

Dietary patterns and body mass index (BMI) of a rural population living in coastal area of Tamilnadu, India

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Abstract

Aims: Diets of Indian people especially in rural areas are inadequate both in terms of quality and quantity. This study was done to explore associations between dietary patterns and Body Mass Index (BMI) among rural population of a community in Southern India.

Methods: This community based observational study was done in Villupuram district. A total of 202 participants of age ≥ 15 years were interviewed. The primary tools in this study were predesigned and pretested interview schedule for recording of individual information. Proportions, means were calculated and Chi-square test and Fischer’s test was applied to find the association.

Results: Out of a total of 202 participants, 133 (65.8%) were females. Regarding consumption of cereals, 96.53 % of the participants were consuming rice daily. The mean energy intake was estimated to be 2384.36 Calories/day. Major source of energy were carbohydrates (71 %), followed by fats (19 %) and proteins (11 %). Only 17.3% and 14.9% of the study participants were consuming fruits and green leafy vegetables daily respectively. Almost one third (33.7%) were overweight and 18.8 % were obese. More than one third subjects had inadequate intake of calories, proteins and fats. The proportion of average intake of calories was least in 25-34 years age group females.

Conclusions: Although the calorie intake was adequate for majority of the participants, majority were overweight and not consuming balanced diet. The diet consisted mainly of refined cereals with low intake of fruits and vegetables, awareness about balanced diet is required in the community.

Keywords: Dietary Pattern, Dietary Intake, India, rural adults

Introduction

Diets of Indian people, especially in rural areas are inadequate both in terms of quality and quantity. India has a very rich and high culinary diversity, and its various diets are influenced largely by social identity, local agricultural practices, religion and cultural factors [1,2]. There is no homogeneity of flavour between North and South or East and West but rather, a wealth of flavours that is simply staggering. Each region offers their own culinary distinctive characteristics and numerous traditional dishes. It is important to identify the common dietary patterns relevant to population sub-groups in India, as well as their association with socio-cultural factors.

Dietary intake patterns featuring a high intake of foods such as cereals, fruits, vegetables, and low-fat meat and dairy products have been associated with various favorable health outcomes in adults including a decreased prevalence of obesity [3, 4], whereas dietary patterns with high intakes of sweets, desserts, and high-fat dairy products have been associated with higher rates of obesity and poor nutritional status in older adults [4].

According to The National Family Health Survey (NFHS-4) there are 43.1 % underweight and 39.5 % overweight and obese adults in India. When considering only rural areas, the proportions are 49.7 % and 29.3 % respectively.[5] Rapid nutritional transition to a more sedentary lifestyle and unhealthy dietary practices seems to be the main reasons of weight gain in adults.

Consequently, the prevalence of obesity is strongly related to chronic metabolic diseases, such as hypertension (HTN), diabetes and cardiovascular diseases in developing countries.[6]

Thus, this study was done to explore associations between dietary patterns and Body Mass Index (BMI) among rural population of a South Indian community.

Material and methods

This community based observational study was done in a coastal area of Villupuram district in Tamil Nadu, India. The study area was the field practice area of Department of Community Medicine, Pondicherry Institute of Medical Sciences. From the list of villages in the study area, a village was randomly selected and all the individuals of 15 years and above were included in the study.

A total of 202 participants were included in the study. The primary tools in this study were predesigned and pretested interview schedule for recording of individual information. Dietary intake was assessed by 24 hours recall oral questionnaire method and also Food Frequency Questionnaire was used to assess the frequency of consumption of food from the various food groups in the last one year.

Body Mass Index is the value obtained when the weight in kilograms is divided by the square of the height in meters. The WHO criteria for BMI classification is widely used for assessment of nutritional status.[7] In this study all participants with BMI ≥ 25 were grouped into Category I (Overweight and obese) while all participants with BMI < 25 were grouped into Category II (Normal and underweight).

Data collection: A house to house survey was done during June-August 2014 and trained interviewers visited all selected households. If any of the household were found locked then they were visited again. Two return visits were made to households where eligible

members were not available for interview during the first visit. Informed written consent and/or assent were taken from all the participants/guardians before the initiation of interview. All available adult members in the household were interviewed and anthropometric measurements done.

Statistical analysis: Data was entered in MS excel and analysed in SPSS version 20. Proportions, means were calculated and Chi-square tests and Fischer's test was applied to find the association and a p value of <0.05 was considered statistically significant.

Results

Out of a total of 202 participants, 133 (65.8%) were females and 69 (34.2 %) were males. Most of the study participants i.e 66 (32.67%) belonged to age group 25-34 years followed by participants of age group 15-24 years i.e 44 (21.78%).

