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INCIDENCE OF OVERWEIGHT AND OBESITY IN ADULT INDIAN POPULATION REPORTED USING A WEB-BASED SERVICE PROVIDER WITH PICTORIAL PORTION SIZES OF INDIAN CUISINES

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ABSTRACT

A comprehensive dietary assessment tool to capture data on a wide variety of food and nutrient intakes across different regions and ethnic groups is lacking in India. In order to measure the nutrient intake, an estimation of amount of food consumed is required. Underreporting and over reporting is often seen in dietary surveys. Conducting FFQ's and 24-hr recalls in large sample dietary surveys is expensive and time consuming. In addition to this correct estimation of portion size presents a major problem. Everything depends on respondents memory and the interviewer's imagination. Larger portions of food may contribute to excess of energy intake and greater obesity. Online self-administered dietary assessment tools can reduce the burden on both the interviewer and the respondents. Since a picture speaks a thousand words, a web-based service provider 'Nutrispoon' was developed to include pictorial portion size of 316 standardised recipes commonly consumed in Indian diet. The website was used to gather dietary intake of individuals using these pictorial portion sizes of standardised recipes. 24 hr recall method was employed to gather this data. The mean BMI of respondents was 23.01 ± 4.48 kg/m^2, with significant difference ($p<0.05$) between the BMI of male and female respondents. Overweight and Obesity was highly prevalent in the respondents of the present study, with 17% respondents being overweight and 25.2% being preobese. Positive and significant correlation between BMI and nutrient intake suggested that as the nutrient intake increases BMI also increases.

KEYWORDS: FFQ, Portion Size, BMI, Nutrispoon

INTRODUCTION

The last two decades have witnessed rapid economic growth, increasing mechanisation of transport, work and household activity domains and steep reduction in physical activity in all segments of population. Reduced physical activity and unaltered dietary intake have led to the increasing prevalence of obesity and associated non-communicable diseases. In affluent segments of population inappropriate dietary choices and increasing sedentary life style have aggravated the problem. Henceforth the country has to gear up to prevent and combat the dual burden of under-nutrition and over-nutrition and associated health problems. India has been self sufficient in food production since seventies. India is

at the top in vegetable and fruit production in the world, but vegetable intake of Indians remains low; consequently prevalence of anaemia and Vitamin A deficiency continue to be high (Ramchandran, 2007).

Dietary assessment is the best approach for assessing nutritional inadequacies or excess. Dietary assessment is an estimation of food and nutrient consumed over a particular time period. It can also be used to identify food patterns and preferences (Kapur et al., 2012). The ongoing epidemic of diabetes and other diet related chronic diseases burdening Asian-Indian population (Enas et al., 2007; Popkin et al., 2001) cannot be adequately addressed without widely applicable and effective research tools to measure dietary intake. Diverse dietary practices linked to India's unique religious and socio-economic heterogeneity may provide information on a wide range and wide variety of food and nutrient intakes as well as on vegetarian diets and use of distinctive spices, oils and pulses (Padmadass et al., 2006). Dietary pattern in India are bound by religious, cultural and family values (Mudambi and Rajagopal., 2001).

Dietary assessment methods are important in Nutrition Research (Forster et al., 2014). One of the main errors that occur in the measurement of food consumption is the assessment of portion size. Photographs of different portion sizes if used for estimation of dietary intake can provide remarkable results. Respondents can better perceive and recall their dietary intake if images of different portion sizes are used in dietary surveys. Online dietary assessment tools have the potential to become invaluable methods of assessing dietary intake because compared with traditional methods, they have many advantages including automatic storage of input data and immediate generation if nutritional outputs (Forster et al., 2014).

Using online systems for dietary assessment, self monitoring of diet can also be facilitated for the general people. People become more empowered about their own disease and can make informed decisions on what, how much and how often to eat and ultimately adopt healthy eating habits (Bonilla et al.,2015).

Hence a novel Nutrient intake assessment instrument with pictorial portion size which can be easily implemented in Indian field setting was developed as 'Nutrispoon' and used for dietary assessment of adult Indian population to report the incidence of overweight and obesity.

MATERIALS & METHODS

The study was carried out in three phases. The first phase comprised of selection of commonly consumed Indian recipes. 316 commonly consumed recipes in Indian diet were selected, grouped in different groups and standardised for one portion size. In the next step of this phase, photographs of these standardised portion sizes were recorded on a digital medium and the cooked weight of all these recipes was also recorded. This was followed by calculation of nutritive value of all these recipes for one portion size and finally making these photographs comprehensive by entering all the data related to the recipe like ingredients used, nutritive value, portion size and cooked weight on the photograph itself.

