

Lung Function In Obese Children

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Introduction


- Childhood obesity is one of the most serious public health challenges of the 21st century.
- Overweight and obese children are likely to be obese into adulthood and more likely to develop non-communicable diseases like diabetes and cardiovascular diseases, respiratory disease at younger age.

- In Ho Chi Minh City, Vietnam, the prevalence of overweight and obesity in preschool children was 20.5% and 16.3% respectively (Huynh Thi Thu Dieu et. al., 2007)
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- In 2008, the prevalence of overweight and obesity in middle school children from No (1) Basic Education Middle School (Dagon), Yangon Division was 13.7% and 9.3% (Moe Myint, 2008).
- According to the national survey carried out in 2009, among children and adolescents aged 10-19 years in Yangon, 7.6% were obese. Out of these, 8.7% were boys and 6.5% were girls (Tint Swe Latt *et. al.*, 2010).

- Even a moderate elevation in body mass index (BMI) has been associated with a substantial reduction in functional residual capacity (FRC) and expiratory reserve volume (ERV) in otherwise healthy adults (Jones RL.et.al., 2006).
- Nang-Yin-Mu-Aye (2007) showed that the lung volumes (FVC, FEV1) were found to be reduced without changes in FEV1/FVC and there was no feature of airway obstruction in overweight and obese children.

Justification

- The prevalence of obesity is increasing trend in both adult and pediatric population worldwide as well in Myanmar.
- Obesity may lead to a reduced lung functional status which might lead to reduce functional exercise and to develop symptom suggestive of lung disease such as sleep apnoea syndrome, obstructive hypoventilation syndrome etc
- this study is aimed to explore the lung function changes in obese children

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- It might predict the elevated BMI is one of the risk factors of abnormal pulmonary function which might lead to pulmonary disease in later life
 - In addition, it can highlight the benefit of prevention of childhood obesity and increased cardio respiratory fitness which can improve qualities of life.

AIM

- To study the lung function in obese children.

OBJECTIVE

- To determine the pulmonary function status in obese children and non obese children.
- To compare the lung function status and BMI (percentile).
- To find out the correlation between the lung function status and BMI (kg/m²).

RESEARCH METHODOLOGY

- **Study Design**

A school based cross sectional comparative study.

- **Study Population**

The children between 10 to 12 years.

- **Study Area**

The study was conducted at No(2) Basic Education High School Mingaladon township, Yangon Division.

- **Study Period**

From February 2015 to 31st December 2015.

- **Sample size**

$$n = \frac{\left(z_{1-\alpha/2} + z_{1-\beta}\right)^2 (\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)^2}$$

- Where,
- n = minimum required sample size for each group
- z= Reliability coefficient (1.96)
- For 95% confidence level
- Z= 1.96 (for 2 sided)
- For power 90%
- Z = 1.28
- According to The effect of obesity degree on childhood pulmonary function test, (Emelet.al., 2014)

- μ_1 = mean PEF among normal children
= 84.1
- μ_2 = mean PEF among obese children
= 72.9
- σ_1 = standard deviation of PEF among normal children
= 12
- σ_2 = standard deviation of PEF among obese children
= 12.6
- $n = 26$
- Drop-out 10% considered in this study. So, minimum required sample size is 30 children for each group.

Inclusion criteria

- All children between 10 to 12 years of age who can perform spirometry satisfactorily after getting informed consent

Exclusion criteria

- Subjects with
 - - Obesity secondary to an organic condition
 - - Chronic cardiopulmonary disease
 - - Skeletal abnormality
 - - Congenital defect

Sampling method and procedure

- There are five basic education high schools at Mingaladon Township.
- One of school was selected randomly by lottery method for this study.
- The permission to do this study was obtained from the Township Education Officer. After consultation with Township Education Officer, Head master of selected school was met and explained about the research such as purpose of the study.
- Collection of basic data such as numbers of classes, number of students between 10 to 12 years of age were done.
- Weight and height of the selected school children were measured .
- Body mass index of students were calculated and the students divided into three groups such as normal weight, over weight and obese.
- According to sample size, the 30 subjects from each group were selected randomly and informed consent were taken.
- Lung function by spirometry of selected subjects were done.

