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Dietary Diversity in Urban and Rural Elderly Living in Patiala district of Punjab

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ABSTRACT

The present study was carried out to investigate dietary diversity among urban as well as rural elderly. Two hundred elderly, 100 each from rural and urban area, 60-80 years of age were selected from the Patiala district by random sampling. Food and nutrient related information were determined through a dietary survey using a questionnaire in which information regarding dietary habits and dietary patterns was collected. The results showed that the intake of cereals (292 g), green leafy vegetables (42.74 g), milk and milk products (431.83 g), sugars (32.49 g) and fats and oils (39.82 g) was higher in rural men as compared to the urban men who had higher intake of other food groups *i.e.,* other vegetables (81.36) and fruits (308.88 g). The mean dietary diversity score of urban elderly ranged between 7-10 for both men and women with the mean values of 7.92 and 7.98, respectively whereas the corresponding values for rural elderly ranged between 6-10 in men and 5-10 in women with mean values of 7.64 and 7.48, respectively. The study concluded that there was a higher dietary diversity and food variety score with optimum mean adequacy ratio in the selected elderly population.

Key Words: Elderly, Food intake, Nutrient intake, Dietary diversity, Health

INTRODUCTION

The ageing process is a biological reality which has its own dynamic, largely beyond human control. Ageing is presumed to be a process starting from infancy and continuing until death. On the other hand, being elderly is an unpreventable process that has biological, chronological and social aspects and problems. Older people have a higher prevalence of chronic disease, take multiple medications and supplements, and tend to be sedentary. In the ageing, malnutrition is an important problem that has been seen in hospitals, residential care and in the community. Malnutrition is not an inevitable side effect of ageing, but many changes associated with the process of ageing can promote malnutrition. For example, ageing is frequently associated with decrease in taste acuity and smell, deteriorating dental health, and decreases in physical activity, which may all effect nutrient intake. The change in food intake can also be attributed to some social factors like loneliness and depression. Any change in the nutrient intake can lead to malnutrition with its potentially serious consequences (Singh *et al,* 2014).

Macro and micro nutrient deficiencies among elderly population are public health problem in most developing countries, partly due to monotonous, cereal-based diet that lacks diversity. Dietary diversity is a measure of the number of individual foods or food groups consumed in a given time period. It can reflect household access to a variety of foods and can also act as a proxy for individual nutrient adequacy. A diverse diet increases the probability of nutrient adequacy among elderly people and leads for positive health outcomes such as reduced complications of diabetes, incidence of several cancers and all- cause mortality. As dietary factors are associated with increased risk of chronic diseases, local and international dietary recommendations promote increased dietary diversity but limiting saturated fats, refined sugar and salt. Keeping this in view, this study was conducted to determine the dietary diversity of the elderly living in rural and urban

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areas in accordance to their food and nutrient intake.

MATERIALS AND METHODS

Two hundred elderly, 100 each from rural and urban area, in the age group of 60-80 years were selected from the Patiala district by random sampling. Dietary survey was carried out using food frequency questionnaire and 3 days 24-hour recall method to collect the food intake related information from the respondents. Then food variety score and dietary diversity score was calculated accordingly. Dietary intake of subjects was recorded for the three consecutive days by "24-hour recall method" to assess the food intakes of the subjects. The average daily nutrient intake of diet was calculated by using Indian nutritive software (Diet Cal). The average raw amount in grams of each and every item of food consumed for three consecutive days for each subject was fed in the software and nutritive value of the diets was recorded and compared with RDA. The food intake was compared with the suggested intake (Pasricha and Thimmayamma, 2010) while nutrient intake was compared with Recommended dietary Allowances (RDA) of ICMR (2010). For calculating food variety score, a list of 49 food items commonly consumed by the studied community was prepared. One point was given for each food category eaten either once or at any frequency throughout the week and each food category was scored only once. Points were added and the resultant score represented the Food variety score (FVS) of the respondent. Average FVS for urban and rural elderly was calculated separately by dividing the sum of FVS with total number of respondents.

