DISCUSSION

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Table 1 shows standard anthropometric measurements of control (n=30) and obese (n=30) adolescents The mean age of control subjects was 15 9 ±1 4 years and that of obese was 15 8±1.37 years The mean height of control and obese group was 164 ± 6 43 and 166.77 ± 9.49 cms respectively. The mean weight of the control and obese group was 51 92± 4 53 and 81 3±13 99 kgs respectively, a highly significant difference ($p<0\ 001$), meeting the selection criterion of the study.

Hence, there was a highly significant difference ($p<0.001$) between the BMIs of the control (19 51 ± 4.12) and obese adolescents (28 82±4.12) respectively and a similar highly significant difference ($p<0.001$) between the BSAs of the control (1.53± 0 09 sq.m.) and obese (1 99±0.18sq m) respectively Thought the Waist/ Hip ratios of the obese and control adolescents (0 96±0.09 and 0 91± 0 05) was marginally different, a significant difference ($p<0\ 001$) was found between their Waist and Hip circumferences (Obese- 89.5±13 35 cms and 96.63±11 48 cms respectively, Control 65 6± 7.51 cms and 72.23± 5 68 cms respectively). Similarly, skinfold thickness (Triceps, Superior iliac, Chest and Subscapular) were significantly lower in the obese ($p< 0.001$) compared to the control group

Table 2 compares the respiratory parameters of obese and age matched control adolescents

The mean of the Forced Vital Capacity in the obese (3 41±0.58 litres) is marginally higher than that of the control (3 2 ± 0.42 litres), while the percent of the predicted value is higher in the control (105.7 ± 13.73%) compared to the obese (102 4 ± 15.88 %) The predicted % of the Forced expiratory Volume at the end of the 1st second (FEV_1) is significantly lower ($p<0.01$) in the obese (93 27 ± 15.27 litres) compared to the control group (107 5 ± 12 51). The ratio of the Forced Expiratory Volume at the end of the 1st second and the Forced vital Capacity (FEV_1/FVC) is significantly lower in the obese ($p<0$ 001) compared to age matched controls. Both the observed and the % predicted are lower in the obese (84.43 ± 7 0 5 % and 94.47 ± 12 25 % respectively) compared to the control group (93.6 ± 5 96% and 102.77 ± 7.5% respectively). The observed values of FIV_1 are (1 93 ± 0.63 lts) and (2.38±0 79 lts), while that of FIVC are (2 09 ± 0 41) and 2.38 ± 0.44), in the obese and control group, respectively Similarly, the ratio of FIV_1 to FIVC ($FIV_1/FIVC$) is significantly lower ($p<0.001$) in the obese and control group, respectively.

The Peak Inspiratory Flow Rate is slightly higher in the control (4.03 ± 0 96l/s) compared to the obese adolescents (3.6 ± 1 39l/s)

However, the observed values of the Peak Expiratory Flow Rate is marginally higher in the Obese (6 87 ± 1 56 l/s) compared to the control adolescents (6.82 ± 1 53 l/s)

$FEF_{25\text{-}75\%}$ (formerly known as Maximum Mid Expiratory Flow Rate) is significantly lower in the obese (3.56 ± 1 02 l/s) compared to the control adolescents (4 76 ± 1 35 l/s). Similarly, the observed values of $FEF_{50\%}$ and $FEF_{75\%}$ are significantly lower in the obese adolescents ($p<0.01$) ($FEF_{50\%}$ - 4 07±1 07 (l/s) (Obese), 5 03±1 48 (l/s) (Control), ($FEF_{75\%}$ – 2.03±0.71 (l/s) (Obese), 3 12±1 07 (l/s) (Control)

Similarly, both the observed and predicted % of the Maximum Voluntary Ventilation is significantly lower in the obese compared to the control group. [Observed- 108 38 ± 22.6 (lts) (Obese), 148 96 ± 29 04 (lts) (control group), % predicted - 95 07±17.1 (lts) (obese), 131 53 ± 26 2 (lts) (control group).]

The values of the Forced Expiratory Volume in the 1st second (FEV_1) and FEV_1/FVC % were significantly lower in the obese compare to the control group. Similar results were obtained by Inselman et al (1989) in their study of 13 obese children age 15 years They observed a decrease in the Forced Expiratory Volume in the 1st second (FEV_1) and suggested these alterations may reflect intrinsic changes within the lungs. These results also tally with those of Mallory GB Jr et al (1989) who detected obstructive deficits in eight out of seventeen obese children they studied and Biring MS et al (1999) in their study of the pulmonary physiologic changes of the morbidly obese

On the contrary, these results are not consistent with those of Bossisio E et al (1984) who, in their study of nineteen children with moderate obesity found pulmonary volumes of children to be within the normal range. Chaussain M et al (1977) in their study of thirty-nine obese children found their parameters to be within the normal range Also, Tang RB et al (2001) in a study comparing forty-two obese and ten normal children found the values of FEV_1 and FEV_1/FVC % to be similar in both the groups.

The ratio of Forced Inspired Volume in the 1st second to Forced Inspiratory Vital Capacity ($FIV_1/FIVC$) is significantly decreased in the obese, which may be due to mechanical limitation of the chest wall and respiratory inertance as suggested by Ho TF et al (1989) and Inselman et al (1993).

The values of Maximum Voluntary Ventilation (MVV) were significantly lower in the obese compare to the control group These results are consistent with those of Inselman et al (1993) who found the values of Maximum Voluntary Ventilation (MVV) to be significantly lower in the thirteen obese children, they studied. Regarding changes in MVV they concluded that the alteration may reflect extrinsic mechanical compression on the lung and thorax Ho TF et al, (1989) also obtained similar results (reduction in MVV to between 60 % and

70 % of predicted normal values) in a study of sixty five Singapore obese children with a mean age of 12 1 years. They attributed the decrease due to increase respiratory inertance possibly due to excess accumulation of adipose tissue in the chest wall and abdomen, leading to respiratory limitation. Similar results were obtained by Biring MS et al (1999) in their evaluation of pulmonary function changes of the morbidly obese Ray CS et al (1989) also found the values of Maximum Voluntary Ventilation (MVV) to be significantly decreased in adults with extreme obesity.

Flow rates ($FEF_{25-75\%}$, $FEF_{50\%}$, $FEF_{75\%}$, and PEFR) were significantly lower in the obese compared to the control adolescents. These results were consistent with those of Ho TF et al, (1989) in obese children of Singapore and Zerah F et al (1993) and Biring MS et al (1999) in the adult obese. They propounded that the findings are suggestive of narrowing of small airways.

The workers, in whom the parameters of pulmonary function tests were normal, proposed that, in obesity, the main factor is a decrease in the distensibility of the chest wall, which worsens with age This change, probably dose not occur in children and adolescents, hence the absence of any significant abnormality