FOOD CONSUMPTION PATTERNS AND THE NUTRITIONAL PROFILE OF THE URBAN SOUTH INDIAN DWELLERS

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Received: 05-06-2012 Accepted: 21-06-2013

ABSTRACT

In urban areas rapid nutrition transition is taking place. Being a representative metropolitan, Chennai was selected for the study. A study group of low to middle income status in the age of 30-60 yr’s with normal glucose tolerance was selected for their food consumption pattern. Information on their socio-economic, anthropometric and dietary assessment was obtained using a detailed socio-economic and food frequency questionnaire. Macronutrient intake of the subjects portrayed a surplus intake of energy in men (10.31 %) and women (27.59 %) in comparison with RDA for Indians. Micronutrient deficit intakes of the study group was seen. Nearly 14 per cent of men and 4 per cent women had total cholesterol above 200 mg/dl and belonged to high-risk group for CVD and other lifestyle disorders. In the selected sample, 88 per cent of males and 38 per cent of females had HDL below 45 mg/dl. Thus 40 percent of males and 18 percent of females were at risk of hypertriglyceridemia. The study revealed that there is a prominent influence of consumption pattern on the nutritional profile of the people and pose them to the risk of CVD and other lifestyle disorders.

Key words: Consumption patterns, Food habits, Risk factors of lifestyle diseases, Urban population.

INTRODUCTION

Food is the substance taken into the body that will help meet the body’s needs for energy, maintenance of good health, growth and reproduction. Diet has been known for years to play a key role as a risk factor for chronic diseases. A rise in total fat intake and decline in the complex carbohydrate consumption with increased micronutrient deficiencies was pragmatic. Excess energy and salt intake coupled with reduced physical activity characterize the nutrition transition in India. It is probably the right time to take a fresh look at the diets consumed by our population and formulate appropriate guidelines to prevent and control lifestyle diseases. Systematic reviews of the association between the food consumption pattern and their impact on nutritional profile of the people will give a clear understanding of the relationship between the food and diseases and may provide a direct scientific basis for practical dietary guidelines for prevention of chronic diet related diseases.

MATERIALS AND METHODS

Subjects with the age group of 30-60 years were selected in middle to low income group (HUDCO, 1999) with a family size of two to seven. The sample size was restricted to 100. Only those subjects with normal glucose tolerance were selected. A fasting plasma glucose level of < 5.6 mmol/L (100 mg/dl) and 2-hour plasma glucose value < 7.7 mmol/L (139 mg/dl) were categorized as normal glucose tolerance (ADA, 2005). In view of the fact that, subjects with normal glucose tolerance do not follow dietary restrictions and are generally free from ill-health, their dietary habits were expected to reflect the regular dietary consumption pattern of a typical urban population.

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Questionnaire: A pre validated self designed socio-economic questionnaire was used to acquire information about their socio-economic and demographic profile aimed at eliciting background information on age, sex, educational status, family income, type of family, personal habits, etc.. A regional based semi-quantitative 222-item validated food frequency questionnaire (Sudha et al, 2006) was used to gather information on the dietary consumption patterns of the selected subjects. A pilot study was conducted among a sub-population of 25 subjects to build up rapport and to overcome elusiveness, bias and other practical difficulties and to acquire expertise on assessing anthropometry with accuracy.

Nutritional assessment: Nutritional assessment encompasses anthropometric (weight, height, body mass index, waist circumference, hip circumference, waist-hip ratio), clinical (blood pressure), biochemical (fasting blood sugar, serum total cholesterol, serum triglycerides, serum high-density lipoprotein, serum low-density lipoproteins and serum very-low density lipoprotein) measurements. Diet and nutrition though genetically determined, profoundly influence the pattern of growth and the physical state of the body.