The relation between food variety score (FVS) and dietary adequacy was determined using the following classification given by (Savige *et al,* 1997). Food Variety Score (FVS) was calculated using a set of 49 food items where '1' point was given for each food category consumed throughout the week. The elderly were categorized into three groups according to FVS obtained i.e. very good having FVS (>30/week), good (25-29/week), fair (20-24/week) and poor (<20/week). For calculating dietary diversity score a set of 12 food groups was used. The choice of 12 food groups was based on outcomes of Food and Nutrition technical assistance (FANTA) project (Swindale and Bilinsky, 2006). Information on respondent's food consumption was collected using the previous 24-hours as a reference (24-hour recall). One code was given for food group consumed during the previous 24-hour and '0' code was given for food group not consumed. DDS was calculated by summing the number of different food groups. Average DDS for urban and rural elderly was calculated separately by dividing the sum of DDS with total number of respondents and interpreted as given in Table 4.

RESULTS AND DISCUSSION

Food intake

Cereals and Pulses

The most commonly used cereals among all the respondents were wheat and wheat products (cracked wheat, refined wheat, semolina etc.) and rice. No significant difference found in the cereal intake of urban and rural elderly men. Whereas the average daily intake of cereals was significantly ($p<0.10$) higher in rural women as compared to urban women with percent adequacy of 123 and 115, respectively. The intake of cereals was found marginally adequate in both urban and rural men, whereas it was found adequate in both urban and rural women. The most commonly used pulses were green gram, bengal grams, lentils and *rajmah*. Results found that the consumption of pulses was significantly higher ($p<0.01$) in urban men and women as compared to the rural elderly men and women. The intake of pulses was found to be marginally adequate in both urban and rural men while adequate in both urban and rural women.

Vegetables

The commonly used green leafy vegetables in elderly were mustard leaves, spinach and fenugreek leaves**.** The intake of green leafy vegetables was found to be marginally adequate in both urban and rural men and women because the data was collected in the months of January to March. During this period, the availability of green leafy vegetables was found to be more as compared to the rest of the

months. The consumption of onions, potatoes, ginger and garlic was most frequent among elderly. The intake of roots and tubers was found marginally adequate in both urban and rural men and women.

Cauliflower, beans, capsicum, peas etc. were most commonly consumed by the elderly men and women. The intake of other vegetables was inadequate in urban men and rural men and women, while it was marginally inadequate in urban women as per classification given by Jood *et al,* (1999). Other vegetables like cabbage, cauliflower, brinjal were not consumed by most of the elderly population as they felt discomfort (gas production) after consuming these vegetables.

Fruits

In context to consumption of fruits in urban and rural elderly there was no significant difference found in the consumption of both urban and rural elderly men and women. The intake of fruits was adequate in both urban and rural men and women. Salehi *et al,* (2010) also reported that the consumption of fruits and vegetables was lower than the recommended minimum of five daily servings. Sharma *et al,* (2013) reported only 41% of elderly were regularly consuming fruits and vegetables in their diet.

Milk and Milk products

Consumption of milk and milk products by the elderly were in the form of milk, tea, curd, *sevian*, *kheer*, cottage cheese and buttermilk. The average daily consumption of milk and milk products in urban and rural elderly men was significantly ($p<0.01$) higher in rural elderly men as compared to urban elderly men with percent adequacy of 144 and 111, respectively. In urban and rural elderly women also, the average daily consumption of milk and milk products was significantly ($p<0.01$) higher in rural elderly women as compared to urban elderly women with percent adequacy of 172 and 111, respectively. The intake of milk and milk products was adequate in both urban and rural men and women.

Sugar and Fat

The intake of sugar was also adequate in both urban and rural men and women. The consumption of fat was mainly in the form of desi ghee, mustard oil, refined oil, butter and hydrogenated fat. Average daily consumption of fats and oils was significantly ($p<0.01$) higher in rural elderly women as compared to urban elderly women with percent adequacy of 206 and 156, respectively. The intake of fats and oils was adequate in both urban and rural men and women.

