for phosphorus was used for comparison. The results were discussed separately for rural and urban women of four different age groups.

Rural. The mean nutrient intakes of rural women were calculated from mean dietary intakes. The nutrient gaps were analyzed from the per cent difference of actual intakes against RDA. The observations on the nutrient intakes of rural women were depicted in Table 3.

The results from the table indicated that the energy intakes varied from 1663 to 1770 kcal. About one fourth and more than that of protein gaps were noticed with the progressive age from younger to elderly.

The calcium intakes observed to be very low as evidenced by percent deficits of 46 percent (younger) to 56 percent (elderly). Whereas, there was not much wider difference was found with phosphorus intakes in the first three age groups. However, the elderly women in this regard experienced one fourth of deficits. The findings clearly demonstrated poor iron intakes which seemed to be varied from 43 to 62 percent deficits with the advancing age. The data well illustrated poor nutrient intakes among rural women with respect to all the essential nutrients.

Urban. The nutrient intakes and the percent deficits were calculated for urban women similar to that of rural women. The mean nutrient intakes and gaps identified in the four different age groups of urban women were denoted in Table 4.

The findings highlighted substantially higher essential nutrient intakes among urban women of four different age groups than rural women. The energy intakes calculated were nearer to the RDA with slighter differences as reflected by 4 percent surplus intake in younger and slightly marginal sub values of 4, 7 and 9 percent deficits respectively in the remaining three age groups. However, protein gaps were noticed even in the urban though lesser than rural women from 12 to 24 percent deficits from younger to elderly women. The calcium intakes found to be much lower against RDA of 600mg which ranged from 331mg (elderly) to 408 mg (younger). On the other hand not much wider gaps were depicted with regard to phosphorus intakes. The deficits of iron intakes were slightly marginal among younger women. One fourth of gap was observed in middle age urban women. Whereas, poor iron intakes were found in aged and elderly urban women. The data thus highlighted the nutrient gaps even in urban women though the intakes were better than rural women. The rural women being involved in more strenuous activities than urban women belong to moderate work category and correspondingly required to consume

more of calories than urban women. The important observation need to be focused that around one fourth or more of calorie deficits were prevailing among rural women.

Table 3: Mean nutrient intakes of rural women groups- A comparison of with ICMR RDA and Calculated per cent differences (gaps).

S. No.	Food group	ICMR-RDA	35-44 Years		45-54 Years		55-64 Years		65-74 Years	
			Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap
1.	**Energy (Kcal)**	2230	1770	-21	1710	-23	1698	-24	1663	-25
2.	**Protein(g)**	55	42	-23	41	-24	40	-26	39	-28
3.	**Calcium(mg)**	600	325	-46	318	-47	303	-49	262	-56
4.	**Phosphorus (mg)**	1000	950	-5	920	-8	892	-11	758	-24
5.	**Iron(mg)**	21	12	-43	11	-49	10	-52	8	-62

Table 4: Mean nutrient intakes of urban women groups: A comparison of with ICMR -RDA and Calculated per cent differences (gaps).

S. No.	Nutrient	ICMR-RDA	35-44 Years		45-54 Years		55-64 Years		65-74 Years	
			Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap	Mean Intake (g)	% Gap
1.	**Energy (Kcal)**	1900	1980	4	1831	-4	1775	-7	1729	-9
2.	**Protein(g)**	55	48	-12	44	-20	43	-22	42	-24
3.	**Calcium(mg)**	600	408	-32	352	-41	349	-42	331	-45
4.	**Phosphorus (mg)**	1000	966	-3	945	-6	920	-8	894	-11
5.	**Iron(mg)**	21	18	-14	16	-24	13	-38	11	-49

If the chronic low calorie intakes continued, might lead to chronic energy deficiency (CED) condition which adversely affects the health status in the later life. On the other hand, as the RDA of urban women (as sedentary) was only 1900 Kcal, they were almost reaching their requirement.

