

BMI and six minute walk distance of healthy medical and paramedical students of Gauhati Medical College, Assam

¹Dr Padmaja Barua, ²Dr Barnali Kalita, ³Dr Soumitra Nath

*Assistant professor, Department of Physiology,
Gauhati Medical College, Assam*

*Associate professor, Department of Physiology,
Gauhati Medical College, Assam*

*Assistant professor, Department of Physiology,
Gauhati Medical College, Assam*

Corresponding author: Dr Padmaja Barua

Abstract- Body mass index or BMI is one of the commonest anthropometric indices used for measurement of obesity. It is easily measurable parameter based on height and weight of an individual. It estimates body fat and is used to categorize people as being underweight, normal, overweight and obese. Six minute walk distance (6MWD) is a simple objective test to measure functional exercise capacity. This walk test is a sub maximal exercise test that assesses physical fitness and hence quality of life. Increased body weight may affect the six minute walk distance. Limited studies are available on analysis of BMI in young adults and 6MWD estimation in healthy young adults in Assam of India, therefore the present study was conducted on 59 students of Gauhati Medical College of Assam to find out BMI and 6MWD and also to find if there is any association between BMI and 6MWD. In this study it was found that 17% of the cases were underweight, 40.7% normal, 18.6% overweight and 23.7% obese. Mean 6MWD was 551 ± 53 m. No significant correlation was found between BMI and 6MWD in our present study.

Keywords: BMI, 6MWD, overweight, obesity

Introduction- Body mass index (BMI) is a very easily measurable parameter developed by Adolphe Quetlet during the 19th century (1). It can assess the risk of various health problems and can be used as risk indicator for overweight and obesity related problems like hypertension, cardiovascular diseases, osteoarthritis, type 2 diabetes mellitus etc. As starvation is a nutritional problem of many parts of the earth, likewise obesity, the problem of the opposite pole is also a nutritional problem of great concern of present era with the changing life style. Sedentary life style or decreased physical activity is found to be a causal factor for increasing weight. Life style changing plays an immense role in the effective control of obesity. Categorization of population in categories of underweight, normal weight, overweight and obese with the help of BMI calculation helps in screening out of the overweight and obese population in whom strict measures should be undertaken to avoid ensuing health risks.

Six minute walk distance (6MWD) is a sub maximal exercise test that assesses

physical performance particularly functional exercise level for day to day activities (2).
Though 6MWD ha

its main implication in assessing functional exercise capacity in various clinical situations like moderate to severe pulmonary diseases (3) and obesity particularly for assessing effectiveness of bariatric surgery (4) etc yet this test is also used in apparently healthy subjects with various objectives like prediction of maximum oxygen consumption (5) exercise performance of sedentary smokers without airway obstruction (6) etc.

Since BMI estimation is easy and inexpensive and this parameter is considered to be a reasonable estimate of body fat, therefore calculation of BMI is a good guide in preventive field to make people aware of the imminent risk of various obesity associated diseases. Thus this variable can be used at an earlier age to detect overweight which indicates increased risk of developing obesity, like adolescent overweight reflecting increased risk of adult obesity (7). Again, six minute walk distance can be used to assess physical functional capacity and being a sub maximal exercise test indicates performance of day to day activities, therefore six minute walk distance estimation gives additional clue of fitness of people. Therefore, estimation of BMI and 6MWD in a population helps in assessment of body fat and physical fitness and moreover relation between BMI and 6MWD can be also studied. Though numerous studies are there on BMI and many researchers have estimated 6MWD to see the functional status in various pathological conditions, yet limited studies are there in which young adults are taken as study population for categorizing them into different groups on the basis of BMI and also finding quality of life in them by assessing physical functional capacity using 6MWD. Therefore, a cross sectional study has been designed to calculate BMI and estimate 6MWD in healthy medical and paramedical students of Gauhati Medical College and also to find if there is any association between BMI and 6MWD. Objectives derived for the present study were:

