BEST: International Journal of Humanities, Arts, Medicine and Sciences (BEST: IJHAMS)
ISSN (P): 2348-0521, ISSN (E): 2454-4728
Vol. 4, Issue 6, Jun 2016, 121-128

ELEMENTS INFLUENCING BODY MASS INDEX

PURNIMA BAIDYA[1] & DEEPAK KUMAR SHRESTHA[2]

[1]Lecturer, Central Department of Microbiology, Tribhuvan University, Kirtipur, Nepal

[2]Faculty member, Department of Pharmacy, School of Medical Sciences, Kathmandu, Nepal

ABSTRACT

The obesity pandemic is sweeping every age group. The aim of this study is to assess whether dietary and non-dietary habits are associated with increase BMI in male and female adults. In this study, dietary and different non-dietary parameters were randomly questionnaire to 50 non-vegetarian and 50 vegetarian participants along with measuring height and weight. Among the non-vegetarian, 21 participants were male and 29 were female. Same way from the 50 vegetarian 14 participants was male and 36 were female. Among the 21 male non-vegetarian (underweight: 3, normal: 16 and overweight: 2) whereas from 14 male vegetarian (normal: 12 and overweight: 2), similarly, among the 29 female non-vegetarian (underweight: 6, normal: 18, overweight: 4 and obese: 1) whereas from 36 female vegetarian (underweight: 7, normal: 23 and overweight: 6). In this study, mean BMI of non-vegetarian male (21.73 ± 2.23) and female (21.67 ± 3.74) and of vegetarian male (21.67 ± 1.90) and female (21.69 ± 3.17) was observed, dietary habits show considerably influences in the BMI values compare to non-dietary habits such as employment status. However, educational background to vegetarian BMI shows noteworthy difference ($p<0.05$).

KEYWORDS: BMI, Non-Vegetarian, Normal, Obese, Overweight, Underweight, Vegetarian

INTRODUCTION

Body mass index (BMI) is a simple, economical measure of body fat. In contrast to other methods, BMI relies solely on height and weight and with access to the proper equipment, individuals can have their BMI routinely measured and calculated with reasonable accuracy (Prentice & Jebb, 2001). BMI is a measure of weight adjusted for height, calculated as weight in kilograms divided by the square of height in meters (kg/m^2) (Lesser, 2007; Prentice & Jebb, 2001). Although BMI is often considered an indicator of body fatness, it is a surrogate measurement of body fat as it measures excess weight rather than excess fat (Garrow & Webster, 1985). Furthermore, BMI level can be related with future health risks. Studies have shown high BMI predicts future morbidity and death (Observatory, 2009). For this reason, it is an appropriate measure for screening for obesity and its health risks. Same time, the widespread and longstanding application of BMI contributes to its utility at the population level. Therefore, its use has resulted in an increased availability of published population data that allows public health professionals to make comparisons across time, regions, and population subgroups (Deurenberg et al., 1998).

The concerns associated with using BMI for adults also apply to children and adolescents. BMI is calculated same way for adults and children, but the results are interpreted differently. BMI classifications do not depend on age or sex in adults (Romero-Corral et al., 2008) but for children and adolescents between 2 and 20 years old, BMI is interpreted relative to a child's age and sex, because the amount of body fat changes with age and varies by sex (Barlow & Committee, 2007; Cole et al., 2000). Therefore, a health care provider should integrate other factors into a health assessment, including

evaluations of diet, physical activity, family history, and other appropriate health screenings (Cole, et al., 2000; Lewis et al., 2009). Various researches have confirmed that individuals with a higher BMI are more likely to experience obesity-related health problems (Romero-Corral et al., 2008).

Although some debate continues about whether different categories should exist for specific subgroups such as Asians, these BMI categories are used worldwide for all adults 20 years and older (Deurenberg et al., 1998; Gallagher et al., 1996). BMI should serve as the initial screening of overweight and obesity in adults as no single body fat measure clearly distinguishes health from disease or risk of disease (Romero-Corral et al., 2008) and individual assessment of disease risk should recognized by other factors, such as fat distribution, genetics, and fitness level (Lewis et al., 2009; Lindsay et al., 2001; National Institute Heart Lung and Blood, 1998; Romero-Corral et al., 2008).

