CORRELATION OF 6-MINUTE WALK TEST AND BODY MASS INDEX IN PRIMARY SCHOOL CHILDREN

Parthkumar Devmurari¹, Jinal Shah², Kalpesh Satani³, Lata Parmar⁴

¹Assistant Professor, College of Physiotherapy, Sumandeep Vidyapeeth an institution Deemed to be University, At & Po: Piparia, Waghodia Road, Ta: Waghodia, Dist. Vadodara, Gujarat, India PIN Code-391760

²PG student, College of Physiotherapy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Waghodiya Road, Vadodara, Gujarat, India Pin-391760.

³Associate Professor, College of Physiotherapy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Waghodiya Road, Vadodara, Gujarat, India Pin-391760

⁴Professor and Principal, College of Physiotherapy, Sumandeep Vidyapeeth an institution Deemed to be University, At & Po: Piparia, Waghodia Road, Ta: Waghodia, Dist. Vadodara, Gujarat, India PIN Code-391760

ABSTRACT

Background: Decrease in physical activity and a sedentary lifestyle are regarded as the most important factors contributing to the development of childhood obesity. Children who are overweight may have impaired cardiopulmonary status that can limit functional capacity and their ability to participate in exercise. Activity level in school going children can be assessed and assisted by 6 Minute Walk distance Test (6MWDT/6MWT) and Body Mass Index (BMI).

Purpose: To determine the relation between 6MWT and Body Mass Index.

Methods: 140 students were selected with simple random sampling from 3 different school of Baroda in this cross-sectional study. Height and weight were measured as a baseline criterion. The 6 MWT is performed according to ATS guidelines 6MWD, Heart rate (HR), blood pressure (BP), oxygen saturation (SaO2) and Borg scale (RPE) was measured before and after the test. Normality tests with kolmogorov Smirnov test. Pearson correlation and T-test were done.

Results: Mean BMI was 1605283 and 15.43 + 2.61 for girls and boys respectively. Mean walking distance in 6 minutes was 492.84 + 70.40 and 461.52 + 69.68 for boys and girls respectively. The correlation between BMI and 6MWD was not significant (p 0.717). The comparison between age and BMI was significant (p=0.04). The comparison between 6MWD with age and gender was significant (P=0.040 and p=0.011 respectively).

Conclusion: In the studied population most of the children were falling within the normal range of Body Mass Index for their age and the study does not showing significant correlation between 6 MWD and Body Mass Index. The Present study is also giving reference value of distance covered for this age group.

Keywords: 6 MWT, Body Mass Index, Children

I. INTRODUCTION

Obesity in children developing health concerns which puts financial burden to the individual and health care system also. Significances may be avoidable by early identification and treatment. 1 The prevalence of child obesity is increasing rapidly globally. 2 The prevalence of obesity has increasing in both children and adult. The medical illness associated with obesity usually occur in adulthood, but adult rarely achieve sustained weight loss. 3 In unites state survey was done and healthy people 2010 identified overweight and obesity as 1 of the 10 leading health indicators. 4
Obesity has important consequences on our nation’s health and economy as it is linked to a number of chronic diseases, including coronary heart disease, stroke, diabetes, and some cancers. It is also associated with several other chronic diseases including hyperlipidemia, hyperinsulinemia, hyper tension, and early atherosclerosis. As stated by evidence, perilous effects on health can be check along with reduced visceral fat mass, commonly known as abdominal obesity and found association with regular physical. Therefore, to make aware about health risk related education program. Anthropometric measurements and physical performance are reliable indicators for evaluating the effectiveness of such program on motor abilities and physical performance.

Lack or minimal activity and eating habits are looked upon as the most important factor that leads to development of obesity in children. A combination of social and environmental changes were the past few years, world has seen changes in eating having increased intake of high caloric food leads to increase in fat content in body and resulted in decrease in physical activity in children. Increase in weight leads to impairment in cardiopulmonary system that can limit working functional capacity and which in turn reduces their ability to participate in sports or exercise. It is proven that increase in weight leads to decreased functional capacity. Further, several studies found direct association between obesity in children and incidence of cardiovascular disease (CVD) in their early years. Thus, it is essential to study its response to various physical activities from childhood to ageing.

The demand for clinical assessment tools to evaluate exercise capacity in children who are OW is increasing. The response to exercise is significant clinical evaluation device because it affords a composite evaluation of the respiratory, cardiac, and metabolic systems. Most daily activities are performed at submaximal levels of exertion and therefore, it has been proposed that submaximal functional tests are a better reflection of physical capability. 6MWT has been extensively searched and studied and established test to assess functional capacity.

Aerobic fitness researcher, Kenneth H Cooper, since 1960 had made walking tests such as 12- min walk test known as abdominal obesity and found association with regular physical. Therefore, to make aware about health risk related education program. Anthropometric measurements and physical performance are reliable indicators for evaluating the effectiveness of such program on motor abilities and physical performance.