Nutrient intake

The energy intake was less than the RDA for both urban and rural men and also for rural women. The intake of energy was marginally adequate in both urban and rural men while it was adequate in urban women and marginally adequate in rural women. The intake of protein was marginally adequate in both urban and rural men and women. The intake of fat was adequate in both urban and rural men and women. Olayiwola *et al* (2013) reported fat intake in men and women ranged between 18-38 g for men and 16-35 g for women. The intake of carbohydrates was marginally adequate in both urban and rural men and women. The average intake of ß-carotene in urban elderly men was significantly ($p<0.05$) higher as compared to the rural elderly men and with percent adequacy of 96 and 86, respectively whereas the percent adequacy of urban and rural elderly women was 100 and 97, respectively. The intake of ß-carotene was marginally adequate in both men and women except urban women where it was adequate. The intake of thiamine was adequate in both urban and rural men while marginally adequate in rural women. The results were similar to as reported by Afolabi *et al,* (2015) where thiamine intake was adequate with mean values of 1.2 for men and 1.2 for women having percent adequacy of 100 and 109, respectively. The intake of riboflavin was marginally inadequate in both urban and rural men. In case of women, intake was marginally adequate in urban women but inadequate in rural women. Though the consumption of milk and milk products was adequate but riboflavin intake was inadequate in the diets. The intake of niacin

was marginally inadequate in both urban and rural men and women. The lower intake of niacin rich foods like fish, chicken, mushrooms, peanuts etc. are responsible for inadequacy of the nutrient in the diets. The intake of Vitamin B_{12} was marginally adequate in both men and women except urban women where it was marginally inadequate. Inadequacy of vitamin B_{12} in urban women can be attributed to less consumption of milk and milk products which are rich in Vitamin B_{12}. The intake of vitamin C was adequate in both urban and rural men and women as during the study period, plenty of citrus fruits are available for consumption. Yadav *et al, (2012)* reported mean vitamin C intake of urban elderly men and women was lower in comparison to rural elderly men and women.

The calcium intake of both men and women was higher than the RDA. The intake of calcium was adequate in both urban and rural men and women. This was due to adequate consumption of milk and milk products. The intake of iron was marginally adequate in both urban and rural men while in case of women it was marginally adequate in urban women but marginally inadequate in rural women. This might be due to less consumption of non-vegetarian sources which have high content of iron in rural elderly women as compared to the urban elderly women. The intake of zinc was marginally inadequate in both urban and rural men, while inadequate in both urban and rural women. The low intake of zinc was because of less consumption of non-vegetarian sources. The intake of magnesium was marginally adequate in urban and rural men and women except urban women where it was adequate. The intake of dietary fibre was marginally inadequate in both men and women except rural women where it was inadequate. This might be due to less consumption of other vegetables.

Dietary Diversity Score and Food variety Score

The mean DDS of urban elderly ranged between 7-10 for both men and women with the mean values of 7.92 and 7.98, respectively whereas the corresponding values for rural elderly ranged between 6-10 in men and 5-10 in women with mean values of 7.64 and 7.48, respectively (Table 3). The lower mean of the DDS was associated to the non-vegetarian sources, other vegetables and fruits and the higher one was due to cereals, and milk and milk products. So, the results showed a trend of higher food variety and dietary diversity with good mean adequacy ratio in the elderly population.

The mean food variety score of urban elderly ranged between 21-33 in men and 18-33 in women with the mean values of 25.76 (good) and 26.18 (good), respectively whereas the corresponding values for rural elderly ranged between 19-29 in men and 16-29 in women with the mean values of 24.28 (fair) and 22.78 (fair), respectively.

CONCLUSION

The study concluded that out of 9 food groups, the consumption of other vegetables was inadequate among elderly men and women. Cereals, pulses, Green leafy vegetables, roots and tubers were marginally inadequate among elderly men whereas, green leafy vegetables and roots and tubers were marginally inadequate among elderly women. The intake of pulses, other vegetables, milk and milk products was significantly higher in elderly urban men when compared with elderly rural men. On the other hand, intake of cereals, milk and milk products and fat was significantly higher in rural elderly women when compared with urban elderly women. The average nutrient intake of all nutrients for all the elderly men and women was less than the suggested nutrient intakes except for calcium, fat and vitamin C which was found to be higher than Suggested intake by all the elderly people. Rural men had significantly higher consumption of fat, calcium, and iron when compared to urban elderly men whereas ß-carotene, zinc and magnesium was found to be significantly higher in urban men as compared to rural men. Urban women had significantly higher thiamine, riboflavin, niacin, Vitamin C, iron, zinc, magnesium and fiber when compared to rural women who had significantly higher fat content in their diets. Food variety score and dietary diversity score was found to be higher in urban elderly as compared with the rural elderly.