Protein intakes were crucial even in the adulthood including elderly age as it was known to be the major nutrient involved in tissue building and repair. But the present study revealed relatively much lower intakes among all ages of rural women than the RDA. This picture of protein intakes highlighted the wider protein gaps which need to be addressed in view of the universal tissue repairing process associated with ageing as the age progressed. The poor dietary intakes might be associated with low consumption levels of protein rich foods such as pulses and dairy products. The urban women slightly conscious about their health due to their higher education status and earning capacities and prefer to afford good protein foods and hence better intakes were noticed. However, urban women also projected around 12 to 25 percent deficit in protein intakes which should not be overlooked.

The calcium and phosphorus were the two important minerals required in forming bone tissue, minimizing bone turnover process and restoration of bone mass. The data collected well explained the low calcium intakes in both groups of all ages. The low calcium intakes found to be particularly detrimental to bone health and reduce the bone mass which might predispose the risk of osteoporosis especially with the advancing age. The phosphorus intakes on the other hand presented a better picture with not much of deficiency in all groups of women.

The other important point to be noted that iron intakes by women also reported a poor scenario. As per the latest RDA, though the requirement was reduced from 30 mg/day to 21 mg/day, still the women were not able to meet even the reduced requirement of 21 mg/day. Pathetically, it was observed that the rural women groups consumed less of iron (6 to 10 mg/day) than the RDA of 10 mg/day and totally all groups put together are not able to take at least 50 percent of RDA. This is a very pathetic situation which needs a systematic approach to improve the iron status of the select women groups. However, the lower intakes were also noticed in urban women in spite of their awareness and

accessibility towards maintenance of health. The situation highlighted the necessity of minimizing the ignorance and insisting on promotion of healthy diet.

Several other studies also similar trend of poor dietary and nutrient intakes among Indians. The cross-sectional study conducted by Sharma *et al.,* 2020 clearly demonstrated the occurrence of nutritional deficiencies in women of reproductive age which seemed to be widely prevalent in socially backward classes [23]. Raghunathan *et al.,* 2021 highlighted the point of limited research on Indian dietary intakes in spite of the prevailing condition of malnutrition in India [18].

The food and nutrient intakes of women in the present study projected a clear picture why the women suffer from chronic nutrient gaps and suffering of poor nutritional status both in rural and urban women and the situation became adverse with the progressive ageing. The condition was much worse among rural women probably due their low socio economic status which might be improvised with the exploitation and encouraging utilization of indigenous foods available in the rural areas.

IV. CONCLUSION

The overall data collected on food and nutrient intakes denoted wider dietary gaps and nutrient deficiencies in the essential nutrients like protein, calcium and iron. The results demonstrated searching for appropriate measures to fulfill the gaps as early as possible. Otherwise the chronic deficiency status prevailing might had greater impact on health and nutritional status among women. Especially in the aged and elderly women, if proper care was not taken might weakened the bone causing brittleness and more porosity in the bone resulted in accelerated age related bone loss at much earlier stage affecting bone health.

The findings addressed that the dietary intakes are not well-balanced in different segments both in rural and urban reflected in the fact that the nutritional quality of the diet required to be improved with consumption of greater diet diversity. The survey highlighted for a comprehensive and effective food policy in India to be integrated along with the national population and health policy. Although, the country succeeded in controlling population growth to a certain extent, the nutritional health of people especially women and children remain a distant goal especially in the light of emerging coexistence of both obesity and under nutrition apart from the other non-communicable diseases.

V. FUTURE SCOPE

The population of the various ethnic groups in the world had empirical knowledge in the utilization of local indigenous flora growing in that particular area for treating various health problems [20]. The people in the rural area have wider knowledge on the indigenous edible sources, the area which may be explored for nutritional and therapeutic benefits to arrive and food and nutritional security. The research may be extended as a holistic approach by integrating the dietary assessment with anthropometry, biochemical and clinical assessment to determine the nutritional status and accordingly plan the suitable intervention approaches to combat the nutritional deficiency disorders.

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