A Cross Sectional Study Assessing The Prevalence of Modifiable Risk Factors of Diet Related Chronic Disease in Tertiary Care Hospital Employees

Fayza Rani[1], Nilofer Fatimi Safdar[2]

Abstract

Objective: To determine the prevalence of risk factors i.e. increased Body Mass Index (BMI), waist circumference, dietary intake and physical activity levels among healthy adults and to compare these with the standard recommendations. Also to identify the group at possible risk of developing diet related chronic diseases.

Methods: Body size of 153 apparently healthy employees from a tertiary care hospital in Karachi between the ages of 20-50 years were assessed and compared with the WHO's criteria for Body Mass Index (BMI) and waist circumference. Interviewer administered questionnaire was used to collect information regarding demographic, anthropometric, dietary and physical activity patterns. Calories and protein were calculated from 24 hour diet recall. Average intakes of different food groups were also compared with the recommended food guides.

Results: Out of 153 apparently healthy individuals whose questionnaires were completed only 35.3% had a normal BMI. The rest were overweight, obese-I (BMI range of 25-29.9) & obese-II (above 30 BMI). However when waist circumference was used to assess obesity, 45% of males and 40% of females were found to be at risk.

Average caloric intake for males was 2000 ± 420 kcal/Day and for females 1500 ± 380. Average protein intake for males was 60.5 ± 13 gms/day and 42.5 ± 12 gms/day for females. Main sources of calories were from bread, cereal (38.4%), fats and oils group (33.5%). Average intake of milk, vegetables and fruit group was less than the recommended servings. Physical activity level was assessed and only 44% were found to be physically active.

Conclusion: Increased body weight, improper dietary composition and sedentary life style can pose a risk for developing diet-related chronic diseases. Dietary intake of certain food groups was not optimal as per recommendations e.g. fruit, vegetable and milk group. Bread and cereal group contributed the most to protein intake, in the studied group instead of protein sources. Therefore dietary and life style modification is needed to lower the risk of diet relate chronic diseases.

Keywords: Diet related chronic diseases, BMI, waist circumference, over-nutrition, obesity

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Introduction

Healthy dietary patterns and appropriate body size promotes good health and consequently decrease the risk for developing diet related chronic diseases such as obesity, diabetes, heart diseases, certain type of cancers and osteoporosis[1-3].

The nutrition transition occurring worldwide even in the poorest countries involves a shift from traditional grain based to high fats and refined sugar type of diets. On the other hand globally chronic diseases are becoming more prominent. These transitions are dramatic and point to a need to increase the focus on preventive approaches to promoting healthy lifestyles[2,4]. The National health Survey of Pakistan (NHS) clearly shows the double burden of under nutrition and over weight in adoles-

[1] Department of Nutrition,
The Kidney Center Post Graduate Institute,
[2] School of Public Health,
Dow University of Health Sciences

Correspondence: Dr. Nilofer Fatimi Safdar,
School of Public Health,
Dow University of Health Sciences
Karachi
Email: niloferfatimi@hotmail.com
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cents and adults. The burden of degenerative diseases in Pakistani population has been reported by NHS 1990-94 to be extremely high. Hypertension, hyperlipidaemia, diabetes and obesity were all found to be elevated across socioeconomic classes and sex, though females had a greater burden[4].

Weight gain leads to greater adverse metabolic changes in certain ethnic groups. BMI is a useful guide to weight related health risks, but waist circumference is also a simple alternative, with additional value for predicting metabolic and vascular complications. As a result, Asians should be considered overweight if BMI is 23 and obese if BMI is 27[5]. Waist levels associated with risk are also lower in Asian men (90 cm v 94 cm in Europeans)[5]. WHO expert consultation committee has emphasized that cut-off point for the amount of overweight should not be interpreted in isolation, but in combination with other risk factors such as diet and activity pattern[4].

Physically active life style and healthy eating are desirable health habits and can be targeted for population-specific intervention to reduce chronic disease risks[6].