Data analysis

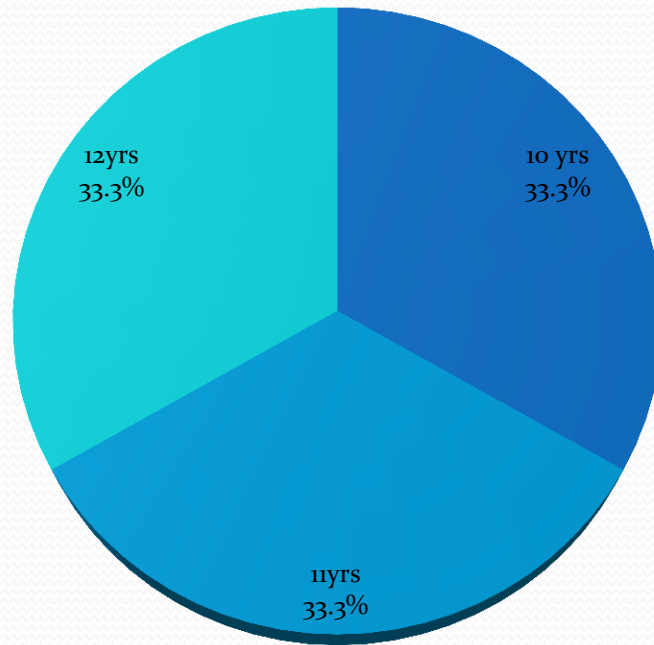
- Data was collected by using profoma and all the data checked, and then coded by manually.
- Data analysis was done by using Statistical Package for Social Science (SPSS 23).
- The frequency distribution of variables was presented as table, chart and diagram.
- The association between frequency data was analyzed by Chi-square test and numerical data was analyzed by ANOVA test. A p value of <0.05 considered statistically significant.
- The correlation was calculated by bivariate pearson correlation p value at 0.01.

Ethical consideration

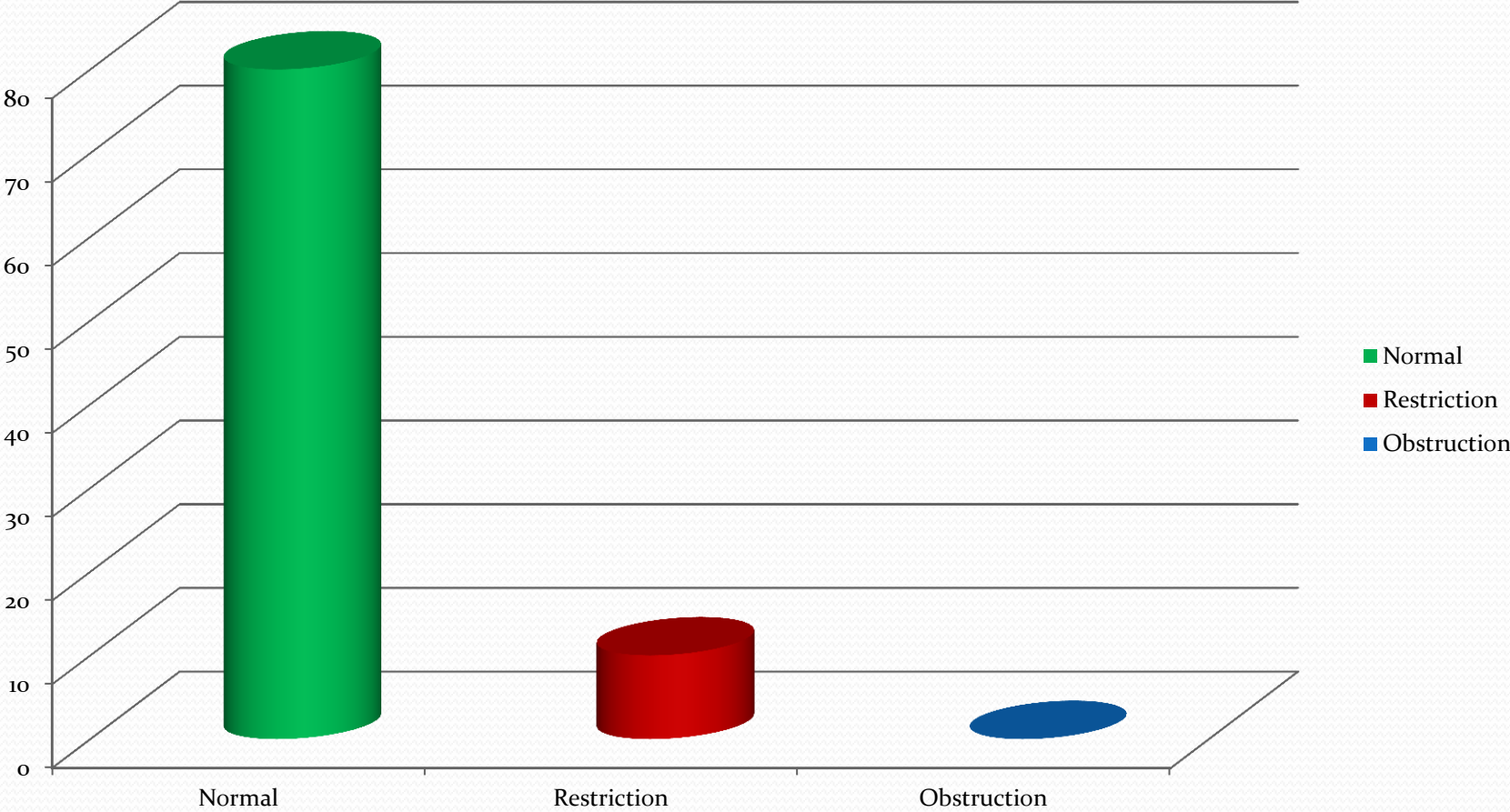
- Written informed consent taken after explanation of the study and performed procedures and methods.
- Participants in this study was invited and explained for procedures and their participation were voluntary.
- The procedure were free of charge for participants
- This study were measuring of weight and height, calculation of BMI and blowing of spirometry for lung function.
- There was no risk or any harm to participants.
- The provision madeto ensure respect for the privacy of participants and for confidentiality of records.
- This study was done after approval of Postgraduate board of Defense Services Medical Academy.

