Original Research Article

THE RELATIONSHIP BETWEEN TRUNK LEG RATIO AND PEAK EXPIRATORY FLOW RATE IN 200 LEVEL MBBS/BDS STUDENTS OF BAYERO UNIVERSITY KANO.

ABSTRACT

Backgroung: Being an important physiological and clinical tool in assessing respiratory conditions, it is common knowledge that Peak expiratory flow rate (PEFR) may be affected by some factors affecting the normal function of the respiratory system. Such factors include the body constitution such as height, bulk; sex, age etc. Also, with the knowledge of how crude a measurement such as body mass index (BMI) is, a novel body shape measure; the trunk-leg ratio (TLR) was used in apparently normal young adults. A better understanding of the association between Trunk-leg ratio and PEFR may provide an opportunity for the identification of those with elevated risk of respiratory diseases.

Methods: The study was an analytical cross-sectional design involving eighty-three 200 Level MBBS/BDS students of Bayero University, Kano. A peak flow meter and a measuring tape to scale were used to measure the PEFR, trunk length and leg length respectively. An interviewer administered questionnaire was used to determine any history of cardio-respiratory disease. **Results:** There were a total of 39 males and 44 females. The males had higher PEFR value (491.79±67.19L/min) while the females had a lower PEFR of 366.82±43.28L/min and the difference was statistically significant. Also, while the males had higher values of trunk length, leg length and TLR, that of trunk length was not found to be statistically significant. There was a statistically significant correlation between PEFR and leg length indicating that the longer the leg length, the higher the PEFR. Although there was a negative correlation between PEFR and TLR, the relationship is not statistically significant.

Conclusion and recommendation: Significant correlation was found between the TLR, which is an anthropometric parameter and the PEFR which is an important diagnostic tool in determination of some types of respiratory diseases. This relationship signifies that the taller the person, irrespective of the trunk length, the higher the PEFR. The significant difference in these parameters between males and the females add insight to the differences between sexes. It is recommended that further studies should be explored involving other anthropometric parameters like trunk-leg volume in future studies. A larger population may provide more a conclusive data.

Keywords: PEFR, trunk length, leg length, trunk-leg ratio, respiratory diseases.

INTRODUCTION

The Peak expiratory flow rate (PEFR; also known as a peak flow) is the maximal rate that a person can exhale during a short maximal expiratory effort after a full inspiration, indicating full lung inflation. It actually depends on voluntary respiratory effort of the individual and the strength of the respiratory muscles[1]. Maximal airflow occurs during the effort-dependent portion of the expiratory maneuver, so low values may be caused by a less than maximal effort rather than by airway obstruction [2] . Nevertheless, the ease of measuring peak flow rate with an inexpensive small portable device has made it popular as a means of following the degree of airway obstruction in patients with asthma and other pulmonary conditions[1] . Forced expiratory volume over 1 second (FEV_1) is a dynamic measure of flow used in formal spirometry. It represents a truer indication of airway obstruction than PEFR. Although the latter usually correlates well with FEV_1, this correlation decreases in patients with asthma as airflow diminishes[3]. PEFR monitoring can be accurately performed by most patients older than 5 years. It is most commonly measured by a portable flow gauge device but may also be obtained by a transducer that converts flow to electric output during spirometry (pneumotachometer) [4]. The most frequent use of PEFR measurement is in home monitoring of asthma, where it can be beneficial in patients for both short- and long-term monitoring. When properly performed and interpreted, peak flow rate measurement can provide the patient and the clinician with objective data upon which to base therapeutic decisions [5]. There are conflicting data regarding the efficacy of peak flow rate monitoring for improving asthma outcome[6].

Trunk-leg ratio could be a potential indicator for identifying the elevated risk of cardio-respiratory diseases. From a public health perspective, a better understanding of the association between Trunk-leg ratio and other parameters may provide an opportunity for the identification those with elevated risk of cardio-respiratory diseases [7] .

Body shape is one of the known risk factors for morbidity in cardio-respiratory diseases, which are major global health problems associated with reduced life span, increased risk of mortality and significant financial burdens on the individuals and health care systems. Some well known measures of body shape such as body mass index, (BMI) and waist circumference, (WC) are crude indicators of adipose tissue distribution but are globally recognized to be associated with risk of cardio-respiratory diseases[8] .

Obstructive lung disease is airflow limitation due to inability to completely expel air from the lungs. Because of narrowing of the airways, an abnormally increased amount of air remains in the lungs at the end of full exhalation. Some conditions related to obstructive lung diseases include; Asthma, Chronic Obstructive Pulmonary Disease etc[9] . Restrictive lung disease is the difficulty in expanding the lungs during inhalation. The difficulty in filling the lungs with air often results from stiffness in the lungs themselves and in other cases, chest wall stiffness, and weakness of muscles or damaged nerves. Some conditions related to restrictive lung disease include; Intestinal lung disease, pulmonary fibrosis, etc[10] .

Trunk-Leg ratio (TLR) or Leg-to-trunk ratio (LTR) is the ratio of leg length and trunk length, and a larger value of TLR indicates a higher leg length for a given body height. Leg length is calculated as the difference between height and sitting height, and TLR is obtained by dividing leg length by sitting height. Because the distributions of TLR and height vary as children mature, and the patterns of growth also differ between males and females [7]. Leg length is a marker of environmental influences on childhood growth before puberty as, up until puberty, height increases are in greater part attributable to leg growth[11]. Furthermore, secular increases in height, representing improvements in the nutritional status of populations, appear to arise more from increases in leg length, rather than trunk growth[12] . Therefore, PEFR serves as a measure for both restrictive and obstructive lung diseases with Trunk-leg ratio serving as an anthropometric measure that may help in their determination. Also, many researches have been conducted to determine the relationship between TLR and cardiovascular risks, very few explored PEFR especially in this part of the world [13]. This study was aimed to evaluate the relationship between trunk leg ratio and peak expiratory flow rate in 200 level mbbs/bds students of Bayero University Kano.

