ASSOCIATION OF LOW PHYSICAL ACTIVITY WITH HIGH BODY MASS INDEX IN BOTH GENDERS

Rizwan Abid[1]✉

[1]✉ Associate Professor, Cardiology Department, AJK Medical College, Muzaffarabad, Azad Jammu & Kashmir.

Formerly working at: Cardiology Department, Divisional Headquarters / Teaching Hospital, Mirpur, Kashmir Institute of Cardiology, Mohi-ud-Din Islamic Medical College, Mirpur Azad Jammu & Kashmir.

E-mail: abid58@hotmail.com

Date Submitted: July 06, 2013
Date Revised: August 18, 2014
Date Accepted: August 19, 2014

ABSTRACT

OBJECTIVE: To compare the association of low physical activity with high body mass index (BMI) in both genders, at divisional headquarter Hospital Mirpur.

METHODOLOGY: This prospective open label study was conducted from 01-01-202 to 31-12-2012 on 179 consecutive patients at cardiology OPD DHQ Teaching Hospital, Mohiuddin Islamic College, Azad Kashmir. Data regarding age, sex, BMI, physical activity, diabetes, hypertension, smoking and hypercholesterolemia were collected and analysis by SPSS 16.0.

RESULTS: Mean age was 56.17±13.591 years. Out of 179 individuals, 53(29.6%) were over-weight (males=24/66; 36.4% and females 29/113; 25.7%), while 49(27.4%) were obese (male=16/66; 24.2% and females=33/113; 29.2%). Overall, sedentary life style was prevalent and 105 (58.7%) subjects were having no or low physical activity in routine daily life. Medium physical activity was observed in 34.8% of male and 39.8% of female subjects (p>0.05). Mean BMI was 26.86±5.46 (26.94±5.843 in males & 26.82±5.250 in females; p>0.05). Mean BMI was 28.40±5.684, 27.10+4.791 and 26.17±4.697 in subjects with no physical activity, low physical activity and medium physical activity respectively (p<0.001). Lack of physical activity was significantly associated with high BMI. Pearson correlation was –0.275 for BMI and physical activity (p<0.01). Out of 105 subjects having no or low physical activity, 66 (62.9%) were having above normal BMI.

CONCLUSION: Low physical activity can lead to obesity in both genders and there is no difference in terms of genders. Physical activity should be encouraged in both genders to avoid obesity related complications. BMI should be measured routinely particularly in sedentary and physically inactive individuals.

KEY WORDS: BMI, Body Mass Index, Physical Activity.

THIS ARTICLE MAY BE CITED AS: Abid R. Association of low physical activity with high body mass index in both genders. Khyber Med Univ J 2014; 6(3): 121-127.

INTRODUCTION

Obesity is a global problem and its prevalence has almost doubled since 1980.[1] However, different regions of the world are showing variation in the prevalence rates of obesity. Obesity is more prevalent in the Pacific Islands, Europe and North America; variable prevalence in Africa and Middle East, and least prevalent in Asia.[2]

World Health Organization (WHO) has developed "WHO Global InfoBase" for collecting data on chronic diseases and their risk factors for all WHO member states. One of its indicators is "Body Mass Index (BMI).[3] In 2008, over 1.4 billion adults were overweight and more than 200 million men and about 300 million women were obese.[1] According to WHO estimates, obesity is present in 1.9% of Indian population, more prevalent among females (2.4%) than males (1.3%).[4] In Pakistan, one in four individuals is either overweight or obese.[5]

Overweight and obesity are defined by using various anthropometric measurements like body mass index (BMI), waist circumference and waist-to-hip ratio.[6] WHO used BMI to classify overweight (BMI $\geq$ 25) and obesity (BMI $\geq$30) in adults.[1] The experts proposed a lower cutoff values of BMI for the definitions of overweight (23.0–24.9kg/m2) and obesity (>25.0 kg/m2) in Asian population,[7,8] However, WHO expert consultation concluded that although selective high risk Asians are at increased risk of developing type 2 diabetes and cardiovascular diseases at BMI lower than WHO cut off value, however, the existing data is not suggestive of any cut-off point of BMI for overweight or obesity in Asian population. Hence, WHO expert consultation recommended retaining the existing BMI cut off values for obesity and overweight classification.[9]

