Original Research Paper

Physiology

A COMPARATIVE STUDY ON THE EFFECT OF WAIST:HIP RATIO ON PEAK EXPIRATORY FLOW RATE AT PLAIN AREA AND PEAK EXPIRATORY FLOW RATE AT HILL AREA.

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ABSTRACT Peak expiratory flow rate measured by mini Wright peak flowmeter is an effective tool for the assessment of respiratory functions both at plains and at hills. The increase in obesity and high altitude may have substantial effect over ventilation and that can be assessed by alterations in the PEFR.
The present study was conducted in the department of Physiology, NEIGRIHMS, Shillong. Total 102 subjects, 45 male and 57 female were evaluated over 6 month. WHR was calculated from WC and HC and WHR>.9 was considered as obese.
PEFR was recorded both at plain and hill.
After statistical analysis PEFR was found to increase with increase in altitude and decline with obesity.
Summary: Ventillation is affected by altitude and obesity.

KEYWORDS : PEFR, WC, HC, WHR.

Introduction: PEFR represents the largest expiratory flow rate from a position of maximal inspiration and is a simple effective tool for the assessment of ventilatory functions.(1,2-4) Being inexpensive, mini Wright peak flow meter is a suitable instrument to measure ventilatory functions affectively in many parts of world where medical facilities are still poor.(5)
The mini Wright peak flow meter though can measure the peak expiratory flow rate accurately upto a great extent still it may be affected by decreased barometric pressure (6) decreased gas density at high altitude (7) and degree of acclimatization related to the altitude and the length of exposure. Similarly as obesity and increased body weight entrusts considerable affect on different organs and systems the body so their influence on respiratory functions can be assessed by alterations in peak expiratory flow rate.

Although several studies have been conducted in different parts of the world to see the effect of obesity and high altitude on lung functions, such studies are rare in the north-east part of the country. Thus keeping this fact in view the present study was undertaken with the following objectives.

Aims and objectives: 1. To measure WC, HC and WHR. 2. To record Peak expiratory flow rate both at plains and hills. 3. To find out the relation of WC, HC and WHR with PEFR at plains and PEFR at hills.

Materials and methods: The present study was carried out in the department of Physiology, NEIGRIHMS, Shillong. Total 102 subjects including 45 male and 57 female were evaluated during a period of 6 month. WC, HC were measured and WHR was calculated then. WHR>.9 was taken to be obese both in male and female.

PEFR was recorded with the help of mini Wright peak flow meter. 3 readings were taken of which the highest value was considered to be the reading. PEFR was first recorded at plain and then the subject was asked to climb a small hill situated within the campus of NEIGRIHMS and the PEFR was again recorded atop the hill of a height of around.

Exclusion criteria:
Respiratory tract infection, asthma, cardiac, renal or hemolytic disorders, Neuromuscular/musculoskeletal disorders that may affect the test

Statistical analysis:
Statistical analysis was done in Microsoft excel and SPSS16. Mean±SD and Pearsons correlation coefficient were measured.

Results and observations:

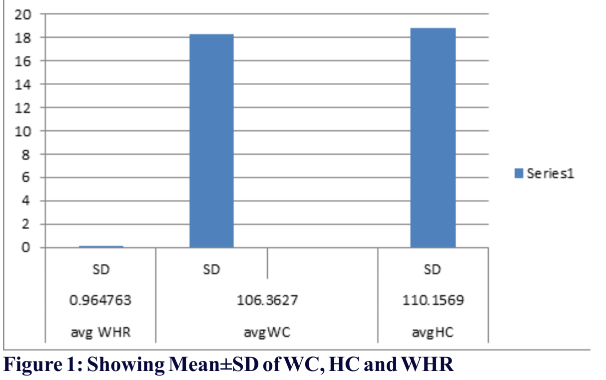

Figure 1: Showing Mean±SD of WC, HC and WHR

The Mean±SD of WC, HC and WHR were 106.36±18.24, 110.16±18.82 and 0.96±0.01.

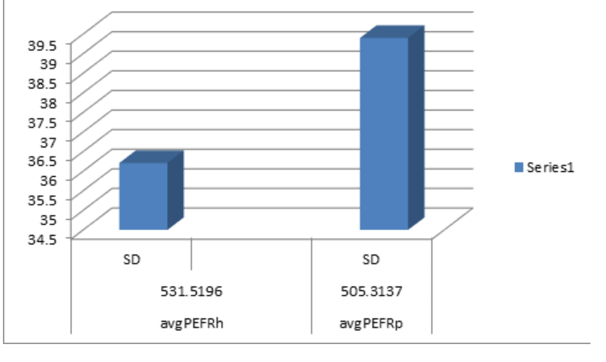

Figure 2: Showing Mean±SD of PEFRplain and PEFRhill

The Mean±SD of PEFRhill was 531.52±36.21 while the Mean±SD of PEFRplain was 505.31±39.40.

Table 3: Table showing Pearsons correlation coefficient and p value of WC, HC and WHR with PEFRhill and with PEFRplain:

Parameter	Pearsons correlation coefficient with PEFRhill	Pearsons correlation coefficient with PEFRplain
WC	-0.99346	-0.98618
HC	-0.99119	-0.98305
WHR	-0.16872	-0.15101

The Pearsons correlation coefficient of WC, HC and WHR with PEFRhill were -0.99346, -0.99119 and -0.16872. The Pearsons correlation coefficient of WC, HC and WHR with PEFRplain were -0.98618, -0.98305 and -0.15101.

Discussion:

The Mean±SD of WC, HC and WHR were 106.36±18.24, 110.16±18.82 and 0.96±0.01.

The Mean±SD of PEFRhill was 531.52±36.21 while the Mean±SD of PEFRplain was 505.31±39.40. Mean±SD of PEFRhill was more than Mean±SD of PEFRplain. PEFR increased with increase in altitude and decrease in pressure. Similar findings were observed in many previous studies. (6,7,11,12)

The Pearsons correlation coefficient of WC, HC and WHR with PEFRhill were -0.99346, -0.99119 and -0.16872 while the Pearsons correlation coefficient of WC, HC and WHR with PEFRplain were -0.98618, -0.98305 and -0.15101. This shows that both at the plains and at the hills PEFR is affected by obesity and increased body weight. With increase in waist circumference, hip circumference and waist:hip ratio PEFR demonstrated a linear decline in both male and female.

The decrease in PEFR with increasing BMI was attributed to the reduced compliance of the lung and thoracic cavity to one third of the normal lung compliance due to obesity-induced increase in pulmonary blood volume and closure of dependent airways by inducing airway hyper-responsiveness in adults and by the development of asthma. (8,9) Obesity also reduces the strength and endurance of the respiratory muscles, especially diaphragm, making the contraction inefficient and the reduction in PEFR is proportional to the increase in BMI leading to a decrease value of PEFR.(10)

Conclusion:

High altitude imparts an important effect on lung functions such as Peak expiratory flow rate which is demonstrated by a substantial increase in PEFR with increase in altitude both in male and female. Measuring other lung functions can be more fruitful in estimating the degree of acclimatization.

Obesity appears to be an important contributing factor which causes significant patho-physiologic changes responsible for altered lung functions. Regular pulmonary function monitoring may be an important tool to assess the adverse effects of obesity over pulmonary functions and to take appropriate remedies to decrease the related co-morbidities.

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