Dietary evaluation: The analysis of food intake as part of an assessment of nutritional status is useful in providing evidence of nutritive intakes that may be suggestive of inadequacies. In the present study the food intake of the selected subjects was evaluated by administering the food frequency questionnaire (Sudha et al., 2006). With an accurate description of the kind and amount of food consumed, the quantity of various nutrients present in the diet was calculated by using nutritive value tables (Gopalan et al., 2004).

Data computation: The data obtained from the study survey were entered in database called EpiNu. Nutritional Epidemiology (EpiNu India®) is a unique database and software (Version 10, Chennai) developed by Nutrition and Dietetics Research Department, Madras Diabetes Research Foundation, Chennai. The database is reported to be popularly used for obtaining quicker computation of nutritive value (Foster - Powell et al., 2002, Gopalan et al., 2004 and U.S. Dept. of Agriculture, Agricultural Research Service, 2004, ). Nutritive values of macronutrients and micronutrients namely energy, protein, fat, carbohydrates, total fiber, beta-carotene, Vitamin C and folic acid for measure of dietary intakes of different foods were acquired using the EpiNu database.

RESULTS AND DISCUSSION

Demographic profile of the selected subjects: Epidemiological transition determines the socio-economic gradient associated with the prevalence of lifestyle diseases. In the selected sample, majority of male members had an educational qualification below Secondary School level (48%) and 18 per cent of them were graduates. In addition, 10 per cent of males finished their post-graduation and were professionals, while four per cent of males were illiterates.

Fifty-two per cent of female subjects selected, had educational qualification below Secondary School education and 16 per cent of them had passed Secondary School education. Moreover, 14 per cent had done their graduation and 6 per cent of women had finished their post-graduation, while remaining 12 per cent of women were illiterates.

It is evident that, 40 per cent of male and 62 per cent of females were daily earners (coolies). Eighteen male members (36%) and 12 female members (24%) had their own business firms such as craft shops, petty shops, tailoring, carpentry, lathe works etc. Among them, 12 percent and 4 percent were working under government sector and 12 per cent of men and 10 per cent of women were working under private sectors.

From the study it was observed that all the individuals belonged to low to middle-income group. Among them, 40 per cent of men and 31 per cent of women were earning less than Rs. 2000 per month and 38 per cent of males and 30 per cent of females were earning an income of Rs. 2000 to 5000 per month. 22 percent men and 8 percent women had their income in the range of Rs. 5000-10000. The classification of subjects based on their income levels was given in Figure 1.

Personal habits of the selected subjects: The data on distribution of personal habits like smoking alcohol consumption pattern of the selected subjects were deliberated as 44 percentage of study group has the habit of smoking and 58 percentage with
regular habit of consuming alcohol. Smoking index of the respondents had a significant positive association with total cholesterol and triglycerides, which are vital risk factor in the pathophysiology of cardiovascular disease. Preethi and Nandhini, (2005), Gulliford and Ukomonne, (2001) reported that increased glycated hemoglobin was associated with cigarette smoking and frequent consumption of fat containing foods. There is an association between several cardiovascular risk factors with total alcohol and types of alcoholic beverage consumption (Schroder et al., 2005).

Food consumption pattern of selected subjects: A deficit in terms of cereal intake was observed in both males and females at 10.53 and 3.57 percent in comparison with the suggestion of the NNMB, (2002). A surplus intake of pulses, computed as 30.57 and 51.23 percent in males and females respectively in comparison with suggested intake was observed. While comparing the intake of sugar with suggested intake levels, a surplus intake of 128.30 and 34.5 percent were noted in men and women respectively. The data about the consumption pattern is given in Table 1.

An alarming surplus intake of fats and oils as high as 206.45 percent in women compared to 163.20 percent in men was observed. However in terms of fruit and vegetable consumption a deficit of 43.24 percent in males and 34.63 percent in females were noted in comparison with WHO recommendation (> 400 g per day).