Emphasis on both energy intake and expenditure is needed to address the current obesity epidemic. Traditionally exercise has been viewed as a universal panacea, providing a wide range of both physical and psychological benefits. Moderate amount of physical activity have been shown to reduce the risk of premature mortality from all causes. In recent years, it has also become apparent that regular physical activity, including activities not traditionally classified as exercise, such as leisure time and work related activities, may also yield health benefits. Research has supported the idea that habitual physical activity is inversely related to the incidence of obesity, diabetes type II, and cardiovascular diseases[7].

Recent diet and disease literature is remarkable for the burgeoning interest in examining diet as a multi-dimensional exposure. The term "dietary pattern" is lately being used to describe meal with intake patterns (number of meals, frequency of eating occasions, snack intake etc), intake of multiple or single nutrient and food patterns, characterized by fruit/vegetable/whole grain/fish & poultry consumption[3].

Evaluation of a complex entity like diet requires assessment of the frequency and quantity of foods eaten, food combinations, cooking practices and dietary variety. It is suggested that diet quality indicators such as nutrient intakes, food or food groupings, or a combination of nutrients and foods could be used to quickly evaluate the survey results. Indeed, it has been stated that by doing so, more is communicated on the disease risk, than the intake of single nutrient or food[3]. Examining these components allow health professionals to target specific dietary problems, and gives valuable insight to plan nutrition intervention[3,8,9].

In Pakistan, very few nationally representative dietary surveys have been conducted and the ones that are done provide limited dietary information[10]. National health survey data done in 1994-96 in Pakistan, clearly shows a need to conduct representative surveys of population to study the changing trends in the dietary and life style patterns of Pakistani families and its consequences on health[4,11]. The interventions must not be entirely focused on medical, but should also include nutrition and educational guide lines[12].

Therefore the purpose of this study was three fold. Firstly, to compare the respondent's anthropometric measurements with WHO's criterion for assessing obesity. Second is to estimate the intake of calories & proteins from various food groups and its comparison with standard guidelines. Lastly to compare BMI with macronutrients (calories & protein intake) and physical activity levels. The results hope to provide insight for nutrition and education strategies, in the prevention of diet related diseases in our health scenario.

Subjects and Methods

After an informed verbal consent the study was carried out between April and June 2005 on 180 ap-

parently healthy adults. Subjects between the ages of 18 to 50 years, working at a tertiary care hospital in Karachi were selected, any one reporting history of diabetes, hypertension, cardiovascular diseases and cancers were excluded from the study. A pre-tested self-administered questionnaire was used to collect the demographic data. However, interviewer-administered questionnaire was used to collect dietary, anthropometric and physical activity data. Twenty four hour's dietary recall for 3 days during the past week (2 week days and one holiday) was taken by showing the respondent, average food serving utensils and food photographs. On the basis of reported physical activity levels (duration & type of activity) subjects were categorized as sedentary if they were not involved in any planned activity, Moderate active; if they were involved in 30 min planned activity per week and active if they were engaged in any 30 min planned activity 3-5 times per week. Anthropometric measurements were taken for body height in meters, weight in kilograms (kg) and waist circumference in inches. Body Mass Index (BMI) was calculated by the standard formula (kg/m^2) and body waist measurements were done using a standard measuring tape. Both the results were then compared with the WHO's criteria for assessing obesity[10-12]. Final data was analyzed using SPSS 11.0 for statistical purposes.

BMI and waist circumference for each individual was matched with cut off values for Asian population. Total number of subjects within each category was then computed. Daily calories, protein & servings of food groups intake once calculated were compared with the recommendations of WHO guidelines[13]. Mean and standard deviation were calculated for BMI values, energy and protein intakes. In all statistical analysis $p<0.05$ was considered significant. ANOVA was used for comparison of mean and standard deviation in different groups.