Exercise testing has been previously conducted in the physical education classes as a means of determining physical fitness. However, this test has focused on skill related activity rather than health related fitness. For the functional capacity assessment tool 6MWT found use full during rehabilitation program for cardiac and respiratory conditions in adults. The 6MWT is the distance a person can walk at a constant uninterrupted, unhurried pace in six minutes. The 6MWT may be a useful assessment tool as it is an activity of daily living and may found convenient as it is of easy applicability for children.

The 6MWT to evaluate daily life activities and efforts to perform it, submaximal exercise tests are performed and been used evidently since many years as it also directly correlating or representing general-exercise/aerobic/functional capacity of an individual. The 6MWT has been broadly used in clinical settings. The test is evolved/modified from previous exercise tests in such a way that it can also be used for clinical population and evaluate at submaximal level. The test can be performed with multiple speeds as it is to be performed at normal speed so that as a result of which it also is well correlated with physiological changes during exercise/physical activities which are limited.

When compare to other exercise tests, 6MWT is well tolerable by individual, similar to Activities of daily living (ADLs), easy to perform and safe. Therefore, 6MWT is most commonly used test. As cardiovascular system takes less load due to test, it makes up the submaximal level of individual’s capacity. As the 6 MWT carries wide applicability, similar to other test, it can be performed in closed corridor and at quiet place as well and also it demands less proficiency skills in the view of technical knowledge and can be performed even with little equipment and economical as well.

6MWT involves all assessment of cardiopulmonary and musculoskeletal systems in addition to the variables like walked distance and time to complete the particular distance. Walked distance can be influenced by corridor
length and also believed to be one of the factors for prognostication of exercise capacity. This test can be performed and utilized for the purpose of modification/change in treatment as per the result gained by test and also it checks indirectly the aerobic capacity during physical activity 17, 18.

Anthropometric screening tool BMI comprised of height and body weight used to assess individual’s body weight relative to their height and is determined by dividing body weight in kg and height per meters square (kg/m²) 13. Weight and height are most common measurement in the clinical setting and health related survey 8. BMI of 25-29 kg/m² are considered overweight. However, more than 30 kg/m² are defined obese in adults. For children the term overweight is considered at percentile rank >85th percentile to 95th percentile. Children with a BMI just above the 85th percentile, who are classified only as overweight, need cardiovascular and, in some cases, diabetes risk screening19.

Among the published studies, the emphasis has been on correlation between childhood and adulthood BMI value. Little is known about the extent to which childhood BMI value are associated with adulthood value that have significant risk for morbidity and mortality8.

Similar to adults, BMI and 6MWT also play role in assessment of child’s physical activity. Present study examined the primary school going children and tried to set the baseline value as a reference in 6MWT. In addition to it, it is crucial to examine the cardio-respiratory fitness in children with obesity and overweight and their performance during the testing. So, the purpose of the study was to determine reference value for primary school going children as according to their age and to correlate distance covered in 6 min with BMI. Also correlated height with distance covered in 6 min as short statured child will have short steps.

II. STUDY DESIGN
A cross-sectional study includes participants of both genders aged 6 to 12 years. Total of 140 Participants were recruited from 2-3 school via convenience sampling from Baroda city. The exclusion criteria were congenital disease/musculoskeletal deformity, any neurological deformity which limits walking any visual/hearing deficit which limits daily activity, any cardia/respiratory congenital defects. Children’s assessment done before test. Total 140 Patients were taken who fulfilled inclusion– exclusion criteria to participate in the study.

Outcome measures:
-Body mass index

BMI is an appropriate measure of fatness. It is an inexpensive and easy way of screening for people in overweight categories that may lead to suture health problems.

-6 Min walk test

As per guidelines, demographic data were collected and included. 6MWT was taken as following method: The test was performed as per American Thoracic Society, in which 30 m corridor with marking at every 3rd meter to collect accurate distance and traffic cones were placed at both end points. Instructions given to subjects that they will have to go as far as possible at their normal speed within 6 minutes of walk test. They can stop/reduce the speed during the test in case of any discomfort. Large meals not recommended prior to test and also vigorous exercise should not be done priorly. As per the guidelines of 6MWT, warm up was not recommended in this test and the subject sat in chair for a while before the test. The procedure of 6 MWT was performed as per the standard guidelines.

