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Assessment of Maximal Expiratory Pressure in Adult Against Reference Standard Value

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ABSTRACT

The present study was cross-sectional in design and carried out in Indian adults. The aim of this study was to assess the MEP (maximal expiratory pressure) and compare with reference standard value. The MEP is part of pulmonary function test and its give idea about expiratory muscle strength, which will be helpful in clinical physiology. The clinical mercury sphygmomanometer was used to measure Maximal Expiratory Pressure, comparisons was made with reference value. The results shows that observed MEP was significantly lower than reference value and also shows gender based variation. So, at the end of study we can conclude that results of this study might be due to variation of body physique, ethnicity and technique. For future development we recommend that MEP value should be revised as par Indian standard and it should be implement in routine pulmonary function testing.

Introduction:
The Maximum Expiratory Pressure (MEP) measures the expiratory pressure in respiratory system which has been used as indicators of respiratory muscle strength in adults and in children (Tomalak, Pogorzelski, & Prusak, 2002).

The MEP is part of respiratory efficiency test as pulmonary function test and it is simple, convenient and non-invasive indices of respiratory muscle strength. It's give idea about expiratory muscle strength which is helpful in physiological and clinical evaluation of respiratory muscle strength.

The values of this parameter as reported in the various studies vary considerably because of wide age range of subjects, different types of instruments used to make the measurements (Smyth, Chapman, & Rebuck, 1984), and the possible differences in the method used for making the measurements also due to ethnicity and race of subjects.

As previous study shows variation in MEP, basis on this the Present study was carried out in Indian adults and compare with reference standard value.

Aims and Objectives:
1. To assess the maximal expiratory pressure in apparently healthy adults and compare it with reference standard value
2. To compare the maximal expiratory pressure in male and female.

Materials and Method:
The present study is Cross-sectional in design; was carried out in 59 apparently healthy Indian adult subjects (mean age 18.06 ± 0.31 year).

Clinical mercury sphygmomanometer was used to measure Maximal Expiratory Pressure. The Single best reading out of three was taken for measurement of MEP as observed value and it compare with predicted reference standard value. The observed value of MEP is also compare with LLN (lower limit of normal).

Reference standard value and LLN value of MEP in adults, were pressure in cmH2o and age in years (Evans & Whitelaw, 2009), as reference and LLN value in cmH2o for analysis it converted in mmhg;

- Male MEP Reference value; 174 – (0.83 age)
- Male MEP LLN value; 117 – (0.83 age)
- Female MEP Reference value; 131 – (0.86 age)
- Female MEP LLN value; 95 – (0.57 age)

Study group divided in two groups according to sex, male (35) and female (24). First compare the MEP in male and female and then compare the MEP with reference standard value and with LLN value in both sexes. The analysis was done by applying student T set in IBM SPSS 20.0.

Observation and Results:
Table 1: Descriptive analysis showing mean and SD of study group

	Sex	N	Mean ± SD
Age (Years)	Male	35	18.02 ± 0.30
	Female	24	18.13 ± 0.33
Height (m)	Male	35	01.72 ± 0.05
	Female	24	01.57 ± 0.06
Weight (Kg)	Male	35	62.29 ± 11.64
	Female	24	53.33 ± 11.63

Table 2: Comparison of MEP in male and female

	Sex	Mean ± SD	p value
MEP (mmHg)	Male (N=35)	75.77 ± 17.31	<0.01**
	Female (N=24)	51.25 ± 11.36	

** The mean difference is significant at the 0.01 level.

Table 3: Comparison of MEP between observed value and reference standard value

	Value	Mean ± SD	p value
Male MEP (mmHg) (N=35)	Observed	75.77 ± 17.31	< 0.01**
	Reference	116.97 ± 0.30	
Female MEP (mmHg) (N=24)	Observed	51.25 ± 11.36	< 0.01**
	Reference	84.88 ± 0.33	

** The mean difference is significant at the 0.01 level.

Table 3: Comparison of MEP between observed value and LLN (lower limit of normal) value

	Value	Mean ± SD	p value
Male MEP (mmHg) (N=35)	Observed	75.77 ± 17.31	NS
	LLN	74.97 ± 0.30	
Female MEP (mmHg) (N=24)	Observed	51.25 ± 11.36	< 0.01**
	LLN	62 ± 0.00	

** The mean difference is significant at the 0.01 level, NS; Not Significant, LLN; lower limit of normal

Discussion:
In male and female (Table 1) there were no significant difference in age but significant difference was seen in height and weight.

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Table 2 shows that; The MEP was significantly higher in male (75.77 ± 17.31) than female (51.25 ± 11.36). This result suggest that male having more respiratory muscle strength than female, as all lung volume and capacities are 10-15 % are higher in male than female.

In table 3 the observed value (male; 75.77 ± 17.31, female; 51.25 ± 11.36) is significantly lower than reference value (male; 116.97 ± 0.30, 84.88 ± 0.33) in both sexes.

In table 4 the observed value (male; 75.77 ± 17.31, female; 51.25 ± 11.36) is significantly lower than LLN value (male; 74.97 ± 0.30, 62 ± 0.00) in female while this difference was not significant in male.

Male having higher MEP than female by 41–57%, depending on age. And correlation with age is the strongest in most of the studies mentioned (Evans & Whitelaw, 2009) in this study MEP ~60% more in male than female.

MEP in Adult males Adults females 93±23, 67±17 respectively (Agrawal, 2006) and one more study in India shows that MEP in adult is 55.72 ±9.47 (Kaur, Singh, & Kaur, 2002).

Few studies have looked systematically at racial or ethnic differences in mouth pressures. Chinese men in Singapore had higher MEP than Malays and Indian men

Potential Reason for Low MEP in this study:

- Study population and sampling method
- Number of test and Rest time between trials
- Manoeuvre used to generate maximal effort
- Instrument and type of mouthpiece
- Technique and posture
- racial or ethnic differences

Conclusion:

Study suggests that averages MEP in adults are much lower than reference standard value.

The MEP was significantly higher in male than female and it significantly lower than reference standard value in both sexes. The MEP of male closure to LLN but in female it's significantly less than LLN.

We believe that these results are due to the variation of body physique in Indian as compared to western, also due to variation in ethnicity, races, and technique.

For, future direction we recommend that normal range MEP should be revised for Indian population; MEP is simple to do, non-invasive, economic and a helpful indicator of muscle weakness, monitoring respiratory muscle strength as an adjunct to mechanical ventilator weaning, also good for repeated testing to follow the course of disease. It should be implemented in routine PFT laboratory.

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