Results

Out of 180 employees, 153 completed the questionnaires, provided 24 hrs diet re-call for all 3 days and were available for their anthropometric measurements. The rest had to be excluded from the final results due to incomplete questionnaires and their non-availability for anthropometric measurements. There were 105 males and 48 females between 20-50 years (mean 33 ± 7.43 years). A total of 56 employees (37%) were in the age range of 20-30 years, 65 (42%) between 31-40 years, and 32 (21%) from 41-50 years. When mean body weight in kg was calculated, it was 70 ± 12.5 kg for males and 57±10.5 kg for females. Using WHO's BMI criteria for Asians, only 35.3% of employees were in normal BMI range (18.5-22.9), 19% were categorized as overweight having (BMI range between 23-24.9), 28% of employees were in BMI range of 25-29.9 (obese1) and 9.2% were above 30BMI (obese 2). Based on WHO's cut-offs criteria for waist measurements in Asians,[14,15] 47% of males (waist $\geq$ 35 inches) and 48% of females (waist $\geq$ 32 inches) were found to be at an increased health risk.

When macro nutrients intake for the day was calculated from total amount of calories consumed, the results of males were 2000 ± 420 calories (29kcal/kg/bw) and 1500 ± 380 (26 kcal/kg/bw) for females. Average daily protein intake was estimated to be 60.5 ± 13gms (0.86 gms/kg/bw) for males and 42.5 ± 12 (0.74 gms/kg/bw) for females.

Estimates of average food servings per day from different food groups for both genders were 8.5 ± 2.3 for bread & cereal group, 2.5 ± 1.4 meat/poultry and only 0.8 ± 0.6 for daals and lentils. Average daily intake of milk & its products was less than one serving a day (0.7 ± 0.6). Vegetable and fruit intake was 1.2 ± 3 and 0.4 ± 1 serving on daily basis. Cumulative servings of fats & oils (6.6±4) and refined sugar /sweets (3.4 ± 2.5)were 10 ± 8.9. These results were further compared with the recommendations Fig.1[16].

When the food intake data was further tabulated to analyze the source providing the maximum calories in daily meals, our results showed that starch and cereal group contributed the most (38.4 ±7). However, its consumption was significantly

Table 1. Educational, Income, physical activity level data and its association with BMI, Kcal and protein intake of respondents.

Respondent's Characteristics	No(%)	Mean BMI±SD	Mean kcal Intake ±SD	Mean Protein Intake ±SD
Education				
Primary	7(4.5%)	23.6±5.0	1743±462	47.6±16
High school	35(23%)	23.2±4.1	1757±355	50.9±14.8
Intermediate	31(20%)	24.0±4.7	1906±491	57.3±15.2
Graduate and above	80(52%)	24.5±4.5	1782±406	56.4±14.6
p-value		0.538	0.447	0.111
Income Level				
<5000	19(12.4%)	24.0± 3.49	1783± 268	53.0±12.9
5000-15000	70(45.8%)	23.2± 4.73	1738± 439	51.4±15.5
15000-30000	40(26%)	24.9 ±3.91	1888± 463	58.3±15
>30,000	24(15.7%)	24.6± 4.9	1843± 340	61.1±12.5
p-value		0.228	0.305	0.014
Physical Activity Level				
Sedentary (no planned activity	30(19.6%)	25.3±4.93	1635 ±309	51.56± 14
Mod. Active(30min./week)	55(35.9%)	23.9± 4.56	1792.9 ±463	51.4 ± 15.4
Active(3-5 Times /week)	66(43%)	23.4± 4.12	1880 ±388	59+13.8
Strenuously active	2(1.3%)	25.4± 0.71	1819±935	65+21.6
Active & strenuously active	68(44.3%)	24.4 ±4.83	1849±940	62±35
p-value*		0.264	0.064	0.014

* Using analysis of variance (ANOVA) for comparison between more then two groups. In all statistical analysis only p<0.05 are considered significant