OBJECTIVES OF THE STUDY

To determine if dietary (vegetarian or non-vegetarian) and non-dietary habits is independently associated with objectively assessed biological markers of obesity

METHODS

This study was carried on randomly selected 100 participants (vegetarians, non-vegetarians or omnivores in the age group of 16-30 years) from various locations of Kathmandu valley who full fills the inclusion criteria (Age: 16 to 30 years, history of no diseases, normal blood pressure and weight with minimal cloths). The research method was quantitative and primary data were collected for further analysis. Measurement of the weight and height of the participants was done in presence of MBBS doctor. The questionnaire was developed for the purpose of the research which includes information about dietary and non-dietary parameters such as, educational level, employment status. The anthropometry measurements of these participants were carried out; weight of participant was measured with accurately calibrated electronic scales (Health meter BR-9510), height of participant was measured with stadiometer (Prestige) recorded to the nearest 0.5 cm and BMI was calculated by mobile application (Body index, version 1.0).

All statistical analyses were completed on a personal laptop (Acer, Aspire E 14) using the software package Statistical Package for Social Sciences (SPSS, version 21) and bar-diagrams were drawn from MS Office (Excel) 13. Statistical comparisons used Pearson's correlation test. Statistical significance was assumed for a $p<0.05$.

RESULTS AND DISCUSSIONS

Dietary and different non-dietary parameters were randomly questionnaire to 100 participants (non-vegetarian= 50, male=21 and female= 29; vegetarian= 50, male= 14, female= 36) along with measuring height and weight. Among the 21 male non-vegetarian (3, 16 and 2 were underweight, normal and overweight respectively) whereas from 14 male vegetarian (12 and 2 were normal and overweight respectively). Similarly, among the 29 female non-vegetarian (6, 18, 4 and 1 were underweight, normal, overweight and obese respectively) whereas from 36 female vegetarian (7, 23 and 6 were underweight, normal and overweight respectively). In this study, mean BMI of non-vegetarian male and female was found to be 21.73 ± 2.23 and 21.67 ± 3.74 respectively as shown in figure 1. Mean BMI of vegetarian male and female was 21.67 ± 1.90 and 21.69 ± 3.17 respectively as shown in figure 2.

