GAVIN PUBLISHERS

Journal of Medical and Biomedical Discoveries

Odeh SO, et al. J Med Biomed Discoveries: JMBD-110.
DOI: 10.29011/ JMBD-110. 1000010

Research Article

An Assessment of the Relationship of Age, Weight, Nutritional Status and Blood Pressure on Peak Expiratory Flow Rate Among Healthy Volunteer Preclinical Medical Students

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Citation: Sambo N, Amaza DS, Yusuf AH, Ojo NA, Odeh SO (2019) An Assessment of the Relationship of Age, Weight, Nutritional Status and Blood Pressure on Peak Expiratory Flow Rate Among Healthy Volunteer Preclinical Medical Students. J Med Biomed Discoveries: JMBD-110. DOI: 10.29011/ JMBD-110. 1000010

Received Date: 13 December, 2018; **Accepted Date:** 31 December, 2018; **Published Date:** 8 January 2019

Abstract

The effect of Age, Weight, as determined by BMI and Nutritional Status, as determined by blood haemoglobin concentration, on Peak Expiratory Flow Rate (PEFR) in healthy volunteer medical students was determined in this study. The study involved twenty-seven healthy male medical students and seventeen healthy female medical students. All students were well oriented on the modality of the study. Results showed that Age, BMI, b have significant effect ($p<0.0001$) on PEFR in both groups. The study showed that there is significant association between age, BMI and nutritional status with PEFR among healthy volunteer medical students.

Keywords: Age; BMI; Peak Expiratory Flow Rate; Students

Introduction

Body Mass Index (BMI) is one of the most accurate anthropometric measurements in determining extra body weight in relation to height that may results into health risks [1]. Increase in body weight could lead to obesity with its several associated health risks like respiratory disorders [2]. It is well known that one of the main factors affecting PEFR is weight apart from height and age [3]. Obesity, a major public health problem with overwhelming increase in prevalence has been linked with impaired pulmonary function and airway hyperresponsiveness [4] and implicated as risk factor for several systemic disease conditions like hypertension, sleep apnea, coronary heart disease, type 2 diabetes mellitus, stroke, dyslipidaemia, and osteoarthritis [1,5], with hypertension being one of the most common obesity-related complications [6]. Peak Expiratory Flow Rate (PEFR) as a parameter of pulmonary function can be easily measured conveniently with a Peak Flow Meter. The measurement is in liters per minute (L/min) and is simple, fairly reproducible, non-invasive, rapid and economical way of assessing pulmonary function [7]. It assesses respiratory muscle strength and airway flow resistance and is related to measurement of functional ability as well as physical activity [8]. Pulmonary function is related to gender, age, height, weight, race, nutritional status, geographical location and also related to cardiovascular function and adequate haemoglobin in the circulation for carriage and transportation of oxygen. Thus, decrease haemoglobin concentration in the blood manifested as anemia, is frequently associated with many chronic diseases and characterized by the feeling of weakness and fatigue contribute to dyspnoea and exercise limitations [9]. Medical students are, by their training, exposed to varying degrees of stress, and it is hypothesized that there is a relationship between their age, BMI and nutritional status, and PEFR.

Material and Methods

This study was conducted in the Department of Human Physiology, College of Medical Sciences University of Maiduguri in 2014, among volunteer medical students during their routine practical/demonstration session in the laboratory. Both male and

female medical students age 18-32 years were involved in the study. All volunteers had on previous laboratory session determined their anthropometric indices of height and weight, their haemoglobin concentration, blood pressure and PEFR. This made the volunteers aware of the procedure and calm. On the day of the experiment the investigator and an assistant first took the blood pressure and the PEFR followed by finger prick for blood to determine haemoglobin concentration and finally height and weight taken.

Blood pressure was taken by Mercury Sphygmomanometer, PEFR was determine by Personal Best Full Range Peak Flow Meter (60-810 L/min), haemoglobin determined by Sahli's method and weight and height by standard weighing machine and stadiometer respectively. ANOVA was used to analyse the results with the aid of GraphPad InStat version 3.10, 2009, and results were presented as Mean ± SEM, $p \leq 0.05$

Results

The mean age of male students in the study was 22.59±0.71while for the females was 20.12±0.29 (age in years). There was no difference in mean BMI in the two groups. The mean haemoglobin concentration were 12.22±0.30 and 10.38±0.48 (g/dl) in the male and female groups respectively. PEFR were 525.55±16.44 and 370.00±14.09 (L/min) (Table 1).