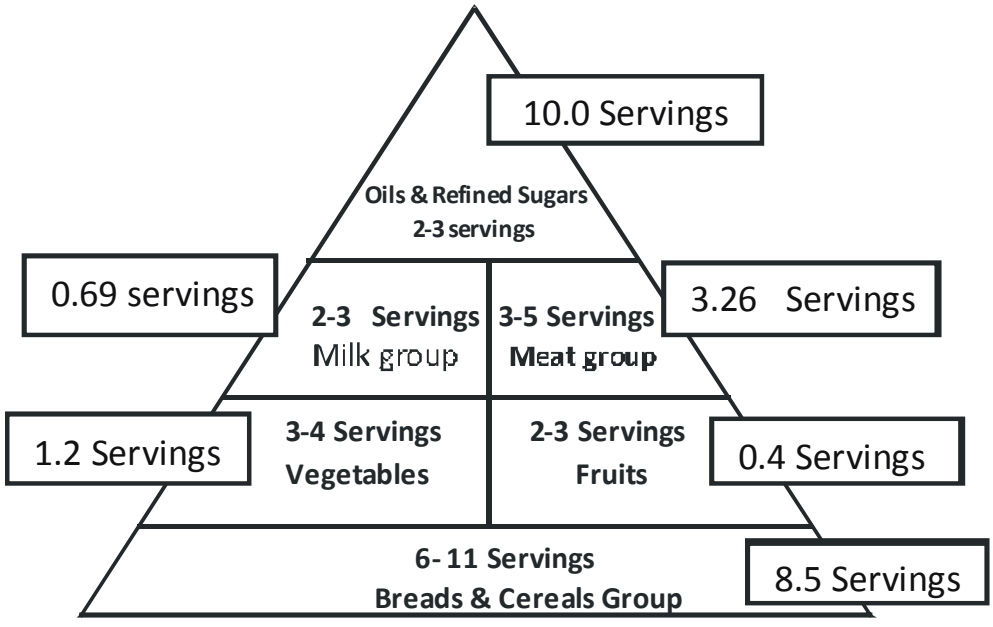

Fig 1. Comparison of WHO Food guide with the Average number of servings consumed by the group studied