Table 1 Food intake of the selected subjects

[NS] Non significant; *Significant at 10%; *** Significant at 1%

Nutrients	Men (n=100)			Women (n=10)			
	Urban (n=50)	Rural (n=50)	P-value	Urban (n=50)	Rural (n=50)	P value	RDA
Energy (Kcal) Range	1145-2266	1130-2180	0.2074[NS]	1348-	1068-	0.00001***	2008 M, 1900 F
Mean ±SE	1707± 42.41	1637 ± 34.28		1921 ± 45.40	1611 ± 29.27		
Protein (g) Range	50.14-65.72	49.64-66.38	0.8905[NS]	42.04-62.42	34.64-61.13	0.3850[NS]	60 M, 55 F
Mean ±SE	58.17 ±0.478	58.24 ± 0.583		53.51 ±0.791	52.53 ± 0.805		
Fat(g) Range	13.06-57.12	23.02-65	0.0001***	13.48- 45.70	17-65	0.00001***	25 M, 20 F
Mean ±SE	30.99 ±1.642	39.38 ± 1.267		23.38 ± 1.057	35.92 ±1.488		
Carbohydrates(g) Range	200.15-253.14	200.86-256.48	0.2009[NS]	210.34- 232.94	203.46-230.64	0.1963[NS]	283 M, 233 F
Mean ±SE	232.37 ± 1.463	229.21 ± 1.973		221.70 ± 0.809	220.24 ± 0.775		
β-carotene(µg) Range	409.5-768	126-1036.5	0.049**	416-765	442.75-693	0.2353[NS]	600
Mean ±SE	575.36 ±12.062	515.04 ± 27.70		600.61 ± 12.14	582.62 ± 8.906		
Thiamine(mg) Range	0.61-2.48	0.58-2.24	0.311[NS]	0.91-2.62	0.58-1.03	0.00001***	1.2 M, 1.1 F
Mean ±SE	1.41 ± 0.055	1.32 ± 0.052		1.57 ± 0.052	1.03 ± 0.045		
Riboflavin(mg) Range	0.407-1.69	0.36-1.46	0.496[NS]	0.53- 2.44	0.31-1.34	0.00001***	1.4 M, 1.1 F
Mean ±SE	0.91 ± 0.041	0.86 ± 0.042		1.12 ± 0.051	0.63 ± 0.033		
Niacin(mg) Range	4.25-19.20	4.16-15.29	0.365[NS]	9.02-21.5	3.82-15.92	0.00038***	16 M, 12 F
Mean ±SE	9.86 ± 0.441	9.32 ± 0.402		10.49 ± 0.460	8.21 ± 0.407		
Vitamin B_{12}(µg) Range	0.21-4.1	0.14- 3.6	0.996[NS]	0.24-3.66	0.13-5.18	0.29915[NS]	1
Mean ±SE	0.86- ± 0.195	0.84 ± 0.256		0.73 ± 0.791	0.89 ± 0.519		
Vitamin C(mg) Range	35.43-72.5	33.66-66.67	0.159[NS]	33.03-62.5	26.20-67.7	0.00125 ***	40
Mean ±SE	54.01 ± 1.167	51.72 ± 1.117		53.79 ± 0.884	48.74 ± 1.227		
Calcium(mg) Range	450.94-1822.52	477.56- 1836.42	0.0437**	428.29-1764	601.17-1557.46	0.5253[NS]	600
Mean ±SE	1037.40 ± 44.14	1163.8 ± 43.36		1133.57 ± 36.00	1164.96 ± 32.487		
Iron(mg) Range	7.53-24.74	6.25-26.24	0.0944*	9.46-26.37	6.13-18.92	0.00001***	17 M,21 F
Mean ±SE	14.61 ± 0.610	15.94 ± 0.502		16.55 ±0.592	10.94 ± 0.423		
Zinc(mg) Range	3.10-10.38	2.68-8.80	0.001***	3.30-12.74	2.47-8.64	0.00001***	12
Mean ±SE	6.28 ± 0.261	5.23 ± 0.195		6.70 ± 0.245	4.83 ± 0.188		
Magnesium(mg) Range	172.06-598.16	122.24-624.27	0. 073*	178.16-636.86	123.53-499.33	0.00099***	340 M, 310 F
Mean ±SE	334.47 ± 14.49	297.48 ± 14.47		363.69 ± 13.32	301.96 ± 12.157		
Dietary Fibre(g) Range	4.37-27.18	1.85-25.26	0.462[NS]	7.59-31.99	1.90-7.46	0.00001***	25-30
Mean ±SE	13.91 ± 0.782	13.05 ± 0.846		16.12 ± 0.714	7.46 ± 0.369		