Raised BMI is an important risk factor for major cardiovascular diseases (heart disease and stroke) and diabetes.[10-12] BMI is a simple, inexpensive, and noninvasive tool that serves as surrogate measure of body fat as it measures excess weight rather than excess fat. Various factors like age, sex, ethnicity, and muscle mass can alter the relationship between BMI and

body fat. [13] Studies have shown an association of low physical activity and body mass index.[14-16] Low physical activity has been shown to increase atherosclerotic coronary heart disease and has been recognized as emerging risk factors, This has been shown that physical activity reduces genetic predisposition to the obesity and also shown to reduce the mortality. Local data from Pakistani studies is also suggestive of high prevalence of obesity and BMI with sedentary lifestyle.[17-20]. However, data on physical activity and BMI is lacking in Azad Kashmir. We conducted this study to compare the association of low physical activity with high body mass index (BMI) in both genders, at divisional headquarter Hospital Mirpur.

METHODOLOGY

This was an open label, non-randomized prospective study of one-year duration from 1st Jan to 31 Dec 2012 conducted at cardiology department outdoor at DHQ teaching hospital Mirpur involving 180 consecutive patients using special BMI calculator Gadget 2007 model.

Inclusion criteria included both genders, patients who gave consent & above 20yrs of age.

Exclusion criteria included:

- Patients with psychiatric disturbances and not able to give consent,
- Patients receiving steroids therapy, oral contraceptive pill
- Pregnancy

Subjects were classified according to WHO international classification[1], as underweight (BMI< 18.5), normal (BMI 18.5 to 24.9), overweight (BMI 25.0 to 29.9) and obese (BMI 30.0 and above).

Azad Kashmir G-power was used for sample size estimation and independent sample t test was used to compare body mass index between two groups; one group of males and another group of females. Data were collected on a predesigned proforma and analyzed by using SPSS version 16. Mean and standard deviation were calculated for quantitative variables and frequencies were estimated for qualitative variables. P-value was considered significant at <0.05.

Confounding factors like age, social economic status, ethnic background and smoking were controlled using logistic regression method. Confounding factors were controlled by including low socio economic groups, non smokers, only patients of Kashmiri origin were considered, who traditionally take less dairy products and less fatty food.

RESULTS

Out of 179 subjects, there were 66 males and 113 females, ranging in age from 20 to 84 years with a mean age of 53.13±11.975 years. Mean age was 56.17±13.591 years and 51.35±10.587 years in male and female subjects respectively.

Majority of subjects (n=68/179; 38.0%) were having normal BMI, while majority (36.4%) of males were overweight and majority (39.8%) of females were having normal BMI. Overall 27.4% of subjects were obese; 24.2% of males and 29.2% of females were also obese (Table 1).

Overall sedentary life style was prevalent and 105/179 (58.7%) subjects were having no or low physical activity in routine daily life. Medium physical activity was observed in 34.8% of male and

TABLE 1: BODY MASS INDEX (BMI) IN MALE AND FEMALE SUBJECTS

BODY MASS INDEX (BMI)		Gender		Total	P value (Fisher's Exact Test)
		Male	Female		
BMI Below Normal	Count	**1**	**6**	**7**	>0.05
	% within Gender	1.5%	5.3%	3.9%	
Normal	Count	**23**	**45**	**68**	
	% within Gender	34.8%	39.8%	38.0%	
Over Weight	Count	**24**	**29**	**53**	
	% within Gender	36.4%	25.7%	29.6%	
Obese	Count	**16**	**33**	**49**	
	% within Gender	24.2%	29.2%	27.4%	
Machine Error	Count	**2**	**0**	**2**	
	% within Gender	3.0%	0.0%	1.1%	
Total	Count	**66**	**113**	**179**	
	% within Gender	100.0%	100.0%	100.0%	