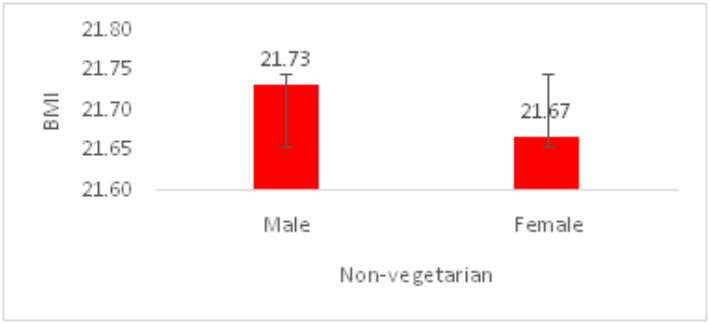

Figure 1: Mean BMI of Non-Vegetarian Male and Female

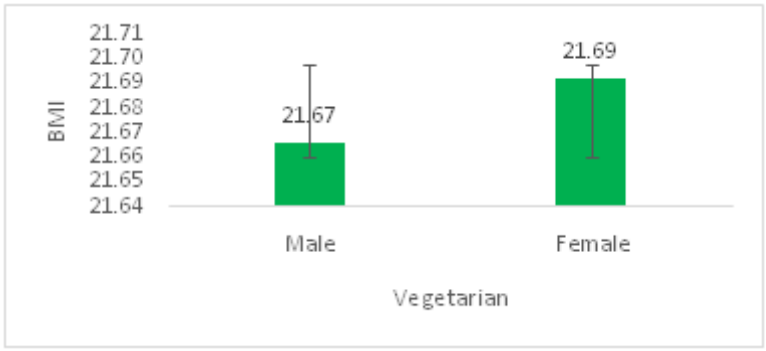

Figure 2: Mean BMI of Vegetarian Male and Female

The educational background of the participants were categorized into two groups, school level (non-vegetarian: $\bar{x}$= 21.98 ±3.62; vegetarian: $\bar{x}$= 21.51 ±3.08) and University (non-vegetarian: $\bar{x}$= 23.24 ± 0.69; vegetarian: $\bar{x}$= 22.31 ± 2.86) as shown in figure 3. In this study, 32 non-vegetarian participants were from school level, among which BMI of 3.13 % underweight, 21.88 % normal, 3.13 % overweight were male, 15.63 % underweight, 40.63 % normal, 12.50 % overweight were female. From the 35 vegetarian participants BMI of 26.67 % normal were male and 20.00 % underweight, 53.33 % normal, 16.66 % obese were female. Whereas, 18 non-vegetarian participants were studying under University, among which 7.69 % underweight, 57.07 % normal, 20.00 % overweight were male, 15.38 % underweight, 25.36 % normal were female. From the BMI of 15 vegetarian participants 20.00 % normal, 5.00 % obese were male and 5.0 % underweight, 35.00 % normal, 10.00 % obese were female as shown in table no 1. Educational background to vegetarian BMI shows noteworthy difference ($p<0.05$) as shown in table 2.

The employment status was categorized into two groups, unemployed (non-vegetarian: $\bar{x}$= 21.90 ± 3.44; vegetarian: $\bar{x}$= 19.36 ± 2.44) and employed (non-vegetarian: $\bar{x}$= 21.93 ± 2.44; vegetarian: $\bar{x}$= 21.98 ± 2.94) as shown in figure 4.In this category, 45 non-vegetarian participants were unemployed, among which BMI of 4.44 % underweight, 31.11 % normal, and 4.44 % overweight were male and 15.56 % underweight, 33.33 % normal, 8.89 % overweight and 2.22 % obese were female. From the 48 vegetarian participants BMI of 25 % normal, 4.166 % overweight were male and 12.5 % underweight, 45.83 % normal, 12.5 % overweight were female. Only, 5 non-vegetarian participants were employed, among which BMI of 40.00 % normal were male and 50.00 % underweight, 60.00 % normal were female. Finally from the 2 vegetarian participants none of the male vegetarian participants were currently employed while among the females 50 % underweight, 50 % normal were found as shown in table no 1.

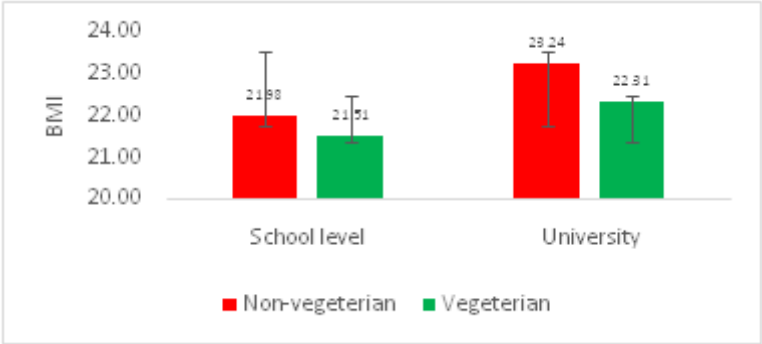

Figure 3: BMI of Non-Vegetarian and Vegetarian against Educational Background

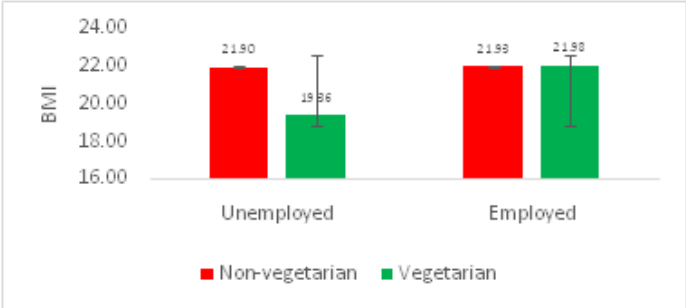

Figure 4: BMI of Non-Vegetarian and Vegetarian against Employment Status

In this study, there were considerable differences in mean BMI values between the diet groups. The vegetarians had lower mean BMI and are within normal ranges than the non-vegetarian. Thus, it appears that the behavioural changes in eating and exercise resulting in weight loss are only temporary. Approximately 40% of women and 19% of men aged 18 to 29 reports that they are trying to lose weight (Serdula, et al., 1993). Obesity rates were significantly lower in the vegetarian than non-vegetarian. This supports previous findings in the Oxford Vegetarian Study (Appleby, Thorogood, Mann, & Key, 1998) and in EPIC-Oxford (Key & Davey, 1996; Spencer, Appleby, Davey, & Key, 2003; Wang, 1994).