Macronutrient and micronutrient intake of the selected subjects: Table 2 depicts the macronutrient intakes of the subjects portrayed a surplus intake of energy in men (10.31 %) and women (27.59 %) in comparison with RDA. In terms of protein intake of the selected sample there existed a surplus intake of 33.11 percent in men and 46.76 percent in women. A maximum surplus fat intake was also observed in both genders, among which fat intakes of women surpassed men. High carbohydrate diets are associated with increased and elevated triglyceride and fall in HDL cholesterol (Mensink and Katan, 1992). There exist a relationship between the progression of atherosclerosis and the intake of selective dietary fiber fractions and also found a significant inverse association between intimal median thickness (IMT) progression and the intakes of viscous fiber and pectin(Wu et al., 2003).

Micronutrient intake of the study group denoted a deficit intake of â-carotene in males (-4.27 %) and females (-2.38 %). Folic acid intake also was in deficit in both the genders (in males: -11.85 % and in females: -25.42 %) and a deficit of intake was seen in terms of vitamin C too in males at 9.25 per cent and females at 13.48 per cent in comparison with suggested intakes.

Nutritional profile of the selected subjects: The mean body mass index of the males were 25.14 which exceeded the normal range (18.5-25.0 kg/m²)

<table>
<thead>
<tr>
<th>Table 1: Food consumption patterns of selected subjects.</th>
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<tbody>
<tr>
<td>Food groups</td>
</tr>
<tr>
<td>Male intakes (n=50)</td>
</tr>
<tr>
<td>Suggested intakes *</td>
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<tr>
<td>Percentage deficit (-) / surplus (+)</td>
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<tr>
<td>Female intakes (n=50)</td>
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<tr>
<td>Suggested intakes *</td>
</tr>
<tr>
<td>Percentage deficit (-) / surplus (+)</td>
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</tbody>
</table>

* Source: National Nutrition Monitoring Bureau (NNMB), 2002
while in females it was 22.6 which was within the normal range (WHO, 2000). Mean waist circumference was 92.5 cm in men, 80.4 cm in women, which exceeded the normal waist circumference value of 90 cm in males and 80 cm in females. The mean height of males and females were 163.0 and 159.9 cm respectively and the mean weight of males and females were 60.85 kg and 57.7 kg respectively. In both men and women, mean weight had surpassed the weight of the reference man and woman (ICMR, 2004). Mean hip circumference of males and females were 86.2 and 92.2 cm respectively. Mean waist-hip ratio of men was 0.98, which was within normal value (< 1.0), and mean waist-hip ratio of women was 0.87, which was greater than the normal value (< 0.80). Measures of regional adiposity such as waist-hip ratio and sub-scapular to triceps, skin fold thickness are opined to be important contributors to CVD risk and are more strongly correlated with lipoprotein cholesterol fractions (Bjorntorp, 1993).

Distribution of subjects based on their Body Mass Index (BMI): Subjects were distributed according to the BMI classification as per the Asia Pacific Perspective of WHO, (2000). Twenty per cent of men and 22 per cent of women were distributed in the less than 18.5 BMI category, 40 percent of males and 24 per cent of females were classified under 18.5 – 22.5 BMI range. Twenty-four per cent of men and 30 per cent of women were in the 25.0 - 29.9 BMI range respectively. None of the males were distributed in the above 30 BMI group but 6 per cent of women were distributed in above 30 BMI category and its been represented in fig. 2.

Asian Indians are known to have lower BMI, than Europeans for any given body mass index, but Asian Indians have greater waist-hip-ratio and abdominal fat than Europeans which is due to the predominance of central obesity (Anjana et al., 2004) Amongst the study group, 60 per cent of men and 46 per cent of women were not obese but 40 per cent of men and 54 per cent of women were obese. Obesity particularly abdominal obesity is a known risk factor for cardiovascular disease and type 2 diabetes. The levels of CVD risk factors were substantially lower at a BMI of < 25 Kg/m² than at higher levels of BMI and it accounts for the strong and consistent relationships with CVD risk factors and other health related characteristics (Brown et al., 2000)