In the second phase, Nutrispoon website development endeavour was undertaken incorporating the above mentioned standardised recipes with pictorial portion size. Various databases were constructed for the website in this phase. These included- Nutrient calculation database, standardised pictorial portion size database, diet chart and diet tips database and program logic database.

In the final phase of research, people were urged to register on the website through social media and personal contact.. The online 24 hour recall of all the registered users was gathered using standardised pictorial portion sizes.. The

data gathered using online 24 hour recall was further subjected to statistical analysis.

RESULTS & DISCUSSIONS

Pictorial Portion Size

Pictorial Portion Size with all the Data Pertaining to the Recipes

The images of the 316 standardised portion size recipes captured on a digital medium was further edited on Microsoft PowerPoint and all the information pertaining to the recipe like ingredients used, nutritive value, portion size and cooked weight were mentioned on the image. These images were uploaded on the website in the next phase for facilitating analysis of dietary intake. Some pictorial portion size images are presented herewith in the following Figures

Figure 1: Pictorial Portion Size of Breakfast Cereal (Poha)

Figure 2: Pictorial Portion Size of Lunch and Dinner recipe (Roti)

Nutrispoon Development

Once all the pictorial portion size data of standardised recipe was available, it was uploaded on the website www.nutrispoon.in. The architecture of Nutrispoon is being explained below

Architecture of Nutrispoon

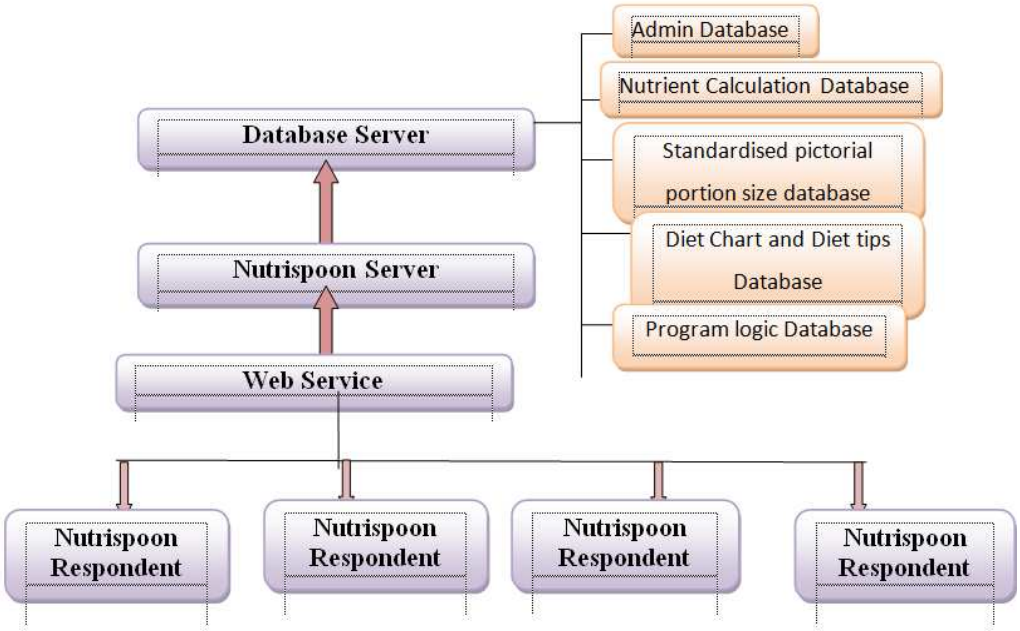

Figure 3: Architecture of Nutrispoon.in

After the respondents entered their personal and dietary information on the website Nutrispoon, this information is send to the server through a web service. The server that receives the information performs operations with databases, determines the results and sends the results to the respondents through the web service on the respondents screen.

Figure 4: BMI Calculator Page of Nutrispoon

Statistical Analysis

Statistical Analysis of the user responses was done using IBM SPSSS version 22.0. The data entered by users regarding their height and weight was evaluated for Mean, Standard deviation, t- test.