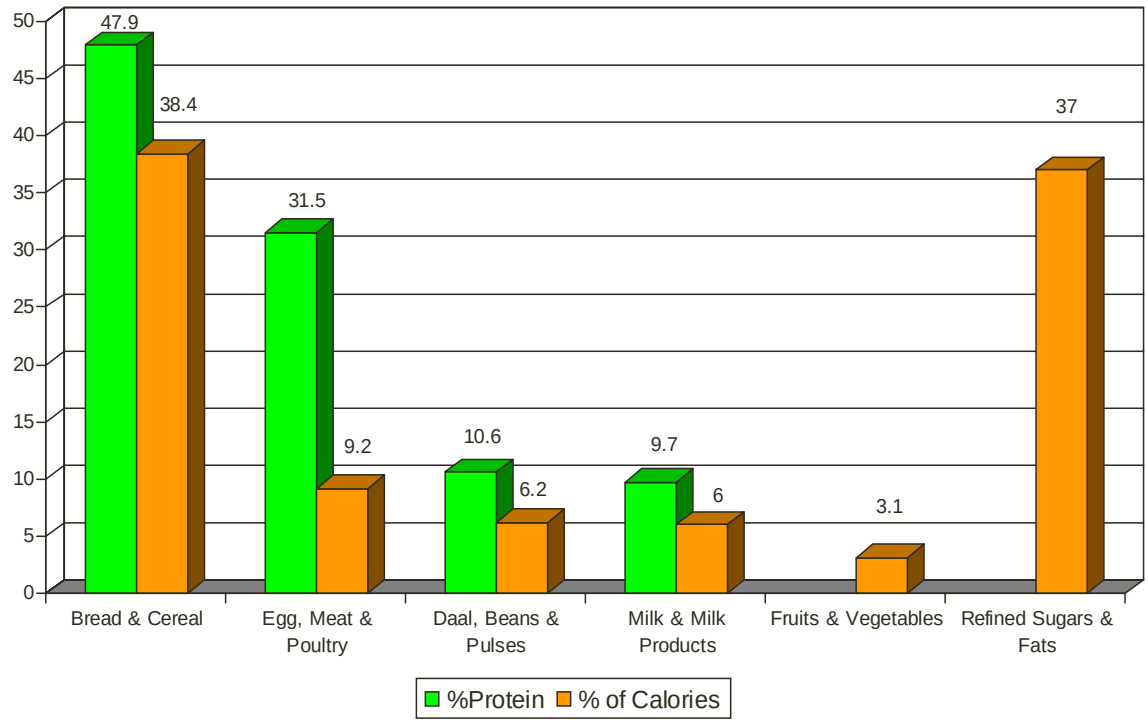

Fig 2. Percentages of Calories and Protein from various food groups

higher ($p<0.05$) in males than females (M:39.5 ± 7% versus F:36 ± 7%).Other composite sources for calories in the diet for both males and females were fats and oil (33.5%), meat group (9.2%), daals and lentils (6.2%), milk group (6%), fruit group (1.5%) and vegetables (1.6%). Refined sugars and sweets, however contributed only 3.4% of total calories in the daily diets of our subjects Fig. 2.

Contrary to the customary dietary pattern, where maximum protein would come from meat & lentils, the results showed starch and cereal group to be the major source of dietary protein. (M: 47.5% F:49%). Other dietary sources for protein were, meat group (M: 32.4% F: 30%), daals and lentils (M: 9.3% F: 14%) and milk group (M: 10.7% F: 8%).

Reported data on the physical activity of subjects is considered an important component contributing to life style modification for the prevention of chronic diseases. Our results showed 44% active (30 minutes of activity/3-5 times/ week), 36% to be moderately active (30 minutes of activity once a week) and 20% leading a sedentary life style as shown in Table 1.

When BMI and macro nutrient intakes were compared with the activity level, family income and education of the respondents, using analysis of variance (ANOVA), the results showed; that with increased physical activity there was no significant change in BMI and caloric intake in the population surveyed. However, protein intake was found to be significantly higher among the physically active and high socioeconomic group (Table 2).

Discussion

Healthy diets and physical activity are keys to good nutrition, and necessary for a long and healthy life. Eating nutrient dense foods and balancing energy intake with the necessary physical activity to maintain a healthy weight is essential at all stages of life[2,3]. In our studied group, anthropometric measurements when used in conjunction with BMI and waist circumference cut off's for Asians, provided reasonable estimate to group, the participant in low or high risk group. Almost half (56%) of

the respondents were in the high risk group based on their increased body weight. These findings indicate that increased body weight and obesity could pose a major risk for developing diet-related non-communicable diseases, leading to poor quality of life and subsequently more serious chronic conditions and premature deaths[16,17,18]. This is supported by the high burden of degenerative diseases in the Pakistani population, which has been reported by National Health Survey of 1990-94. In this survey obesity was found to be elevated across the socio-economic classes and sexes[11,19]. Increased adult BMI and obesity was also found to be associated with urban work[4,11,18]. Therefore,it is imperative and absolutely essential to make necessary life style modification, and dietary intervention, in order to lower the risk for developing obesity related complications in our population. Our data did not indicate a very high consumption of calories, but may be due to decrease energy requirements and expenditure a large proportion of them were categorized as overweight and obese. However, inclusion of activity patterns differences may be present, which we could not capture so well through our questionnaire, therefore the recommendation should also gear to activity pattern along with dietary interventions.

Calorie intake in our studied group was found to be consistent, with the limited national data available, indicating fat as the second major source for calories[10,11].

However, when protein source was evaluated in respondent's diet, interestingly the bread & cereal group was the main source, than the meat group. These results are similar to the National Health Survey of Pakistan[11]. However, western data reflect otherwise where the major source for protein is animal food[16]. This could however jeopardize the population as far as other nutrient deficiency such as iron, protein and B-vitamins are concerned.