TABLE II: PHYSICAL ACTIVITY IN MALE AND FEMALE SUBJECTS

Activity		Gender		Total	P value (Fisher's Exact Test)
		Male	Female		
No Physical Activity	Count	19	32	51	>0.05
	% within Gender	28.8%	28.3%	28.5%	
Low Physical Activity	Count	21	33	54	
	% within Gender	31.8%	29.2%	30.2%	
Medium Physical Activity	Count	23	45	68	
	% within Gender	34.8%	39.8%	38.0%	
High Physical Activity	Count	2	3	5	
	% within Gender	3.0%	2.7%	2.8%	
Very High Physical Activity	Count	1	0	1	
	% within Gender	1.5%	0.0%	0.6%	
Total	Count	66	113	179	
	% within Gender	100.0%	100.0%	100.0%	

TABLE III: CROSS TABULATION OF BODY MASS INDEX (BMI) WITH PHYSICAL ACTIVITY

Physical Activity		BODY MASS INDEX					Total	P value (Fisher's Exact Test)
		BMI Below Normal	Normal	Over Weight	Obese	Machine Error		
No Physical Activity	Count	1	18	11	21	0	51	<0.001
	% within BMI	14.3%	26.5%	20.8%	42.9%	0.0%	28.5%	
Low Physical Activity	Count	2	17	24	10	1	54	
	% within BMI	28.6%	25.0%	45.3%	20.4%	50.0%	30.2%	
Medium Physical Activity	Count	1	32	17	18	0	68	
	% within BMI	14.3%	47.1%	32.1%	36.7%	0.0%	38.0%	
High Physical Activity	Count	3	1	1	0	0	5	
	% within BMI	42.9%	1.5%	1.9%	0.0%	0.0%	2.8%	
Very High Physical Activity	Count	0	0	0	0	1	1	
	% within BMI	0.0%	0.0%	0.0%	0.0%	50.0%	0.6%	
Total	Count	7	68	53	49	2	179	
	% within BMI	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

TABLE IV: CORRELATION OF BODY MASS INDEX WITH PHYSICAL ACTIVITY

Correlation of BMI & Physical activity		BMI	Activity
BMI	Pearson Correlation	1	-.275**
	Sig. (2-tailed)		.000
	N	179	179
Physical Activity	Pearson Correlation	-.275**	1
	Sig. (2-tailed)	.000	
	N	179	179

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE V: CROSS TABULATION OF DIABETES MELLITUS, HYPERTENSION, SMOKING AND HYPER-CHOLESTEROLEMIA WITH BODY MASS INDEX

		BODY MASS INDEX					Total
		BMI Below Normal (n=7)	Normal (n=68)	Over Weight (n=53)	Obese (n=49)	Machine Error (n=2)	(n=179)
Diabetes mellitus	Yes	**6**	**58**	**45**	**33**	**1**	**143**
		85.7%	85.3%	84.9%	67.3%	50.0%	79.9%
	No	**1**	**10**	**8**	**16**	**1**	**36**
		14.3%	14.7%	15.1%	32.7%	50.0%	20.1%
Hypertension	Yes	**4**	**48**	**37**	**30**	**1**	**120**
		57.1%	70.6%	69.8%	61.2%	50.0%	67.0%
	No	**3**	**20**	**16**	**19**	**1**	**59**
		42.9%	29.4%	30.2%	38.8%	50.0%	33.0%
Smoking	Yes	2	1	3	1	0	7
		28.6%	1.5%	5.7%	2.0%	0.0%	3.9%
	No	5	67	50	48	2	172
		71.4%	98.5%	94.3%	98.0%	100.0%	96.1%
Hyper- cholesterolemia	Yes	3	14	17	18	1	53
		42.9%	20.6%	32.1%	36.7%	50.0%	29.6%
	No	4	54	36	31	1	126
		57.1%	79.4%	67.9%	63.3%	50.0%	70.4%

39.8% of female subjects. Only, 3.4% had high or very high physical activity (Table II).