RESULTS

Age distribution of the study population



Lung function abnormality in the study



BMI(percentile) and Lung Function Test Distribution

BMI (Percentile)		Lung Function		Total	Chi-Square	P value
		Normal	Restriction			
Normal	n	30	0	30	6.300	0.043
	%	100%	0.0%	100%		
Over weight	n	26	4	30		
	%	86.7%	13.3%	100%		
Obese	n	24	6	30		
	%	80%	20%	100%		
Total	n	80	10	90		
	%	88.9%	11.1%	100%		

Comparison between mean FVC (L) and BMI (percentile)

BMI (Percentile)	Number		FVC (L)	f	p
Normal (5-85)	30	Mean	2.70	1.496	0.230
		Std. Deviation	0.33		
		Minimum	2.03		
		Maximum	3.63		
Over Weight (85- <95)	30	Mean	2.74		
		Std. Deviation	0.6		
		Minimum	1.97		
		Maximum	4.5		
Obese (≥ 95)	30	Mean	2.55		
		Std. Deviation	0.41		
		Minimum	1.78		
		Maximum	3.38		

Comparison between mean FEV1(L) and BMI (percentile)

BMI (Percentile)	Number		FEV1 (L)	f	p
Normal (5-85)	30	Mean	2.34	1.995	0.142
		Std. Deviation	0.30		
		Minimum	1.72		
		Maximum	3.12		
		Mean	2.31		
Over Weight (85- <95)	30	Std. Deviation	0.5		
		Minimum	1.64		
		Maximum	3.82		
		Mean	2.14		
		Std. Deviation	0.35		
Obese (≥ 95)	30	Minimum	1.43		
		Maximum	2.79		

Comparison between mean FEV1/FVC (%) and BMI (percentile)

BMI (Percentile)	Number		FEV1/FVC (%)	f	P
Normal (5-85)	30	Mean	86.31	1.581	0.212
		Std. Deviation	4.07		
		Minimum	75		
		Maximum	93		
Over Weight (85- <95)	30	Mean	84.23		
		Std. Deviation	5.5		
		Minimum	70		
		Maximum	92		
Obese (≥ 95)	30	Mean	84.3		
		Std. Deviation	5.39		
		Minimum	70		
		Maximum	93		