There is also strong evidence suggesting, that not only the density, but the dietary composition/ patterns have an association with the development of obesity[12,20]. Health full dietary patterns characterized by fruits/vegetables/whole grain cereals/fish poultry consumption generally have been reported to relate to micronutrient intake and to be selected as biomarker of dietary exposure and disease risk in the expected direction[3]. An inverse association of health full dietary patterns with all-cause mortality and cardiovascular disease risk was also reported in some studies[1,3,6]. Need for the usefulness of assessing diet, with different types of food guides/food groups/food pyramids to identify lapses in food consumption is now well recognized as a tool for dietary intervention[21]. Recent dietary surveys and research is suggestive of the beneficial effect of increased intake of fruits and vegetables[22]. However, there was a huge inadequacy in its consumption in our study group. Of the recommended only 23% vegetables and 20% fruitswere consumed, thereby exposing the group at an increased disease risk. A recently published WHO/FAO report recommends for a population-wide intake goal fo rthe consumption of a minimum of 400g (Approx. 3-4 servings) of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries[1,22]. Gopalan studied changes in south east Asian countries and found that as population moved up in socioeconomic scale, the dietary pattern changed from coarse grain cereals to refined cereals that result in a significant decrease in the amount of fiber intake. So was the consumption of vegetables and fruit decreased with subsequent increase in total fat from animal food[23].

Osteoporosis and bone health is another emerging issue in our population and one of the contributing factorsis the decreased intake of dietary calcium. Adequate intakes of calcium (500 mgor more) and of vitamin D in populations with high osteoporosis rates, help to reduce fracture risks, so does sun exposure and physical activity to strengthen bones and muscles[1]. Milk groupfoods are the major sources for dietary calcium; however our data showed an average consumption of only

40% of the recommended, thereby, increasing the group at risk for developing osteoporosis and related bone diseases[1,24].

Income and education have been reported to be among the positive predictors of more health full dietary patterns. However, this association was not found to be statistically significant in our population.

Limitation of this study includes it that it was sent for publication in 2015, though the work was done in 2005. Final compilation of the data and analysis took more time than was expected. Further recent studies need to be done to document if there has been a change in the trend of the risk factors related to diet, leading to chronic diseases and to relate with the work presented.

Conclusion

The results of this study hope to provide useful information to be incorporated for individual nutritional counseling, public health education & life style modification for preventive health management. The results are further suggestive of the need for increased intake of fruits, vegetables and dairy products, which is consequently related to fiber, anti-oxidant nutrients & non nutrient substances like phyto-chemicals. There is a dire need to conduct similar types of surveys on a larger scale, to assess prevailing dietary patterns in our country.

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Conflict of interest

Authors have no conflict of interests and no grant/ funding from any organization.