Amongst the study participants 49 (24.25%) i.e almost one fourth were illiterate. Most of the study participants were homemaker who accounted for 125 (61.88%) of the total participants. The study population comprised mostly of Hindus who formed 98.51% (199) followed by the Muslims who formed a meager 1.48% (3) of the study participants. Out of all participants, 10 were suffering from Diabetes while 11 were suffering from Hypertension. Most of the study participants (91) belonged to Lower middle class according to B.G Prasad classification.(Table 1)

A total of 109 (53.96 %) participants belonged to Category I (Overweight and obese) while 93 (46.03 %) participants fell into Category II (Underweight and Normal). 46.61% of females belonged to Category I while 53.38 % females belonged to Category II. 68.11 % males belonged to Category I while 31.88 % females belonged to Category II. There was statistically significant association

between Gender and Body Mass Index ($p = 0.003$). There was statistically significant association between Age distribution and Body Mass Index ($p = 0.006$). The association between education, occupation, religion, diabetes, hypertension, family size and socio-economic status with Body Mass Index was not statistically significant.(Table 1)

Regarding consumption of cereals, 96.53 % of the participants were consuming rice daily. Other cereals; wheat, Bajra, Jowar, Ragi and maize were consumed less commonly. (Table 2) The mean energy intake was estimated to be 2384.36 Calories/day. The mean energy intake of the study participants belonging to the Category I was 2374.67 Calories/day while it was 2395.73 Calories/day for the study participants belonging to Category II. Major source of energy were carbohydrates (71 %), followed by fat (19 %) and protein (11 %). Only 17.3% and 14.9% of the study participants were consuming fruits and green leafy vegetables daily respectively. Almost one third (33.5%) were overweight and 19.0% were obese. Also, 6.5 % participants were underweight. More than one third subjects had inadequate intake of calorie, protein and fat. More females were having inadequate intake of calories and protein. The proportion of average intake of calories was least in 25-34 years age group females.

Table 1. Relation of socio-demographic characteristic of study population with Body Mass Index (n=202)

Characteristics		Body Mass Index		P value
		Category I Overweight and obese (BMI \geq 25)	Category II Underweight and Normal (BMI <25)	
Gender	Female	62 (46.61)	71 (53.38)	0.003
	Male	47 (68.11)	22 (31.88)	
Age groups	15-24	13 (29.54)	31 (70.45)	0.0066
	25-34	36 (54.54)	30 (45.45)	
	35-44	21 (61.76)	13 (38.23)	
	45-54	15 (71.42)	6 (28.57)	
	55-64	17 (68.00)	8 (32.00)	
	\geq 65	7 (58.33)	5 (41.66)	
Education	Graduate and above	5 (41.66)	7 (58.33)	0.68
	Secondary	4 (44.44)	5 (55.55)	
	High school	25 (53.19)	22 (46.80)	
	Primary	27 (57.44)	20 (42.55)	
	Literate	24 (63.15)	14 (36.84)	
	Illiterate	24 (48.97)	25 (51.02)	
Occupation	Farmer/Fisherman/Labourer	32 (57.14)	24 (42.85)	0.12
	Private service	6 (75.00)	2 (25.00)	
	Govt. service	10 (76.92)	3 (23.07)	
	Homemaker	61 (48.80)	64 (51.20)	
Religion	Hindu	107 (53.76)	92 (46.23)	0.99
	Muslim	2 (66.66)	1 (33.33)	
Diabetes	No	101 (52.60)	91 (47.39)	0.166
	Yes	8 (80.00)	2 (20.00)	
Hypertension	No	100 (52.35)	91 (47.64)	0.056
	Yes	9 (81.81)	2 (18.18)	
Family size	<4	77 (53.10)	68 (46.89)	0.69
	>4	32 (56.14)	25 (43.85)	
B G Prasad classification	Upper class	1 (50.00)	1 (50.00)	0.837
	Upper middle class	10 (66.66)	5 (33.33)	
	Lower class	28 (54.90)	23 (45.09)	

Middle class	44 (50.57)	43 (49.42)
Lower middle class	26 (55.31)	21 (44.68)
Lower class		

Table 2: Relation of dietary characteristic of study population with Body Mass Index (n=202)

Characteristics		Body Mass Index		P value
		Category I Overweight and obese (BMI \geq 25)	Category II Underweight and Normal (BMI <25)	
Rice consumption	Never	3 (100.00)	0 (0)	0.14
	Occasionally	1 (25.00)	3 (75.00)	
	Daily	105 (53.84)	90 (46.15)	
Wheat consumption	Never	22 (43.13)	29 (56.86)	0.19
	Occasionally	82 (57.34)	61 (42.65)	
	Daily	5 (62.5)	3 (37.5)	
Bajra consumption	Never	46 (47.91)	50 (52.08)	0.25
	Occasionally	59 (59.59)	40 (40.40)	
	Daily	4 (57.14)	3 (42.85)	
Jowar consumption	Never	47 (47.00)	53 (53.00)	0.14
	Occasionally	59 (60.82)	38 (39.17)	
	Daily	3 (60.00)	2 (40.00)	
Ragi consumption	Never	23 (52.27)	21 (47.72)	0.72
	Occasionally	80 (53.69)	69 (46.30)	
	Daily	6 (66.66)	3 (33.33)	
Green leafy vegetables	Never	9 (64.28)	5 (35.71)	0.72
	Occasionally	84 (53.16)	74 (46.83)	
	Daily	16 (53.33)	14 (46.66)	
Milk consumption	Never	1 (25.00)	3 (75.00)	0.49
	Occasionally	23 (53.48)	20 (46.51)	
	Daily	85 (54.83)	70 (45.16)	
Meat consumption	Never	5 (41.66)	7 (58.33)	0.65
	Occasionally	100 (54.94)	82 (45.05)	
	Daily	4 (50.00)	4 (50.00)	
Fish	Never	1 (25.00)	3 (75.00)	0.14
	Occasionally	54 (60.67)	35 (39.32)	
	Daily	54 (49.54)	55 (50.45)	