METHODS

Sampling and Data collection: Eighty three (83) MBBS/BDS students as the sample size was estimated from statistical table for sample size determination. A non-probability sampling technique was used in such a way that only the students who give their consent and were willing to participate in the study were used. The procedure was explained to the volunteering subjects and consent form was given to them so as to sign. A measuring tape was used in measuring the Trunk length and Leg length and a peak flow meter was used in measuring Peak Expiratory Flow Rate.

Determination of Trunk-Leg Ratio

In this study, the trunk-leg ratio was determined according to[14] ……….as follow; the subject was asked to stand in an anatomical position and a measuring tape was used to measure the trunk-length which was measured from the shoulder to the summit of the iliac crest. With the subject still in anatomical position, the leg length was measured which was gotten from the summit of the iliac crest down to the floor. The Trunk-leg ratio was gotten by dividing the trunk length with the leg length.

Determination of Peak Expiratory Flow Rate

PEFR (L/min) was Evaluated with the brand name device Mini Wright (Clement Clarke International Ltd., Essex, England) with a range of 60 to 900 L/min [15]. The PEF was obtained by a forced exhalation maneuver beginning with a maximum inhalation (equal to a spirometric test). Following the directions of Quanjer *et al.* [16], subjects were evaluated in a standing position without bending the neck. Prior to the evaluation, the device was described to the adolescent subjects, and they were allowed to practice the exercise twice (familiarization). Afterwards, the assessment was carried out with the highest value recorded of the three attempts. The Technical Error of Measurement (TEM) was less than 2% for both sexes. The PEF was classified as lowest (first tertile), middle (second tertile), and highest (third tertile). The students were asked to stand erect holding the medium Wright Peak Expiratory Flow Meter with one hand and was asked to maximally inspire atmospheric air and then wrap the mouth around the mouth piece of the Peak Flow Meter then use the other hand to close the nose then expire maximally into the Peak Flow Meter until the air filling the lungs was expired completely.

Statistical Analysis

The data collected was expressed as mean± standard deviation and the statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 20.0 and excels 2013 for windows. Both inferential and descriptive statistics was used to examine the outcome of the study. Pearson's Moment of Correlation and independent sample t-test were used in determining the relationship between LTR and PEFR. A p-value of <0.05 will be considered statistically significant in all the calculations.

RESULTS AND DISCUSSION

A total of 83 students; both males (39) and females (44) from first year of MBBS/BDS of Bayero University Kano were recruited for the study. All of whom were in the adolescent age group 18 to 25 years.

A relationship between TLR and PEFR was sought for and this research is not in contrast with the findings of previous studies [17] who both found a relationship between Trunk-leg ratio and PEFR. A significant positive correlation between leg length and PEFR was found in this research which means that the longer the legs of an individual, the higher the PEFR value. And vice versa.

It was found that males had longer trunk length which was found to have a mean value of 16.93, longer leg length with a mean value of 39.51 and they also had higher PEFR value of 425.54 and finally a higher Trunk-leg ratio with mean value of 0.43 even though both the males and females were on same stage of adolescence(Table 1 and 2).

Table 1: Descriptive statistics of anthropometric variables of The mean value of PEFR, Trunk length, Leg length and Trunk-leg ratio among the participants.

Variables	Number(n)	Mean±STD
Trunk length(cm)	83	16.93±1.606
Leg length(cm)	83	39.51±2.62
PEFR(L/min)	83	425.54±83.74
Trunk-leg ratio	83	0.43±0.51

Table 2: Comparison of PEFR And Some Anthropometric Parameters Between Male and Female Students of 200 Level MBBS/BDS Students.

Variables	Males(39)	Females(44)	P-value
Trunk length(cm)	17.10±1.759	16.77±1.461	0.35
Leg length(cm)	40.79±2.166	38.36±2.48	0.00
PEFR(L/min)	491.79±67.19	366.82±43.28	0.00
Trunk-leg ratio	0.42±0.06	0.43±0.50	0.09

Result are in triplicate as mean ± SD P≤0.01

Majority of the parameters of the males were higher than those of the females, significantly. Except for the trunk length in which the difference is not significant.

This difference is purely constitutional, which is due to the difference in anthropometric parameters between males and females. The difference in PEFR could possibly be due to stronger muscles in males.

The result of this research study found that there was no any significant relationship between Trunk-leg ratio and PEFR (table 3), which might be due to the difference in race between blacks and whites. It may be a useful predictor when dealing with mixed ethnic origins due to the fact that blacks have lower Trunk-to-leg ratio[18] .

Table 3: Correlation between PEFR and some anthropometric parameters

Variables	**N**	**R-value**	**P-value**
PEFR/Trunk-leg ratio	83	-0.107	0.33
PEFR/Trunk length	83	0.197	0.74
PEFR/Leg length	83	0.457**	0.00

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

The table shows a significant positive correlation between PEFR and the leg length of the participants, no significant correlation between PEFR and trunk length but also shows a negative correlation between PEFR and the trunk-leg ratio although the relation is not statistically significant.

CONCLUSION

The results of this study revealed significant correlation between leg length and PEFR among the males and females, also revealed significant difference between the leg length and PEFR between the males and females. However, no significant relationship was established between the Trunk-leg ratio and PEFR both in the males and females.

RECOMMENDATION

It is recommended that further studies should look into relationship between PEFR and more anthropometric parameters and also consider children. A reference range for the Trunk-leg ratio in Nigeria should also be a future study.

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