Table 1: Mean BMI (kg/m^2) of Respondents

S.No.	Gender	Mean ±S.D	p- value
1.	Male	24.10±4.66	0.003*
2.	Female	22.49±4.30	
3.	Total	23.01±4.48	

*p value of t was significant at 5% level

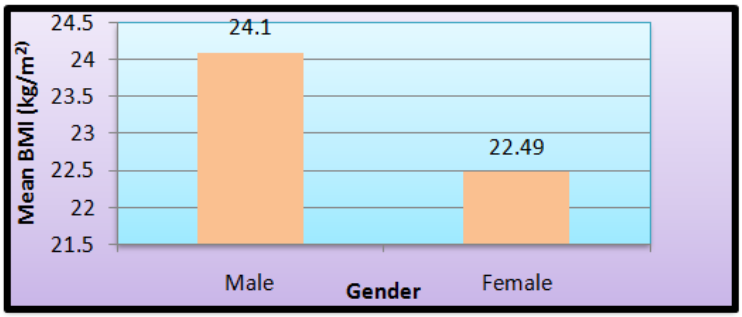

Figure 5: Mean BMI (kg/m^2) of Respondents

The mean BMI of respondents was 23.01±4.48 kg/m^2. The mean BMI of males was 24.10±4.66 kg/m^2 and the mean BMI of females was 22.49±4.30 kg/m^2 (Table 4.21).

Shridhar et al. (2014) had reported in their study on Indian population that the mean BMI of respondents was 23.9 ± 4.4 kg/m^2 which was in accordance with our study. Fallaize et al. (2014) had reported the mean BMI of respondents in an online diet history questionnaire to be 23.6±3.3 kg/m^2 and for males it was 24.3 ± 3.1 kg/m^2 and for females it was 23.3±3.3 kg/m^2. Gupta et al. (2010) reported a mean BMI of 19.8 ±3.3 kg/m^2 in a study on young Asian Indian Adolescents. In the present study, there was significant difference ($p<0.05$) between the mean BMI of males and females. Similar difference in BMI was seen in a study done by Rolls et al. (2002), where men had a BMI significantly greater than women (men -24.3 ±0.4 kg/m^2, women- 23.0 ± 0.4 kg/m^2, p=0.04). Forster et al. (2014) also showed similar significant difference in the BMI of male and female subjects (male- 24.3 ± 3.0, female- 22.6±2.6, p =0.005).

Table 2: Classification of respondents on the basis of BMI (kg/m^2)

S.No	Classification	BMI (kg/m^2)	Males		Females		All Respondents	
			N	%	N	%	N	%
1.	Underweight	<=18.5	7	7.14	40	19.7	47	15.6
2.	Normal Weight	18.5-22.9	33	33.67	74	37.9	107	35.5
3.	Overweight	23-24.9	23	23.46	28	13.79	51	16.9
4.	PreObese	25-29.9	24	24.48	52	25.61	76	25.2
5.	Obese	>=30.0	11	11.2	9	9.85	20	6.6

N- Number of respondents

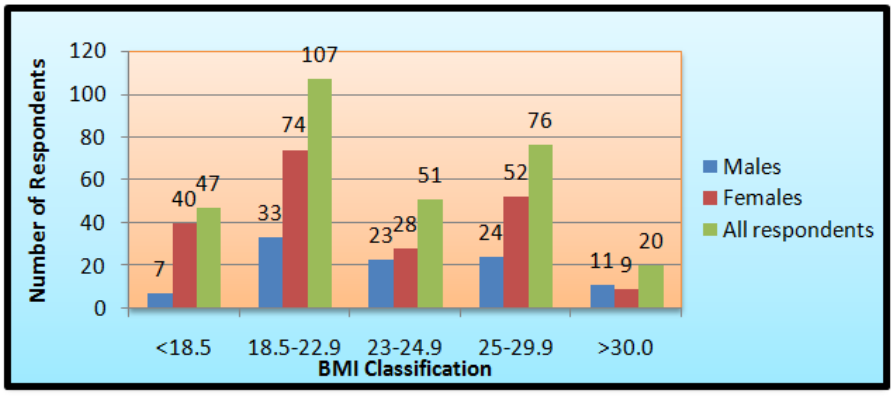

Figure 6: Distribution of Respondents on the Basis of BMI Classification

Table 2 reveals that 15.6% respondents were underweight, 35.5% were normal weight, 175% were overweight, 25.2% were preobese and 6.6% were obese.

Gupta et al. (2010) reported that 16% of young Asian adults had a BMI >23.1 kg/m^2, which means they were overweight.

Correlation between BMI and Dietary Intake

In order to ascertain relationship of BMI with dietary intake, Karl Pearson correlation test was applied between BMI and dietary intake. There was found to be a significant ($p<0.05$) and positive correlation ($r= 0.153$) between BMI and energy intake, between BMI and protein intake ($r= 0.176$), between BMI and fat intake ($r= 0.149$), between BMI and Calcium intake ($r= 0.152$) and between BMI and iron intake ($r= 0.171$). Positive and significant correlation between BMI and nutrient intake suggested that as the nutrient intake increases BMI also increases. Miglani et al. (2014) had reported that energy, carbohydrate and fat intakes are significantly correlated with increased body fat and waist circumference.