III. RESULT:
Table-1 Demographic variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (6-12 years)</td>
<td>8.7 ± 1.79</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.29 ± 0.12</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>27.2 ± 8.30</td>
</tr>
<tr>
<td>BMI</td>
<td>16.05 ± 2.83</td>
</tr>
</tbody>
</table>
Table-2 Comparison Between age and 6 MWD

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>16.05 ± 2.83</td>
<td>-0.031</td>
<td>0.717</td>
</tr>
<tr>
<td>6 MWD</td>
<td>480.76 ± 71.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-3 Comparison between age and 6 MWD

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>8.7 ± 1.79</td>
<td>0.174</td>
<td>0.040</td>
</tr>
<tr>
<td>6 MWD</td>
<td>480.76 ± 71.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table: 4 Comparison between age and BMI

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>8.7± 1.79</td>
<td>0.245</td>
<td>0.004</td>
</tr>
<tr>
<td>BMI</td>
<td>16.05 ± 2.83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-5 t-test

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Mean (SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>86</td>
<td>16.43 (2.90)</td>
<td>0.042</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>15.4394 (2.61)</td>
<td></td>
</tr>
<tr>
<td>6 MWD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>86</td>
<td>492.84 (70.40)</td>
<td>0.011</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>461.52 (69.61)</td>
<td></td>
</tr>
</tbody>
</table>

IV. DISCUSSION:

In this study, total 140 subjects were selected from 3 different schools of Baroda. Among 140 students there were 68 boys and 54 were girls. As the purpose of the study was to correlate BMI with 6MWT, individual height and weight were taken before starting the test.

The 6MWT has proven standardized (valid/reliable) test for assessing cardio-respiratory fitness in elderly and adults. similarly, it has been studied by A.M. Li et al, that the 6MWT in healthy children is reliable.

Understanding and knowing baseline values for the 6MWT for children may provide important information (normative values) on healthy children. It is known that cardio-respiratory fitness accounts and helps in understanding the risks for health and also help better understand the factors responsible for disorders and diseases. In another perspective of health school teacher may gather information about child’s physical fitness and understand who are at risk of developing disease. Since this is a test of cardiovascular fitness, using this test on children in the schools may give the physical education teachers a better idea of which children may be in danger of developing disease in later life. Early intervention at early life may reduce the risk of developing lifestyle disorders and may be helpful to children incorporate healthy lifestyle throughout their lives.

In the present study, the mean height of these children was 1.29 ± 0.12 and the mean weight of these children was 27.2 ± 8.30. According to height and weight, mean BMI of these children were 16.43 = 2.90 in males and 15.43 + 2.61 in females. (Table: 1) The mean distance walked in the 6 minutes was 492.84 + 70.40 in males and 461.52 + 69.68 in the females.

CDC & WHO have approved BMI as a technique to detect body composition and it is one of the easiest methods to determine obesity. For children aging 2-20 years a tool for assessment is helpful i.e. The BMI-for-age, as child’s body composition changes as they grow.

In the present study there is no correlation found between the 6MWD and BMI -0.03 and p = 0.716). James Roush et al, have studied on same and concluded that the relationship between distance walked was r = -0.20 for females and p value is> 0.05 and 0.10 males and no direct relation found among the two paramenters. Neeti Pathare also studies for children who are normal weight and overweight found there is no significant difference in distance covered between normal weight and overweight. On the contrary to these studies Camila Varella...
In the present study, the mean 6 MWD for the children was 480.7 m ± 71.52. Several authors have given reference value for 6MWD in children in different countries.\(^9,14,15,20,21\) This is found to range from 500 to 600 m, and variations found also have correlation with length of the walkway, repeated practice for test procedures and encouragement take a part in such variations in healthy individuals.\(^8\) Factors may also include attitude towards physical activity, and musculoskeletal pain. Another factor that may affect 6MWD can be length of the corridor. Shorter corridor may result in more turns and can reduce distance covered\(^15\). In the present study, according to the ATS Standard length of the corridor, that is 30 m was chosen the value of the distance walked yet was found to be lower than the quoted studies accept study done by Astrid E Lammers et al\(^5\) that is 470 ± 59.

Comparison between gender and 6MWD was found to be significant (p = 0.011). According to Albert M. Li\(^9\) et al, have studied and concluded that 6MWD was more in females than in than females\(^6\).

Few other studies in children did not show an association of gender on 6MWD\(^15,16\). BMI increases significantly with the age\(^14\). In the present study correlation of BMI and age shows significant relationship with r value 0.245 and p value 0.004 also correlation of age and 6MWD shows r = 0.174 and p = 0.040. According to Camila Varella Priesnitz, et al, distance was increased in older children than younger ones. According to Varella Priesnitz, distance was increased in older children than younger ones.\(^15\) in the present study also showed increase distance with age.

While comparison of changes in physiological parameters like oxygen saturation and heart rate in adults and children it was found that oxygen saturation shows no much change during the test. Besides, as demonstrated by Lammers et al., other parameters also gained resting values after the test was concluded.\(^14\)

V. CONCLUSION:

There was no significant correlation between 6MWD and BMI. Stated study is showing significant difference in 6MWD in both genders. It is also found that distance covered is correlated with the age of the subjects

REFERENCES