Egg	Never	1 (25.00)	3 (75.00)	0.17
	Occasionally	91 (52.60)	82 (47.39)	
	Daily	17 (68.00)	8 (32.00)	
Western style diet	Never	74 (49.33)	76 (50.66)	0.08
	Occasionally	33 (67.34)	16 (32.65)	
	Daily	2 (66.66)	1 (33.33)	
Desi style diet	Never	66 (52.38)	60 (47.61)	0.49
	Occasionally	43 (56.57)	33 (43.42)	
	Daily	0 (0)	0 (0)	
Alcoholic beverages	No	86 (52.12)	79 (47.87)	0.26
	Yes	23 (62.16)	14 (37.83)	
Tea or coffee	Never	36 (56.25)	28 (43.75)	0.60
	Occasionally	3 (75.00)	1 (25.00)	
	Daily	70 (52.23)	64 (47.76)	

Discussion

In the present study we found that there is a strong relationship between dietary patterns and higher BMI in the population. Obesity and overweight are considered a global epidemic. Obesity represents an important risk factor for many chronic diseases such as type 2 diabetes, cardiovascular disease, hypertension, dyslipidemia, and some type of cancers. Obesity by itself, could be considered a risk factor for mortality. There is a straight correlation between the severity of overweight and mortality risk. From the public health perspective obesity represents one of the more important or may be the most important challenge.[8]

In the present study it was found that mean age of study population was 36.94 years with most common age group being 25-34 years (32.67%) while in a study done by Olinto et al it was found that mean age of study population was 23 years with the most common age group being 20-49 years.(91%)[9] In another study done by Kutty et al it was found that the mean age group of the study population was 20.7 years. Lesser

mean age in the study by Kutty et al could be due to the fact that the study population in these studies were university students.[10]

In the present study it was found that overweight and obese constituted 53.96% of the study population while 46.03 % of study population belonged to Normal and underweight category. Contrasting results were seen in the study done by Kutty et al where only 13.20 % of the study population belonged to overweight and obese category.[10] Contrasting results were also seen in the study done by Nasr et al where only 25% of the study population belonged to overweight and obese category.[11] The contrasting difference in the percentage of overweight and obese persons in the present study and these studies could be due to the fact that the study population in these studies were college students. The average BMI of males and females in the present study was 27.20 and 24.81 respectively while in a study done in Gwalior, the average BMI of both male and female participants was 23.1 kg/m (plus/minus 4.4

kg/m²) and 23.7 kg/m²(plus/minus 4.6 kg/m²) respectively.[12]

There was statistically significant association between gender and body mass index in the present study with 68.11 % males belonging to overweight and obese category while 46.61 % females belonging to overweight and obese category. Similar findings were seen in the studies done by Kutty et al and Daradkeh et al where there was statistically significant association between gender and body mass index with higher percentage of males in the overweight and obese category.[10,13]

The average calorie consumption per day in the present study was 2384.36 kilocalories per day which is very high in comparison to the study by Olinto et al where it was 1482 kilocalories per day.[9] In the present study 54.45 % of the participants were consuming a non-vegetarian diet while 45.55 % of the participants were consuming a vegetarian diet. Similar findings were seen in a study done in Ludhiana where almost 50.5 % of the participants were consuming a vegetarian diet while 49.5 % of the participants were consuming non-vegetarian diet.[14] Contrasting results were obtained in the study by Nimmala et al where only 34 % of the participants consumed a vegetarian diet while 66 % of the participants consumed non-vegetarian diet.[15] 23.52 % of the participants consuming vegetarian diet belonged to overweight and obese category while 40 % of the participants consuming non-vegetarian diet belonged to overweight and obese category.[15]

5.Conclusions: Although the calorie intake was adequate for majority of the participants, majority were overweight and not consuming balanced diet. The diet consisted mainly of refined cereals with low intake of fruits and vegetables; awareness about balanced diet is required in the community. Obesity and overweight are

quite prevalent among adult population especially 30 years and above in both the sexes. BMI is a simple and effective way to screen obese and overweight persons so that timely measures could be taken to prevent their progression and complications associated with it. Measures to increase physical exercise both at home and at workplace could be undertaken using the behavior change communication strategy. Awareness regarding the impact of fried and fast food on health could be spread among general populations.

Limitation and Recommendation

This research study was cross-sectional in nature, and therefore the results were limited in predicting a causal relationship. BMI was used to determine the weight status of the participants without distinguished excess fat, muscle, or bone mass in an individual. This study only examined the dietary habits and patterns among study participants. Further longitudinal studies are recommended to determine conclusive results.

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