The results are as presented in the table below.

Variables	MALE (n=27)	FEMALE (n=17)
Age (yrs)	22.59±0.71	20.12±0.29
BMI (Kg/m^2)	21.05±0.42	21.05±0.60
Hb (g/dl)	12.22±0.30	10.38±0.48
PEFR (L/min)	525.55±16.44	370.00±14.09
MAP (mmHg)	87.44±1.65	88.33±3.10

Table 1: Showing comparison of variables in male and female.

Comparison of variables between male and female. Data expressed in Mean ± SEM, n=number of subjects. BMI=Body Mass Index, Hb=Haemoglobin, PEFR=Peak Expiratory Flow Rate, MAP=Mean Arterial Pressure, p<0.0001 (Table 2 and 3)

Variables	Mean Difference	q	P value
Age vs BMI	1.543	0.2068	p>0.05
Age vs Hb	10.367	1.363	p>0.05
Age vs PEFR	-502.96	67.422	p<0.001
Age vs MAP	-64.852	8.693	p<0.001
MBI vs Hb	8.824	1.160	p>0.05
BMI vs PEFR	-502.51	67.629	p<0.001
BMI vs MAP	-66.394	8.900	p<0.001
Hb vs PEFR	-513.33	67.475	p<0.001
Hb vs MAP	-75.219	9.887	p<0.001
PEFR vs MAP	438.11	58.729	p<0.001

Table 2: Multiple comparisons of variables measured in male.

Variables	Mean Difference	q	P value
Age vs BMI	-0.9365	0.1449	p>0.05
Age vs Hb	9.733	1.506	p>0.05
Age vs PEFR	-349.88	54.137	p<0.001
Age vs MAP	-68.216	10.555	p<0.001
MBI vs Hb	10.669	1.651	p>0.05
BMI vs PEFR	-348.95	53.992	p<0.001
BMI vsMAP	-67.279	10.410	p<0.001
Hb vs PEFR	-359.62	55.643	p<0.001
Hb vs MAP	-77.949	12.061	p<0.001
PEFR vs MAP	281.67	43.582	p<0.001

Table 3: Multiple comparisons of variables measured in female.

Showed multiple comparison of variables measured in both groups (male and female) with significant difference (p<0.001) on comparison of age with PEFR and MAP, BMI compared with PEFR and MAP. Haemoglobin also showed a significant difference (p<0.001) in both groups when compared with PEFR and MAP. There was no significant difference (p>0.05) when age was compared with BMI and Hb in both groups.

Discussion

This study assessed the relationship between body weight as calculated by Body Mass Index (BMI), which is one of the most accurate anthropometric measurements in determining extra body weight, with Peak Expiratory Flow rate (PEFR), Mean Arterial Blood Pressure (MAP) and nutritional status as determined by Haemoglobin (Hb concentration in the blood with PEFR and MAP. Mean Arterial Pressure (MAP) was considered instead of Blood Pressure (BP) because MAP is a better indicator of tissue perfusion. Normal MAP range between 70 and 110 mmHg with a minimum of 65 mmHg being widely accepted [10] as required to provide adequate perfusion to vital organs like the heart, kidneys and brain. A MAP below 65 mmHg for long period may compromise tissue perfusion by depriving vital organs like the

heart, kidneys and brain of oxygen. The significance of improving the MAP has been shown in conditions of decreased MAP as in sepsis, that increasing the MAP improves the microcirculation as assessed by near-infrared spectroscopy (NIRS) at the thenar eminence [11].

In this study, age showed no significant effect ($p>0.05$) on BMI and Hb in both groups but showed significant effect ($p<0.001$) on PEFR and MAP in the groups and between groups. The difference is due to sex. On the other hand, BMI has significant effect on ($p<0.001$) PEFR and MAP. Haemoglobin showed significant effect ($p<0.001$) on PEFR and MAP. This is significant, in this study, though Hb is considered as an indicator of nutritional status; it is also a very important indicator of the ability of the blood to carry oxygen via the microcirculation to tissues. The positive correlation of BMI with Hb and Hb with PEFR indicates that in both male and female their respiratory muscle strength, airway flow resistance as related to measurement of functional ability perform physical activity is in an excellent form.

Conclusion

The study concludes that age, weight and nutritional status among the volunteer students is a good indicator of pulmonary function.

Acknowledgement

The authors acknowledge the medical students for volunteering and the Human Physiology Laboratory, University of Maiduguri for technical support.

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