- Measurement of height and weight and calculation of BMI
- Estimation of 6MWD

Materials and methods-

For this descriptive study, data was collected from 59 (20 male and 39 female), apparently healthy medical and paramedical students of Gauhati Medical College and Hospital, Assam by simple random sampling method after taking informed consent. As per the inclusion criteria adopted for the study, apparently healthy students without the history of cardio pulmonary illness, any muscular disorder, fibromyalgia, spinal cord injury and spinal muscular atrophy are included. After taking brief history, anthropometric measurements like height and weight are measured with the subjects wearing light clothing and bare footed. BMI is calculated using the formula weight in kg/height in m². Both WHO and Asia pacific reference standards are used for categorizing people using BMI (8) with categorization as <18.5Kg/m² as underweight, 18.5-24.9kg/m² as normal weight, 25-29.9kg/m² as overweight and ≥30 kg/m² as obesity according to WHO standard and <18.5kg/m² as underweight, 18.5-22.9 kg/m² as normal, 23-24.9 kg/m² as overweight and ≥ 25 kg/m² as obesity according to Asia Pacific standard. Pulse and BP are also measured. 6MWT is an easily administrable functional exercise capacity evaluation test. This objective test measures the distance that a person can walk in six minutes period. The test has been performed along a long, flat, straight, enclosed corridor with hard surface with a walking course of 30 m length as per the guidelines laid by American thoracic society standard (2). Subjects are allowed to stop and rest when needed.

For the statistical analysis IBM SPSS statistics 21 for windows software is used. Correlation coefficient (r) has been determined and scatter diagram is plotted to analyse the association between BMI and 6MWD.

Results- A total of 59 students, 20 male and 39 female have participated in the study. The students are in the age group of 18-23. Overall details of the subjects are shown in the table-1 as mean \pm SD.

Table 1: Details of the subjects participated in the study

Mean Age (in year)	20 \pm 1
Mean Weight in (kg)	58 \pm 12
Mean Height (in m)	1.6 \pm 0.08
Mean BMI in (kg/m ²)	22 \pm 4
Mean 6 MWD (in m)	551 \pm 53

Interpretation: In table 1, the details of the subjects participated in the study are presented as mean \pm standard deviation (sd). The average age of the individuals is 20 years with a standard deviation of 1 year. The average weight is 58 kg with a standard deviation of 12 kg. The average height is 1.6 meters with a standard deviation of 0.08 meters. The average body mass index (BMI) is 22 kg/m² with a standard deviation of 4 kg/m². The average six-minute walk distance (6MWD) is 551 meters with a standard deviation of 53 meters.

Table 2: Distribution of subjects as per BMI within the study subjects according to Asia pacific standard

	BMI in kg/m ²	Frequency (N)	Percentage
Underweight	<18.5	10	17%
Normal Weight	18.5-22.9	24	40.7%
Overweight	23-24.9	11	18.6%
Obese	\geq 25	14	23.7%

Interpretation: The above table shows the distribution of the studied subjects as per BMI according to Asia pacific standard. The majority of subjects have a normal weight, followed by those classified as obese. The presence of subjects in the underweight and overweight categories indicates a smaller proportion of the sample.

To see the correlation between BMI and 6MWD, the correlation coefficient (r) and the p value were determined. The findings are-

	<u>Correlation coefficient (r)</u>	<u>p value</u>
BMI vs 6MWD	-0.006	0.965

Since the p-value is not significant (i.e., p-value > 0.05). Thus, it can be inferred that the BMI of the respondents does not have any effect on the 6-minute walking distance. The same inference can be drawn with the help of the scatter plot-