Overall, mean BMI was 26.86±5.46. In male subjects, mean BMI was 26.94±5.843 while in females the mean BMI was 26.82±5.250. Lack of physical activity was significantly associated with high BMI. Out of 105 subjects having no or low physical activity, 66 (62.9%) were having above normal BMI (Table III). Mean BMI was 28.40±5.684, 27.10+4.791 and 26.17±4.697 in subjects with no physical activity, low physical activity and medium physical activity respectively.

Increased physical activity has a significant strong negative association with BMI (Table IV) and it is evident from scatter plot that with decline in the physical activity, BMI increases (figure 1).

Diabetes mellitus (n=143; 79.9%), hypertension (n=120; 67%), smoking (n=7; 3.9%) and hyper- cholesterolemia (n=53; 29.6%) were observed in these subjects. In obese patients, diabetes was present in 67.3% cases, Hypertension in 61.2% cases, hyper-cholesterolemia in 36.7% cases and smoking in only 2% cases (Table V).

DISCUSSION

Our study clearly showed that low level of physical activity is significantly associated with high body mass index which have cardiovascular mortality and morbidity implications. Low physical activity should be discouraged from childhood as metabolic syndrome is being increasingly recognized at pediatric age,[21,22] both parents and teachers and more community role will be required in this regards. Low physical activity is increasingly being seen, as emerging risk factor for development of atherosclerotic coronary artery disease. High mortality has been reported with both overweight and obese patients.[23] Our study is first in the region of Azad Jammu and Kashmir suggesting the magnitude of the problem. A very large frequency of diabetes and Hypertension was another important observation in our study.

According to American Heart Association Guidelines Body mass index is useful parameter to assess obesity with different techniques having Both advantages and disadvantages.[24] Physical activity in our study was classified Into sedentary, light, moderate, vigorous and high. In our study, lack of physical activity was significantly associated with high BMI. This finding is favoring other international studies that physical inactivity is associated with obesity and raised