Prevalence of hypertension: The urban dwelling study subjects were distributed based on their blood pressure levels and it was evident that 18 percentages of men and women had hypertension where their blood pressure levels were above 135/85 mg/dl. As per a study from MDRF, Chennai 21.1 per cent of

![FIG 2: Distribution of subjects based on their Body Mass Index.](image)

### TABLE 2: Macronutrient and micronutrient intakes of the selected subjects.

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Energy (k cals)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>CHO (g)</th>
<th>Dietary Fibre (g)</th>
<th>β-Carotene (IU)</th>
<th>Folic Acid (µg)</th>
<th>Vit C (µg)</th>
</tr>
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<tbody>
<tr>
<td><strong>Males (n=50) intakes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suggested intakes</td>
<td>2675.07</td>
<td>79.87</td>
<td>71.20</td>
<td>424.76</td>
<td>41.23</td>
<td>2297.56</td>
<td>88.15</td>
<td>36.3</td>
</tr>
<tr>
<td>Percentage deficit</td>
<td>+ 10.31</td>
<td>33.11</td>
<td>137.3</td>
<td>16.7</td>
<td>+ 10.09</td>
<td>-4.27</td>
<td>-11.85</td>
<td>-9.25</td>
</tr>
<tr>
<td><strong>Females (n=50) intakes</strong></td>
<td>2392.46</td>
<td>73.38</td>
<td>64.90</td>
<td>380.0</td>
<td>38.14</td>
<td>2342.94</td>
<td>74.58</td>
<td>36.61</td>
</tr>
<tr>
<td>Suggested intakes</td>
<td>1875</td>
<td>50</td>
<td>30</td>
<td>282</td>
<td>33.49</td>
<td>2400</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>Percentage deficit</td>
<td>+ 27.59</td>
<td>46.76</td>
<td>206.3</td>
<td>34.8</td>
<td>+ 13.84</td>
<td>-2.38</td>
<td>-25.42</td>
<td>-13.48</td>
</tr>
</tbody>
</table>

* Source: Recommended Dietary Allowance (ICMR, 2004)
The recommended dietary fibre intakes for children and adults are 14 g/1000 kcal.
Suggested intakes for fibre (g) was calculated based on their caloric intakes.
Lipid profile of the selected subjects: Amongst the study group a 14 per cent of men and 4 per cent women had total cholesterol above 200 mg/dl and belonged to high-risk group. In the selected sample, 88 per cent of males and 38 per cent of females had serum HDL count below 45 mg/dl and 10 per cent of men and only 6 per cent of women were having high serum LDL count of above 100 mg/dl. (Fig.3). A study on prevalence of hyperlipidemia in urban population of Southern India observed 32.6 per cent hypercholesterolemia, 12 per cent hypertriglyceridemia, 27.5 per cent of decreased HDL levels and 33.7 per cent of increased LDL levels among normal glucose tolerant subjects. (Mohan et al., 2001). Also it was embodied that 40 per cent males and 16 per cent females were having a serum triglyceride count above the normal level of 150 mg/dl.

The association of small dense LDL with diabetes and CAD among Asian Indians and concluded that the small dense LDL was associated with both diabetes and CAD in Asian Indians and that a triglyceride to HDL ratio ≥ 3.0 could serve as a surrogate marker of small dense LDL in this specific ethnic group (Mohan et al., 2001).

**CONCLUSION**

More than fifty percent of male members were smokers and alcoholics, which is accounted as a risk factor of many lifestyle diseases. An increased consumption of energy rich foods was contributed mainly by high intake of fats and sugars compared to carbohydrates. Mean weight of the subjects exceeds the normal ICMR standards which ultimately lead to obesity and in further advance the CVD risks and chronic lifestyle oriented diseases. Changes in food consumption pattern should be monitored regularly in relation to changing socio-economic circumstances in order to understand the impact of the nutrition transition in the community also to aid the better health of the people.

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