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

Rizwan Abid

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 01-01-2012 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 overweight (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.

INTRODUCTION

Obesity is a global problem and its prevalence has almost doubled since 1980. 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.

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).” In 2008, over 1.4 billion adults were overweight and more than 200 million men and about 300 million women were obese. According to WHO estimates, obesity is present in 1.9% of Indian population, more prevalent among females (2.4%) than males (1.3%).

In Pakistan, one in four individuals is either overweight or obese. Overweight and obesity are defined by using various anthropometric measurements like body mass index (BMI), waist circumference and waist-to-hip ratio. WHO used BMI to classify overweight (BMI ≥ 25) and obesity (BMI ≥30) in adults. 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. 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.

Raised BMI is an important risk factor for major cardiovascular diseases (heart disease and stroke) and diabetes. 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...
Studies have shown an association of low physical activity and body mass index. 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. 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, 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 pre-designed 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>
<thead>
<tr>
<th>BODY MASS INDEX (BMI)</th>
<th>Gender</th>
<th>Total</th>
<th>P value (Fisher’s Exact Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Below Normal</td>
<td>Count</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>% within Gender</td>
<td>1.5%</td>
<td>5.3%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Normal</td>
<td>Count</td>
<td>23</td>
<td>45</td>
</tr>
<tr>
<td>% within Gender</td>
<td>34.8%</td>
<td>39.8%</td>
<td>38.0%</td>
</tr>
<tr>
<td>Over Weight</td>
<td>Count</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>% within Gender</td>
<td>36.4%</td>
<td>25.7%</td>
<td>29.6%</td>
</tr>
<tr>
<td>Obese</td>
<td>Count</td>
<td>16</td>
<td>33</td>
</tr>
<tr>
<td>% within Gender</td>
<td>24.2%</td>
<td>29.2%</td>
<td>27.4%</td>
</tr>
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<td>Machine Error</td>
<td>Count</td>
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<td>0</td>
</tr>
<tr>
<td>% within Gender</td>
<td>3.0%</td>
<td>0.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
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<td>113</td>
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<tr>
<td>% within Gender</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
### TABLE I: PHYSICAL ACTIVITY IN MALE AND FEMALE SUBJECTS

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

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

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>BMI Below Normal</th>
<th>Normal</th>
<th>Over Weight</th>
<th>Obese</th>
<th>Machine Error</th>
<th>Total</th>
<th>P value (Fisher’s Exact Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Physical Activity</td>
<td>1</td>
<td>18</td>
<td>11</td>
<td>21</td>
<td>0</td>
<td>51</td>
<td>28.5%</td>
</tr>
<tr>
<td>% within BMI</td>
<td>14.3%</td>
<td>26.5%</td>
<td>20.8%</td>
<td>42.9%</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Physical Activity</td>
<td>2</td>
<td>17</td>
<td>24</td>
<td>10</td>
<td>1</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>% within BMI</td>
<td>28.6%</td>
<td>25.0%</td>
<td>45.3%</td>
<td>20.4%</td>
<td>50.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Physical Activity</td>
<td>1</td>
<td>32</td>
<td>17</td>
<td>18</td>
<td>0</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>% within BMI</td>
<td>14.3%</td>
<td>47.1%</td>
<td>32.1%</td>
<td>36.7%</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Physical Activity</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>% within BMI</td>
<td>42.9%</td>
<td>1.5%</td>
<td>1.9%</td>
<td>0.0%</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very High Physical Activity</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>% within BMI</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>50.0%</td>
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<tr>
<td>Total</td>
<td>7</td>
<td>68</td>
<td>53</td>
<td>49</td>
<td>2</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>% within BMI</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE IV: CORRELATION OF BODY MASS INDEX WITH PHYSICAL ACTIVITY

<table>
<thead>
<tr>
<th>Correlation of BMI &amp; Physical activity</th>
<th>BMI</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td></td>
<td>-.275**</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>179</td>
<td>179</td>
</tr>
</tbody>
</table>

| Physical Activity                    |     | 1        |
| Pearson Correlation                  |     | -.275**  |
| Sig. (2-tailed)                      |     | .000     |
| N                                     | 179 | 179      |

**Correlation is significant at the 0.01 level (2-tailed).
AssociA tion of Low PhysicAL Activity with high Body MAss index in Both genders

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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

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

<table>
<thead>
<tr>
<th></th>
<th>BMI Below Normal (n=7)</th>
<th>Normal (n=68)</th>
<th>Over Weight (n=53)</th>
<th>Obese (n=49)</th>
<th>Machine Error (n=2)</th>
<th>Total (n=179)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes mellitus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
<td>58</td>
<td>45</td>
<td>33</td>
<td>1</td>
<td>143</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>10</td>
<td>8</td>
<td>16</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
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<td>48</td>
<td>37</td>
<td>30</td>
<td>1</td>
<td>120</td>
</tr>
<tr>
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<td>3</td>
<td>20</td>
<td>16</td>
<td>19</td>
<td>1</td>
<td>59</td>
</tr>
<tr>
<td>Smoking</td>
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</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>67</td>
<td>50</td>
<td>48</td>
<td>2</td>
<td>172</td>
</tr>
<tr>
<td>Hyper-cholesterolemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>14</td>
<td>17</td>
<td>18</td>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>54</td>
<td>36</td>
<td>31</td>
<td>1</td>
<td>126</td>
</tr>
</tbody>
</table>
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. 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**

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**REFERENCES**


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CONFLICT OF INTEREST

Authors declare no conflict of interest

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