CONCLUSIONS

- Pictorial portion size of standardised recipes can be used as a tool for dietary assessment.
- Technology can be successfully linked to nutrition to empower general public to gain knowledge about their diet, eating habits and correct portion size.
- Correct portion size assessment through pictorial representation can reduce under-reporting and mis-reporting in dietary surveys.
- Results revealed that mean BMI of respondents was falling in the category of overweight. This should be immediately addressed through dietary counselling to prevent the risk of obesity.
- Significant correlation was found between BMI and energy, protein, fat, calcium and iron intake.
- The results showed that as the intake of energy, proteins and fat in the diet increased consequently the BMI also increases.

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REFERENCES

1. Bonilla, C., Brauer, P.,Royall, D.,Keller, H., Hanning, R.M., & DiCenso, A.(2015). Use of electronic dietary assessment tools in primary care: an interdisciplinary perspective**.** *BMC Medical Informatics and Decision Making*, 15, 14.
2. Enas, E.A., Mohan, V., Deepa, M.,Farooq, S., Pazhoor,S., & Chennikkara, H.(2007). The metabolic syndrome and dyslipidemia among Asian Indians: a population with high rates of diabetes and premature coronary artery disease. *Journal of Cardiometabolic Syndrome*, 2, 267–275.
3. Fallaize, R., Forster, H., Macready, A.L., Walsh, M.C., Mathers, J.C., Brennan, L., Gibney, E.R., Gibney, M.J.,& Lovegrove, J.A. (2014). Online Dietary Intake Estimation: Reproducibility and Validity of the Food4Me Food Frequency Questionnaire against a 4-Day Weighed Food Record. *Journal of Medical Internet Research,* 16(8): e190.
4. Forster ,H., Fallaize, R., Gallagher, C., O'Donovan, C.B., Woolhead, C., Walsh, M.C., Macready, A.L., Lovegrove, J.A., Mathers ,J.C., Gibney, M.J., Brennan, L., & Gibney, E.R. (2014).Online Dietary Intake Estimation: The Food4Me Food Frequency Questionnaire. *Journal of Medical Internet Research,* 16(6), e150
5. Gupta, N., Shah, P., Goel, K., Misra, A., Rastogi, K., Vikram, N.K., Kumari, V., Pandey, R.M., Kondal, D., Wasir, J.S., Bharadwaj, S., & Gulati, S.(2010). Imbalanced dietary profile, anthropometry and lipids in urban Asian Indian adolescents and young adults. *Journal of the American college of Nutrition,* 29(2), 81-91.
6. Kapur, D.,Geeta,K., & Rajshree. (2012). Dietary Assessment. *Childhood Nutrition: Basic Concepts and Physiological Requirements* (pp.64). New Delhi: School of Continuing Education, IGNOU.
7. Miglani, N., Bains, K., & Singh, P.(2014). Diet and physical activity in relation to metabolic syndrome among young urban Indian men and women *Ecology of Food & Nutrition,* 17, 1-14.
8. Mudambi, S., & Rajagopal, M.(2001). *In Fundamentals of Food and Nutrition (4th ed.).Madras: New Age International.*
9. Padmadas, S.S., Dias, J.G. & Willekens, F.J. (2006). Disentangling women's responses on complex dietary intake patterns from an Indian cross-sectional survey: a latent class analysis. *Public Health Nutrition,* 9, 204–211.
10. Popkin, B.M., Horton, S., Kim. S., Mahal, A., & Shuigao, J.(2001). Trends in diet, nutritional status, and diet-related non communicable diseases in China and India: the economic costs of the nutrition transition. *Nutrition Reviews*, 59, 379–390.
11. Ramchandran, P.(2007). *Nutrition transition in India 1947-2007.* Nutrition Foundation of India. Retrieved from http//www.wcd.nic.in/publications

12. Rolls, B.J., Morris, E.L., & Roe, L.S.(2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition*, 76(6), 1207-13.

13. Shridhar, K., Dhillon,P.K., Bowen,L., Kinra, S., Bharathi, A.V., Prabhakaran,D., Reddy,K.S., & Ebrahim, S. (2014). Nutritional profile of Indian vegetarian diets – the Indian Migration Study (IMS). *Nutrition Journal*, 13, 55. doi 10.1186/1475-2891-13-55