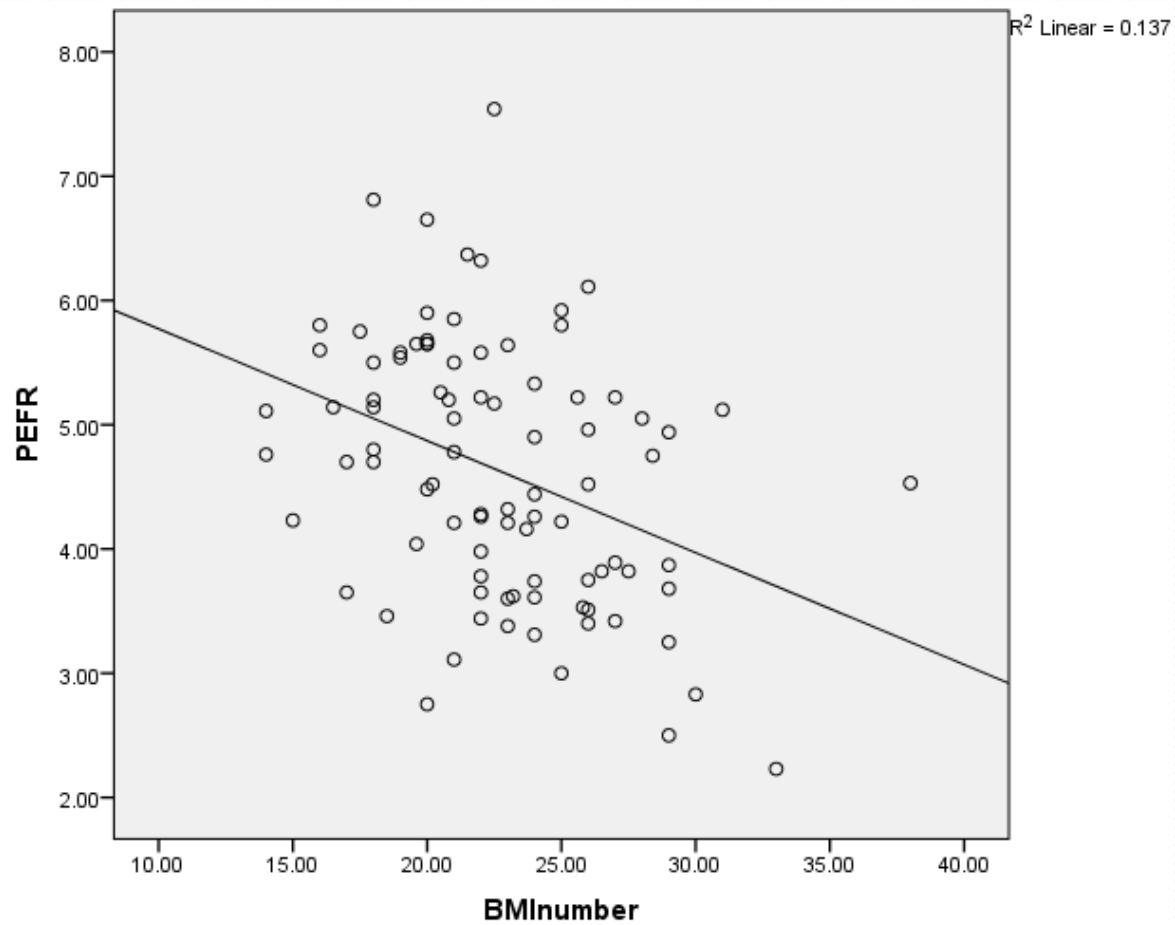
Comparison between mean PEFR(L/s) and BMI (percentile)

BMI (Percentile)	Number		PEFR (L/s)	f	P
Normal (5-85)	30	Mean	5.09	7.747	0.001
		Std. Deviation	0.87		
		Minimum	2.75		
		Maximum	6.81		
		Mean	4.67		
Overweight (85- <95)	30	Std. Deviation	1.08		
		Minimum	3.11		
		Maximum	7.54		
		Mean	4.1		
		Std. Deviation	0.94		
Obese (≥ 95)	30	Minimum	2.23		
		Maximum	6.11		