Table 2 Nutrient intake of the selected subjects

[NS] Non-significant; *Significant at 10%; *** Significant at 1%

Food groups (g/day)	Men (n=100)				Women (n=100)			
	Urban (n=50)	Rural (n=50)	P- value	Suggested intake	Urban (n=50)	Rural (n=50)	P-value	Suggested intake
Cereals Range	180-460	198-389.3	0.8531[NS]	350 [a]	180-450	150-395	0.08184*	225 [a]
Mean ± SE	289±9.278	292±7.64			258± 7.215	276 ± 7.502		
Pulses and Range	36-53.3	23-55	0.0003***	50 [a]	35-56	23-55	0.0048***	40 [a]
legumes Mean ± SE	46.36 ± 0.652	42.29 ± 0.892			45.84 ± 0.652	42.35 ± 0.888		
Green leafy vegetable Range	13.3-90	17-88	0.1692[NS]	50 [a]	23-80	14-90	0.4431[NS]	50 [a]
Mean ± SE	38.55± 2.134	42.74 ± 1.868			40.25±1.590	38.26± 1.810		
Roots and tubers Range	73-93	70-90	0.5631[NS]	100 [a]	75-96	58.3-100	0.0002***	100 [a]
Mean ± SE	85.00 ±0.684	85.00 ± 0.629			86.56 ± 0.698	80.06± 0.662		
Other vegetable Range	50-110	40-96	0.0006***	200 [a]	48-106	50-95	0.0001***	150 [a]
Mean ± SE	81.36± 1.902	72.24 ± 1.759			82.00 ± 1.864	72.10±1.553		
Fruits Range	130-566	126-528	0.8244[NS]	200 [a]	217-466	140-490	0.1835[NS]	100 [b]
Mean ± SE	308.88 ± 10.956	305.4 ±11.213			297.64±7.066	279.64 ± 10.983		
Milk and milk products Range	100-654	200-740	0.0001***	300 [ab]	100-648	210-780	0.00001***	300 [ab]
Mean ± SE	331.87±14.930	431.83±19.462			331.56±14.922	516.73± 20.58		
Sugar Range	20-54	25-58	0.1815[NS]	20 [ab]	21-50	20-55	0.6933[NS]	20 [ab]
Mean ± SE	30.20 ± 1.165	32.49 ± 1.243			31.77 ± 1.116	32.43 ± 1.240		
Fats and Oils Range	21-67	22-75	0.4001[NS]	25 [ab]	20-43	25.3-70	0.00001***	20 [ab]
Mean ± SE	37.96 ± 1.361	39.82 ± 1.719			31.16 ± 0.837	41.15 ± 1.424		
Meat and poultry Range	100-347	100-454	0.1081[NS]	----	100-308	100-250	0.2317[NS]	----
Mean ± SE	220.94± 12.855	273.25±16.884			206.25± 11.852	170± 9.028		

FVS and DDS was found to be higher in urban elderly men and women as compared to the rural elderly men and women. The FVS of urban elderly was categorized as good having mean values of 25.76 and 26.18 for men and women respectively whereas corresponding values for rural elderly men and women were 24.28 and 22.78, respectively which was categorized as fair.

Table 3. Dietary diversity score (DDS) and Food variety score (FVS) of the selected elderly

[NS] Non significant; *Significant at 10%; *** Significant at 1%

Food items	Men (n=100)			Women (n=100)		
	Urban	Rural	p-value	Urban	Rural	p-value
DDS						
Range	7-10	6-10	0.750 [NS]	7-10	5-10	0.439 [NS]
Mean ± SE	7.92± 0.13	7.64±0.16		7.98±0.13	7.48 ± 0.14	
FVS						
Range	21-33	19-29	0.004***	18-33	16-29	0.001***
Mean ± SE	25.76 ± 0.39	24.28 ± 0.32		26.18 ± 0.51	22.78 ± 0.39	
MAR (%)	95	95.14	-----	101.21	91	----

Table 4 Relationship between food variety score (FVS) and dietary adequacy.

Total Food variety score/week	Dietary adequacy
>30	Very good
25-29	Good
20-24	Fair
<20	Poor
<10	Very poor

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