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Respiratory science

CORRELATION OF WAIST CIRCUMFERENCE WITH RESPIRATORY MUSCLE STRENGTH IN HEALTHY INDIVIDUALS WITH NORMAL BODY MASS INDEX

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ABSTRACT **Background &Objectives:** The respiratory muscles include the diaphragm as the major muscle of inspiration along with the intercostals and the scalene muscles. MIP is a measure of inspiratory muscle strength, whereas MEP measures the strength of abdominals and intercostals which help in active exhalation. Thoraco-abdominal compliance is required for adequate excursion of diaphragm during inspiration. Increased tone of abdominal muscles or increased abdominal contents will affect this compliance, also affecting the rib cage–expanding action of the diaphragm. This relationship between the diaphragm and the abdominal muscles is crucial.Hence the need was felt to study the correlation between the waist circumference(WC) and respiratory muscle strength(RMS) in normal healthy adults with normal BMI.

Methodology: RMS was measured using Portable capsule sensing pressure gauge device in 200(100 males & 100 females) subjects.

Results:Pearson correlation coefficient(r) for WC and MIP was r=0.30 and for WC and MEP was r=0.26.

Conclusion:In normal healthy individuals, there is a weak to moderate positive correlation between the WC & the RMS.

KEYWORDS :

INTRODUCTION:

The function of muscles is to generate force and contract.[1] In the respiratory system, force is usually equated to pressure and contraction of muscles brings about lung volume change or displacement of chest wall structures.[1]

To test respiratory muscle strength, pressures can be measured either during voluntary maneuvers or during involuntary contractions, notably in response to phrenic nerve stimulation.[1] Maximal inspiratory pressure (MIP or PImax) and maximal expiratory pressure (MEP or PEmax) are global measures of maximal strength of respiratory muscles and are respectively the greater pressure which may be generated during maximal inspiration and expiration against an occluded airway.[2]

The respiratory muscles include the diaphragm as the major muscle of inspiration along with the intercostals and the scalene muscles.[3,4] PI max is a measure of inspiratory muscle strength, whereas PEmax measures the strength of abdominals and intercostal muscles which help in active exhalation.[3,4]

During inspiration, contraction of the diaphragm pulls the lower surfaces of the lungs downward. Then, during expiration, the diaphragm simply relaxes, and the elastic recoil of the lungs, chest wall, and abdominal structures compresses the lungs. During heavy breathing, however, the elastic forces are not powerful enough to cause the necessary rapid expiration, so the extra required force is achieved mainly by contraction of the abdominal muscles, which pushes the abdominal contents upward against the bottom of the diaphragm. In addition, because abdominal muscle tone limits the diaphragmatic excursion during inspiration, they may affect the the rib cage–expanding action of the diaphragm.[5,6] This relationship between the diaphragm and the abdominal muscles is essential and required for respiration, known as the diaphragm – abdominal compliance.

Sonam Daftari et al found that Aerobic exercise training causes significant improvement in respiratory muscle strength alongwith functional performance in individuals with increased BMI and respiratory muscle weakness.[7]

Fatih Kantarci et al showed that healthy persons of younger age with a smaller body mass index and waist circumference show a decreased amount of diaphragmatic motion.[8] Decreased amount of diaphragmatic motion manifests as reduced muscle strength.

Hence the need was felt to assess the effect of waist circumference on repiratory muscle strength.

METHODS:

Sample size: 200(100 males and 100 females)

INCLUSION CRITERIA:

- Age: 25-44 years
- BMI between 18.5-24.9 Kg/m2
- Both males and females
- Non-smokers

EXCLUSION CRITERIA:

- H/o cardiopulmonary pathology
- H/o any neuromuscular disease
- Recent physical trauma
- Recent surgery

Procedure:

The subjects fulfilling selection criteria were included in the study.

Waist Circumference (WC): WC was taken in accordance with ACSM guidelines.[9]

Respiratory muscle strength: Maximal Inspiratory pressure (MIP) in cms H2O and Maximal expiratory pressure (MEP) in cms H2O was measured with Portable capsule sensing pressure gauge device.[10]

RESULTS:

Statistical analysis was done using SPSS 16.

Table 1: Demographic data

	Age	BMI	WC	MIP	MEP
Mean	30.78	23.08	88.85	69.33	59.03
SD	5.27	2.03	5.86	11.79	6.92
N	200	200	200	200	200

Table 2: Pearson coefficient

		MIP	MEP
WC	Pearson correlation(r)	0.30	0.26
	Sig(2- tailed)	0.00*	0.00*
	N	200	200

*Correlation is significant at the 0.001 level

DISCUSSION:

In the present research, we aimed to study the influence of waist circumference on respiratory muscle strength. The researchers found a mild to moderate, statistically significant correlation between waist circumference (WC) and MIP as well as WC and MEP.

This suggests that as the WC increased, there was increase in MIP and MEP as well.

Kantarci et al[8] found that healthy subjects with smaller BMI and WC showed a decreased amount of diaphragmatic motion, and as the BMI and WC increased, the diaphragmatic motion increased.

Costa T et al[11] found that there was no correlation between WC and respiratory muscle strength in normal weight as well as in obese women. In our study we did find a statistically significant mild to moderate correlation between WC and respiratory muscle strength in women who had their BMI within the normal range.

CONCLUSION:

In healthy individuals with normal BMI, as the waist circumference increases, there is an increase in MIP and MEP as well

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