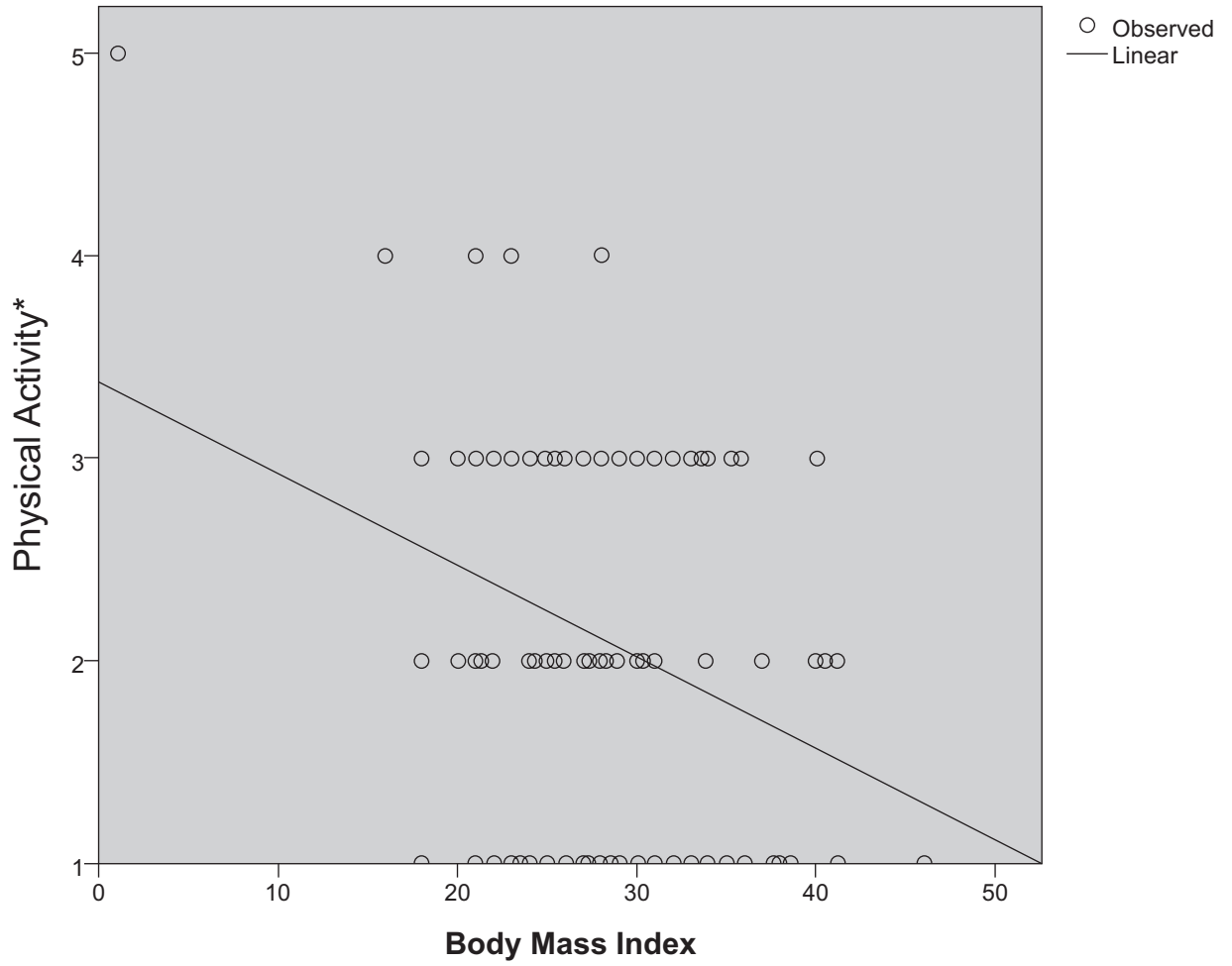

Figure 1: Scatter plot of Association of Physical activity with Body mass Index

*1= No Physical Activity, 2= Low Physical Activity, 3= Medium Physical Activity, 4= High Physical Activity, 5= Very High Physical Activity

BMI.[25-30] Other studies from Pakistan also showed a higher prevalence of physical inactivity in obese individuals.[31,32]

In our study, males (36.4%) were more over weight as compared to females (25.7%). However, more females were (29.2%) were obese as compared to males (24.2%). However, this difference was not significant. Studies have shown that obesity is relatively more common in females, with race and income as stronger risk factors for obesity in females.[33] However, the associations of obesity with gender, age, ethnicity, and socioeconomic status are very complex and cannot be oversimplified.[34] Our study showed that low physical activity can lead to obesity in both genders and there is no difference in terms of genders.

Fighting obesity and metabolic syndrome, needs to target it from childhood and adolescent levels and measure BMI even at school age to identify the persons and to make an effective strategy. One such strategy was set by New York State department of health for prevention of overweight and obesity. The goals were set to increase the awareness of overweight and obesity as a major public health threat and increase early recognition of overweight and/or excessive weight gain. Apart from need to improve the management obesity and related diseases, it was emphasized to improve the eating habits and increase the lifelong physical activity. An important goal was set to decrease the exposure to television and other recreational screen time.[35]

Obesity is a major cause on non-communicable diseases and is very common in Pakistan. Unhealthy foods are one of the causes of increased obesity in our country as Pakistani foods are "energy dense". The lack of physical activity and changing life styles are main contributing factors towards rapidly growing prevalence rates of obesity in Pakistan.[32] WHO has developed a global strategy to promote and protect health by suggesting sustainable actions at individual, community, national and global levels to

reduce disease and death rates related to unhealthy diet and physical inactivity.[36] Unfortunately, Pakistan is lacking a national strategy to wrestle the obesity and we need to develop a national policy to promote physical activity in Pakistan.

Study limitations

We could not measure physical activity level using specially designed gauge accelerometer Due to non availability of this gadget. Cost of gadget is very high and is available only in big cities.

CONCLUSION

Low physical activity can lead to obesity in both genders and there is no difference in terms of genders. Physical activity should be encouraged in both genders to avoid obesity related complications. BMI should be measured routinely particularly in sedentary and physically inactive individuals to recognize obesity and metabolic syndrome early and take preventive measures and prompt intervention in both genders.