Correlation between lung function status and BMI(kg/m²)

Lung function tests	BMI(kg/m ²)	
	r	p
FVC	-0.077	0.471
FEV1	-0.140	0.189
FEV1/FVC	-0.172	0.104
PEFR	-0.370	<0.01

Correlation between PEFR and BMI (kg/m²)



Discussion

- In this study, the lung function of thirty normal weight, thirty over weight and thirty obese children between the age of 10 to 12 years from No (2) Basis Education High School, Mingaladon Township, Yangon were involved.
- The studies on over weight and obesity are important not only for prevention of disease but also for promotion of good health.
- In this study, there were 44 male and 16 female of overweight and obese children.

- . In the study of The Effect of Obesity Degree on Childhood Pulmonary Function Tests (Emel Torun et al 2014), 30 overweight, 34 obese and 64 morbidly obese children and adolescents between the ages of 9 to 17 who had admitted to paediatric endocrinology department .
- In the study of the effect of obesity on pulmonary function Li AM et al (2003), 48 male and 16 female with the medium age of 12 years who were admitted to obesity and lipid disorder clinic.

- **Comparison of the lung function abnormality in the study**
- In this study, normal respiratory function was found in 88.9% of study population and restrictive type was 11.1% and no obstructive type.
- Nan-Yin-Mu-Aye (2007) found that normal 39.29% and restrictive type 59.64% and no obstructive type.
- Li AM (2003) found that 90% with primary obesity had normal pulmonary functions.

- In this study, FEV1, FVC, FEV1/FVC and PEFR were lower in overweight and obese children compared with the normal weight children in which the PEFR was statistically significant ($p= 0.001$).
- In the study of Nan-Yin-Mu-Aye (2007) the mean FVC and FEV1 of overweight and obese children were significantly different but FEV1/FVC and PEFR in overweight and obese children were not significantly different.
- In the study of Emel Torun et al (2014), the mean FVC, FEV1, FEV1/FVC ratio values were found to decrease, but not to a statistically significant level ($p=0.232,0.089$ and 0.054 , respectively) but in the mean of PEF was significantly different ($p<0.001$).

- In this study, there were negatively correlation between lung function status and increasing BMI(kg/m²) in which correlation of FVC,FEV1 and FEV1/FVC were not significant although PEFr was statistically significant ($p = <0.01$).
- Li et al (2008) found that reduction in the functional residual capacity and a diffusion impairment in obese adolescent correlated to the degree of obesity.

Conclusion

- This study found that lung function abnormalities in overweight and obese compared with normal weight children.
- There were normal respiratory function 88.9%, restrictive type 11.1% and no obstructive type.
- this study showed that lung function was reduced in overweight and obese children and had correlation between reducing of lung function status with increasing of BMI(kg/m²). The restrictive pattern abnormality was only occurred in overweight and obese children

- So, spirometry is one of the components of lung function test and other tests such as static lung volume measurement, diffusing capacity, respiratory muscle strength and arterial blood gas are needed to consider in further study.
- It is important to assess the longitudinal studies into adulthood.
- Reassessment of lung function test after weight reduction should be done to detect the changes of lung function abnormalities and to detect the cardiopulmonary fitness which can improve qualities of life.

RECOMMENDATIONS

Based on this study the following recommendation would be made.

- The effects of environmental factors such as air pollution, overcrowding, parental smoking on the respiratory function of overweight and obese children should be considered in next studies.
- More different age groups, overweight and obese children should be studied to get better correlation between lung function test and obesity.
- The study of difference between obese children with respiratory symptoms and without respiratory symptoms.

- Not only spirometry, other lung functions such as plethysmography, diffusion capacity, static lung volume measurement and arterial blood gas should be carried out in lung function abnormalities children.
- Community based study should be carried out to represent the Myanmar overweight and obese children in all urban and rural areas.
- Reassessment of the lung function after weight reducing
- Education to parents and patients to reduce weight and prevent the obesity to better the quality of life.

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THANK YOU