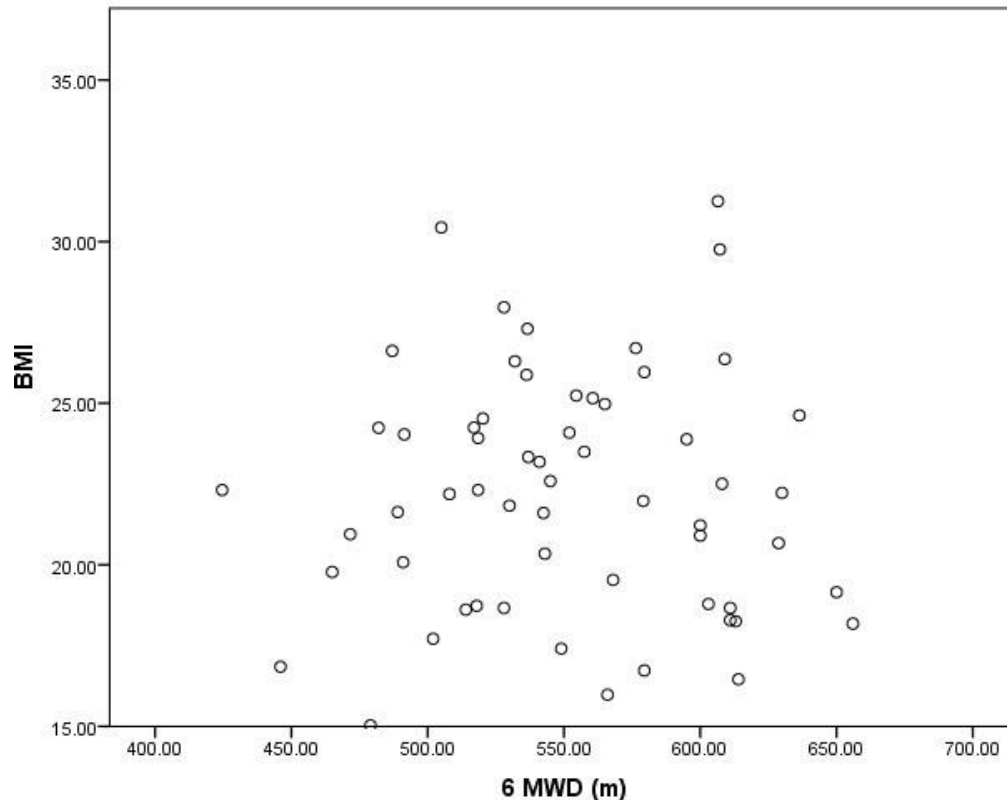


Figure 1: Scatter Plot: Correlation between 6MWD and BMI

Interpretation: The scatter graph depicting the relationship between BMI and 6MWD shows no discernible pattern or correlation between the two variables. This lack of relationship is indicated by the scattered distribution of data points without any clear trend or clustering.

The absence of a relationship suggests that there is no significant association between BMI and 6MWD in the studied subjects. In other words it indicates that BMI does not appear to have a direct impact on the six-minute walk distance.

Discussion- Like in many parts of the world, overweight and obesity are rapidly increasing in India. Overweight and obesity are associated with health risks and therefore screening for overweight and obesity may aid in taking preventive measures.

6MWT is a submaximal exercise test used to quantify functional exercise capacity and hence can assess the physical fitness of the people. Aim of the present descriptive study is to calculate BMI and estimate 6MWD in apparently healthy medical and paramedical students of Gauhati Medical College, Guwahati, Assam. After calculation of BMI it has been found that as per the Asia Pacific standard 23.7% of the study subjects are obese and 18.6% are overweight. A study conducted in adolescents of 10-14 years found prevalence of overweight and obesity in 20.9% and 10.2% respectively in Dibrugarh district of Assam (9). Another study aimed at finding prevalence of generalized and abdominal obesity in ≥ 20 years of age in urban and rural India, found generalized obesity in Tamil Nadu, Maharashtra, Jharkhand and Chandigarh as 26.6%, 18.7%, 16.9% and 36.1% respectively (10). Mean 6MWD in the present study is found to be 551 ± 53 m. The mean 6MWD was found to be 619.8 m in a study conducted by Rodriguez-Nunez I et al in healthy children and adolescents (11). The difference in finding may be due to the geographic and anthropometric variables. In the present study, correlation is not found between BMI and 6MWD. Similarly weak correlation was found between 6MWD and height, weight and BMI in a study conducted in young adults by Stephen J Halliday et al (12).

One of the limitations of the present study is the small sample size. Recruitment of large subjects provides a clearer picture of the prevailing scenario to assess health risk. Again for the people of Asian descent, measurement of waist size is complementary to the BMI as BMI assessment alone overlooks the health risk associated with excess abdominal fat which is found to be slightly more in Southeast Asian people.

Conclusion- In the present study, 17% of the subjects are found to be underweight, 40.7% are of normal BMI range, 18.6% of the subjects fall in overweight category and 23.7% people are obese according to Asia Pacific standard. Mean 6MWD is 551 ± 53 m. In this study no significant association was found between BMI of the respondents and their 6MWD.