ACKNOWLEDGEMENTS

We are especially grateful to Mr. Farman Ali and Mr. Muhammad Atif Shahzad for their valuable Contribution in preparing this article and Mr. Antonio from Canada who guided us in statistical part of presentation

REFERENCES

1. World Health Organization. Obesity and overweight. Fact sheet No 311. Updated August 2014, [Cited on August 18, 2014]. Available from URL: http://www.who.int/mediacentre/factsheets/fs311/en/
2. Prentice AM. The emerging epidemic of obesity in developing countries. Int J Epidemiol. 2006 Feb; 35(1):93-9.
3. World Health Organization. WHO Global InfoBase. , [Cited on June 15, 2014]. Available from URL: https://apps.who.int/infobase/
4. World Health Organization - Noncommunicable Diseases (NCD) Country Profiles, 2014. India. http://www.who.int/entity/nmh/countries/ind_en.pdf?ua=1
5. Jafar TH, Chaturvedi N, Pappas G. Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian population. Canadian Med Assoc J 2006; 175: 1071–7.
6. Sherin A. Obesity: How to prevent Pakistani people from getting heavier? Khyber Med Univ J 2013; 5(2):59-60.
7. World Health Organization, Western Pacific Region. The International Association for the Study of Obesity and the International Obesity Task Force. The Asia–Pacific perspective: redefining obesity and its treatment. Sydney, Australia: Health Communications Australia Pty Limited; 2000. [Cited on July 08, 2013]. Available from URL: www.diabetes.com.au/pdf/obesity_report.pdf
8. Choo V. WHO reassesses appropriate body- mass index for Asian populations. Lancet 2002; 360: 235.
9. WHO expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004; 363: 157–63
10. Fogelholm M. Physical activity, fitness and fatness: relations to mortality, morbidity and disease risk factors. A systematic review. Obesity reviews. 2010;11(3):202-21.
11. Kenchaiah S, Sesso HD, Gaziano JM. Body mass index and vigorous physical activity and the risk of heart failure among men. Circulation. 2009;119(1):44-52.
12. Coutinho T1, Goel K, Corrêa de Sá D, Carter RE, Hodge DO, Kragelund C, et al. Combining Body Mass Index With Measures of Central Obesity in the Assessment of Mortality in Subjects With Coronary Disease Role of "Normal Weight Central Obesity". J Am Coll Cardiol. 2013;61(5):553-60.
13. Centre for Disease Control (CDC) and Prevention. Body Mass Index: Considerations for Practitioners. [Cited on June 15, 2014]. Available from URL: http://www.cdc.gov/obesity/downloads/bmiforpactitioners.pdf
14. Stefanov T, Temelkova-Kurktschiev T, Koehler C, Henkel E, Schaper F, Hanefeld M. Association of physical activity with insulin resistance, subclinical inflammation, coagulation, and fibrinolytic biomarkers among population at high risk for type 2 diabetes. Folia Medica. 2012;54(2):32–39.
15. Mitchell JA, Pate RR, España-Romero V, O'Neill JR, Dowda M, Nader PR. Moderate to vigorous physical activity is associated with decreases in body mass index from ages 9 to 15 years. Obesity 2012;(21)3: E280-286.
16. Hamer, M, Brunner EJ, Bell1J, Batty GD, Shipley M, Akbaraly T. Physical activity patterns over 10 years in relation to body mass index and waist circumference: The Whitehall II cohort study. Obesity 2013;(21)12:E755-61.
17. Mushtaq MU, Gull S, Mushtaq K, Shahid U, Shad MA, Akram J. Dietary behaviors, physical activity and sedentary lifestyle associated with overweight and obesity, and their socio-demographic correlates, among Pakistani primary school children. Int J Behav Nutr Phys Act 2011, 8:130.
18. Nair M, Prabhakaran D. Why Do South Asians Have High Risk for CAD. Global Heart 2012;(7)4:307-14.
19. Rehman R1, ullah Shaikh S, Syed S, Shakeel N. Relationship Of Life Style Choices On Body Fat Mass In Young Adults. J Ayub Med Coll Abbottabad J Ayub Med Coll Abbottabad. 2010;22(4):146-9.
20. Qureshi SA, Rehman MMU, Azmi MB, Hasnat S. Most Prevalent Diseases with Relation of Body Mass Index and Waist Circumference in Karachi, Pakistan. J Dow Univ Health Sci Karachi 2011;5 (3): 85-91.
21. Ahmad M, Hassan S, Hafeez F, Jajja A. Prevalence of various components of metabolic syndrome in our younger population. Pak J Physiol 2011;7(2):46-9.
22. Messiah SE, Arheart K, Luke B, Lipshultz SE, Miller TL. Relationship between body mass index and metabolic syndrome risk factors among US 8 to 14 year olds, 1999–2002. J Pediatr 2008;153(2):215–21.
23. Flegal KM1, Kit BK, Orpana H, Graubard BI. Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. J Am Med Assoc 2013;309(1):71-82.
24. Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie, AG, Donato KA, et al. 2013 AHA/ACC/TOS Guideline for the management of overweight and obesity in adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. Circulation. 2014;129:S102-S138.
25. Guo SS, Zeller C, Chumlea WC, Siervogel RM. Aging, body composition, and lifestyle: the Fels Longitudinal Study. Am J Clin Nutr 1999; 70: 405-411.
26. Schmitz KH, Jacobs DR, Leon AS, Schreiner PJ, Sternfeld B. Physical activity and body weight: associations over ten years in the CARDIA study. Int J Obes 2000; 24: 1475-1487. CrossRef | PubMed