Educational back ground such as school level accounted for only a very small proportion of the difference in mean BMI between non-vegetarian and vegetarian. In contrast, other non-dietary parameters employment status accounted for true associations in mean BMI between non-vegetarian and vegetarian (Serdula, et al., 1993; Spencer, Appleby, Davey, & Key, 2003; Wang, 1994). The BMI values of non-vegetarian participants from schooling and University back ground has real associations, participants from the higher education have the comparatively higher BMI values than those who were in school level which supports earlier conclusions given by (Appleby, Thorogood, Mann, & Key, 1998; Bourn, 2001). But in case of the vegetarian participants, the BMI value from school background has a noticeably differences ($p<0.05$) than participants studying under Universities.

Employment status indicates the identical relation with the BMI values, whether non-vegetarian participants are unemployed or employed they definitely not shown any kind of relation with the increment in BMI values. But in case of employed vegetarian participants, they were found with somewhat increment in the BMI values. However in a study in Kuwait no relation was observed in between income levels and obesity (Moussa, et al., 1999). There is some correlation between obesity and income levels of the subject. Controversy, obesity is prevalent among the low income groups in developed countries (Bray, 1999; Hardly, Watsworth, & Kuh, 2000; Power & Parsons, 2000). While it is more prevalent in the high income groups in the developing countries. In a cohort study which is carried on in GB, especially the women who

grew up in low income families face obesity more than the others (Hardly et al., 2000; Power and Parsons, 2000). Similar to my study, obesity increases as the income levels rise in Turkey (Akman, Demireli, & Çivi, 1988; Açkurt & Wetherilt, 1991; Bagci & Akdag, 1992).

Table 1: BMI of the Non-Vegetarian and Vegetarian with Various Non-Dietary Parameters (%)

Non-Dietary Parameters	Underweight				Normal				Overweight				Obese			
	Non-Vegetarian		Vegetarian		Non-Vegetarian		Vegetarian		Non-Vegetarian		Vegetarian		Non-Vegetarian		Vegetarian	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Educational background																
School level	3.13	15.63	-	20.00	21.88	40.63	26.67	53.33	3.13	12.50	-	-	-	3.12	-	16.66
University	7.69	15.38	-	5.0	57.07	25.36	20.00	35.00	20.00	-	-	-	-	-	5.00	10.00
Employment status																
Unemployed	4.44	15.56	-	12.5	31.11	33.33	25	45.83	4.44	8.89	4.166	12.5	-	2.22	-	-
Employed	-	50.00	-	-	40.00	60.00	-	50.00	-	-	-	-	-	-	-	-

♂: Male, ♀: Female

Table 2: Correlation Analysis between BMI of Non-Vegetarian and Vegetarian with Non-Dietary Parameters

Non-Dietary Parameters	Pearson's Correlation (r)		Strength of Relationship	
	Non-Vegetarian	Vegetarian	Non-Vegetarian	Vegetarian
Educational background	0.74	0.25*	Strong positive	Low positive
Employment status	0.03	0.22	No linear	Low positive

*Correlation is significant at the 0.05 level

If r=>0.5 to 1.0; strong correlation, r= >0.3 to 0.5; moderate correlation and r= >0.1 to 0.3; low correlation. The negative number indicates same strength with negative correlation and r=0; no correlation.

CONCLUSIONS

Here in this study, dietary habits (non-vegetarian and vegetarian) show considerably influences in the BMI values as compare to non-dietary habits as educational background and employment status. Here in this study, educational background to vegetarian BMI shows noteworthy difference ($p<0.05$) which stated educational background do not contribute for weight management in vegetarians.

ACKNOWLEDGEMENTS

This research project was sponsored by the Research Centre, Tribhuvan University, Kirtipur. I also received continuous, immeasurable support and help from Mr. Sudarshan Basnet; faculty member from School of Medical Sciences, Er. Kshitiz Man Pradhan, Ms. SakuntalaMaharjan. I am grateful to all my participants for providing me their valuables

time to collect data.