Conflict of interest-No conflict of interest

References:

1. <https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle-who-recommendations>.
2. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. *Am J Respir Crit Care Med*. 2002 Jul 1;166(1):111-7. doi: 10.1164/ajrccm.166.1.at1102. Erratum in: *Am J Respir Crit Care Med*. 2016 May 15;193(10):1185. PMID: 12091180.
3. Agarwala P, Salzman SH. Six-Minute Walk Test: Clinical Role, Technique, Coding, and Reimbursement. *Chest*. 2020 Mar;157(3):603-611. doi: 10.1016/j.chest.2019.10.014. Epub 2019 Nov 2. PMID: 31689414; PMCID: PMC7609960.

4. de Souza SA, Faintuch J, Fabris SM, Nampo FK, Luz C, Fabio TL, Sitta IS, de Batista Fonseca IC. Six-minute walk test: functional capacity of severely obese before and after bariatric surgery. *Surg Obes Relat Dis.* 2009 Sep-Oct;5(5):540-3. doi: 10.1016/j.soard.2009.05.003. Epub 2009 May 15. PMID: 19656738.
5. Vásquez-Gómez J, Castillo-Retamal M, Faundez-Casanova C, Carvalho RS, Ramírez-Campillo R, Valdés-Badilla P. Ecuación para predecir el consumo máximo de oxígeno a partir de la prueba de caminata de seis minutos en jóvenes sanos [An equation to predict maximum oxygen consumption from the six-minute walk test in healthy young adults]. *Rev Med Chil.* 2018 Jul;146(7):830-838. Spanish. doi: 10.4067/s0034-98872018000700830. PMID: 30534881.
6. Melliti W, Kammoun R, Masmoudi D, Ahmaidi S, Masmoudi K, Alassery F, Hamam H, Chlif M. Effect of Six-Minute Walk Test and Incremental Exercise on Inspiratory Capacity, Ventilatory Constraints, Breathlessness and Exercise Performance in Sedentary Male Smokers without Airway Obstruction. *Int J Environ Res Public Health.* 2021 Dec 1;18(23):12665. doi: 10.3390/ijerph182312665. PMID: 34886390; PMCID: PMC8657380.
7. Whitlock EP, Williams SB, Gold R, Smith P, Shipman S. Screening and Interventions for Childhood Overweight [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2005 Jul. PMID: 20722132.
8. Lim JU, Lee JH, Kim JS, Hwang YI, Kim TH, Lim SY, Yoo KH, Jung KS, Kim YK, Rhee CK. Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients. *Int J Chron Obstruct Pulmon Dis.* 2017 Aug 21;12:2465-2475. doi: 10.2147/COPD.S141295. PMID: 28860741; PMCID: PMC5571887.
9. Saikia D, Ahmed SJ, Saikia H, Sarma R. Body mass index and body fat percentage in assessing obesity: An analytical study among the adolescents of Dibrugarh, Assam. *Indian J Public Health.* 2018 Oct-Dec;62(4):277-281. doi: 10.4103/ijph.IJPH_24_18. PMID: 30539889.
10. Pradeepa R, Anjana RM, Joshi SR, Bhansali A, Deepa M, Joshi PP, Dhandania VK, Madhu SV, Rao PV, Geetha L, Subashini R, Unnikrishnan R, Shukla DK, Kaur T, Mohan V, Das AK; ICMR-INDIAB Collaborative Study Group. Prevalence of generalized & abdominal obesity in urban & rural India--the ICMR-INDIAB Study (Phase-I) [ICMR- NDIAB-3]. *Indian J Med Res.* 2015 Aug;142(2):139-50. doi: 10.4103/0971-5916.164234. PMID: 26354211; PMCID: PMC4613435.
11. Rodríguez-Núñez I, Mondaca F, Casas B, Ferreira C, Zenteno D. Valores normales del test de marcha de 6 minutos en niños y adolescentes sanos: Una revisión sistemática y metaanálisis [Normal values of 6-minute walk test in healthy children and adolescents: A systematic review and meta-analysis]. *Rev Chil Pediatr.* 2018 Feb;89(1):128-136. Spanish. doi: 10.4067/S0370-41062018000100128. PMID: 29664515.
12. Halliday SJ, Wang L, Yu C, Vickers BP, Newman JH, Fremont RD, Huerta LE, Brittain EL, Hemnes AR. Six-minute walk distance in healthy young adults. *Respir Med.* 2020 Apr-May;165:105933. doi: 10.1016/j.rmed.2020.105933. Epub 2020 Mar 19. PMID: 32308201; PMCID: PMC717437

Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023