References

1. World Health Organization. Diet, Nutrition and the Prevention of Chronic Diseases [Internet]. Geneva: World Health Organ Tech Rep Ser; 2003. Available from: http://www.who.int/dietphysicalactivity/publications/trs916/download/en/. Accessed on January 14, 2016.
2. Kennedy ET. Evidence for nutritional benefits in prolonging wellness. Am J Clin Nutr 2006;83:410-4.
3. Kant AK. Dietary patterns and health outcomes. J Am Diet Assoc 2004;104:615-635.
4. Bharmal FA. Trends in nutrition transition: Pakistan in focus. J Pak Med Assoc 2000;5:159-67
5. Han TS, Sattar N, Lean M. ABC of obesity. Assessment of obesity and its clinical implications. BMJ 2006;333:695-8.
6. Engels HJ, Gretbeck RJ, Gretbeck KA, Jimenez L. Promotinghealth full diets and excercise, efficacy of a 12-week after-school programme in UrbanAfricaAmericans. J Am Diet Assoc 2005;105;455-9.
7. KeimNL,Blanton CA, Kretsch MJ. America's obesity epidemic: measuring physical activity to promote an active lifestyle. J Am Diet Assoc 2004;104:1398-409.
8. Shatenstein B, Nadon S, Godin C. Ferland G. Diet quality of Montreal-area adults needs improvement: estimates form a self-administered food frequency questionnaire furnishing a dietary indicator score. J Am Diet Assoc 2005;105:1251-6.
9. Zhang M, Binns CW, Lee AH. Dietary patterns and nutrient intake of adult women in south- east China: a nutrition study in Zhejiang province. Asia Pacific J ClinNutr 2002;11:13-21.
10. Agriculture and Consumer Protection Department. Nutrition Country profile of Pakistan [Internet]. Rome. Available from: http://www.fao.org/ag/AGN/nutrition/PAK-e.stm. Accessed on January 14, 2016.
11. Govt. of Pakistan. National Health Survey of Pakistan 1990-94. Islamabad. Available from: https://www.google.com/#q=Govt.+of+Pakistan.+National+Health+Survey+of+Pakistan+1990-94.
12. Available from: http://www.who.int/nutrition/publications/public_health_nut3.pdf Public Health Nutrition: 7(1A), 123-46
13. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy & interventional strategies. The Lancet 2004;363:157-63.

14. WHO global data base on Obesity and BMI in adults, 2002. Availble from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html.

15. World Health Organization. Obesity: preventing and managing the global epidemic [Internet]. Geneva. World Health Organization; 1997. Available from: https://scholar.google.com/scholar?q=Obesity%3A+preventing+and+managing+the+global+epidemic+report+of+a+WHO+consultation+on+Obesity.+Geneva%2C+3-5+June+1997&btnG=&hl=en&as_sdt=0%2C5&as_vis=1. Accessed on January 14, 2016.

16. Intoduction to basic principles of nutrition science. In: Nix S. Williams Basic Nutrition and Diet Therapy. 12th edition. Mosby Elsvier; 2005. pg.10.

17. Popkin BM, Doak CM. The obesity epidemic is a worldwide phenomenon. Nutr Rev 1998;56:106-14.

18. Jorgensen ME, Borch-Johnson K, Bjerregaard P. Lifestyle modifies obesity- associated risk of cardiovascular disease in a genetically homogenous population. Am J Clin Nutr 2006;84:29-36.

19. Pappas G, Akhtar T, Gergen PJ, Hadden WC, Khan Aq. Health status of the Pakistani population: a health profile and comparison with the United States. Am J Public Health 2001;91:93-8.

20. Thompson F, Midthune D, Subar AF, McNeel T, Berrigan D, Kipnis V. Dietary intake estimates in the National Health Interview Survey, 2000: methodology, results and interpretation. J Am Diet Assoc 2005;105:352-63.

21. Romein I, Willet WC, Stampfer MJ, Colditz GA, Sampson L, Rosner B, et al. Energy intakes and determinants of relative weight. Am J of Clin Nutr 1988;47:406-12.

22. Healthful Eating: Perception, motivations, barriers, promoters in Low Income Minnesota Communities. J Am Dietetic Assoc 2004; 104:1158-1161.

23. Gopalan C. Nutrition in developmental transition in South Asia [Internet]. New Delhi: World Health Organization; 1992. Available from: http://www4.dr-rath-foundation.org/NHC/who_documents/whodoc10.pdf. Accessed on January 14, 2106.

24. Tucker KL, Chen H, Hannan MT, Cupples LA, Wilson PW, Felson D, et al. Bone mineral density and dietary patterns in older adults: the Framingham Osteoporosis Study. Am J ClinNutr 2002;76:245-52.

25. Kimm SYS, Kwiterovich PO.Childhood prevention of adult chronic diseases: rationale and strategies. In: Cheung KWY, Richmond J, eds. Child health , Nutrition and Physical Activity. Champaign: Human Kinetics Books; 1995. p.249.