REFERENCES

1. Appleby, P. N., Thorogood, M., Mann, J. I., & Key, T. J. (1998). Low body mass index in non-meat eaters: the possible roles of animal fat, dietary fibre and alcohol. *Int J Obes Relat Metab Disord., 22*, 454–460.
2. Açkurt, F., & Wetherilt, H. (1991). Türk okul çagi çocuklarinin büyüme-gelisme durumlarinin Amerikan standartlarina göre degerlendirilmesi. *Beslenme ve Diyet Derg., 20*, 21-34.
3. Akman, M., Demireli, O., & Çivi, O. (1988). Konya' da farkli sosyoekonomik düzeylere sahip iki ilkokuldaki ögrencilerin beslenme durumu ve fiziksel gelismelerinin etkilesimi üzerine bir arastirma. *Beslenme ve Diyet Derg., 17*, 47- 57.
4. Barlow, S., & Committee, E. (2007, 31March–2 April). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. *Pediatrics*, 120.
5. Cole, T., Bellizzi, M., Flegal, K., & Dietz, W. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal*, 320.Daniels, S. (2009). The use of BMI in the clinical setting. *Pediatrics, 124*(suppliment 1), S35-S41.
6. Deurenberg, P., Yap, M., & VanStaveren, W. (1998). Body mass index and percent body fat: a meta analysis among different ethnic group. *International Journal of Obesity, 22*, 1164-1171.
7. Gallagher, D., Visser, M., Sepulveda, D., Pierson, R., Harris, T., & Heymsfield, S. (1996). How useful is body mass index for comparison of body fatness across age, sex, and ethnic groups? *American Journal of Epidemiology, 143*(3), 228-239.
8. Garrow, J., & Webster, J. (1985). Quetelet's index (W/H2) as a measure of fatness. *International Journal of Obesity and Related Metabolic Disorders, 9*, 147-153.
9. Hardly, R., Watsworth, M., & Kuh, D. (2000). The influence of childhood weight and socioeconomic status on change in adult body mass index in a British national birth cohort. *Int. J. Obes. Relat. Metab. Disord., 24*, 725-34.Lesser, G. (2007). Issues in body fat measurement Archives of Internal Medicine. *169*, 636.
10. Lesser, G. (2007). Issues in body fat measurement Archives of Internal Medicine. *169*(6), 636.
11. Lewis, C., McTigue, K., Burke, L., Poirier, P., Eckel, R., & Howard, B. (2009). Mortality, health outcomes, and body mass index in the overweight range: a science advisory from the American Heart Association. Circulation. *119*, 0-0.
12. Lindsay, R., Hanson, R., Roumain, J., Ravussin, E., Knowler, W., & Tataranni, P. (2001). Body mass index as a measure of adiposity in children and adolescents: relationship to adiposity by dual energy x-ray absorptiometry and to cardiovascular risk factors. *Journal of Endocrinology and metabolism, 86*(9), 4061-4067.
13. Key, T., & Davey, G. (1996). Prevalence of obesity is low in people who do not eat meat. *BMJ, 313*, 816–817.
14. Moussa, M. A., Shaltout, A. A., Nkansa-Dwamena, D., Mourad, M. A., Agha, N., & Galal, D. O. (1999). Factors

associated with obesity in Kuwait children. *Eur. J. Epidemiol., 15*, 41-9.

15. National Institute Heart Lung and Blood. (1998). *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report.*
16. Observatory, N. O. (2009). *Body mass index as a measure of obesity.*
17. Power, C., & Parsons, T. (2000). Nutritional and other influences in childhood as predictors of adult obesity. *Proc. Nutr. Soc., 59*, 267-72.
18. Prentice, A., & Jebb, S. (2001). Beyond body mass index. *Obesity Reviews, 2*, 141-147.
19. Romero-Corral, A., Somers, V., Sierra-Johnson, J., Thomas, R., Collazo-Clavell, M., & Korinek, J. (2008). Accuracy of body mass index in diagnosing obesity in the adult general population. *International Journal of Obesity, 32*, 959-966.
20. Serdula, M. K., Collins, M. E., Williamson, D. F., Anda, R. F., Pamuk, E. R., & Byers, T. E. (1993). Weight control practices of U.S. adolescents and adults. *Ann Int Med., 119*, 667–71.
21. Spencer, E. A., Appleby, P. N., Davey, G. K., & Key, T. J. (2003). Diet and body mass index in 38 000 EPIC-Oxford meateaters, fish-eaters, vegetarians and vegans. *International Journal of Obesity, 27*, 728–734.
22. Wang, J., Thornton, J. C., & Russell, M. (1994). Asians have lower body mass index (BMI) but higher percent body fat than do Caucasians: comparisons of anthropometric measurements. *Am J Clin Nutr, 60*, 23–8.