27. Lahti-Koski M, Pietinen P, Heliovaara M, Vartianinen E. Associations of body mass index and obesity with physical activity, food choices, alcohol intake, and smoking in the 1982-1997 FINRISK Studies. Am J Clin Nutr 2002; 75: 809-17.

28. Koh-Banerjee P, Chu NF, Spiegelman D, Rosner B, Colditz G, Willett W, et al. Prospective study of the association of changes in dietary intake, physical activity, alcohol consumption, and smoking with 9-y gain in waist circumference among 16587 US men. Am J Clin Nutr 2003; 78: 719-27.

29. Sulemana H1, Smolensky MH, Lai D. Relationship between physical activity and body mass index in adolescents. Med Sci Sports Exerc. 2006;38(6):1182-6.

30. Ward DS1, Dowda M, Trost SG, Felton GM, Dishman RK, Pate RR. Physical activity correlates in adolescent girls who differ by weight status. Obesity (Silver Spring) 2006;14(1):97-105.

31. Khuwaja AK, Kadir MM. Gender differences and clustering pattern of behavioral risk factors for chronic non-communicable diseases: community-based study from a developing country. Chronic Illn 2010;6:163–70.

32. Samir N, Sadia Mahmud S, Khuwaja AK. Prevalence of physical inactivity and barriers to physical activity among obese attendants at a community health-care center in Karachi, Pakistan. BMC Res Notes. 2011; 4: 174.

33. Borders TF, Rohrer JE, Cardarelli KM. Gender-Specific Disparities in Obesity. J Community Health. 2006;31(1):57-68.

34. Wang Y1, Beydoun MA. The obesity epidemic in the United States--gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. Epidemiol Rev 2007;29:6-28.

35. New York State Department of Health. New York state Overweight and Obesity Prevention. http://www.aging.ny.gov/news/2013/Strategic_plan%20NYS-DOH%20Obesity%202005.pdf

36. World Health Organization. Global strategy on diet, physical activity and health. World Health Organization May 2004. [Cited on June 23, 2014]. Available from URL: http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf?ua=1

AUTHOR'S CONTRIBUTION

The sole author **(RA)** has made substantial contributions to the manuscript in conception and design, acquisition of data, drafting the manuscript and final approval of the version to be published. Author agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE

NIL

KMUJ web address: www.kmuj.kmu.edu.pk

Email address: kmuj@kmu.edu.pk