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A Study of Lung Volumes and Capacities in Children and Adolescents of Western Odisha

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Abstract: ***Introduction:*** *PFT has been used as an important diagnostic tool to determine the pulmonary conditions. It can diagnose various restrictive and obstructive lung diseases. Burla, a small town In Western Odisha, in Sambalpur district, has a large number of sporadic cases of bronchial asthma, mostly in young age group. This work is done to find out the reason for such an occurrence of bronchial asthma here.* ***Material and Method:*** *72 boys from Government High School , Burla were taken and PFT done on them by Spirometer to detect the various parameters like Vital Capacities, Inspiratory Reserve Volume, Expiratory Reserve Volume.* ***Result:*** *The Vital Capacities in children were found lower in comparison to the studies done on children of the same age groups on other parts of the country and also western countries.* ***Conclusion****: Children in this area has some weakness in ventilatorry efficiencies which can be attributed to inadequate nutrition and environmental factors.*

Keyword*: Brinchial asthma, Vital Capacity, Spirometer*

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I. Introduction

Various processes involved in the act of respiration are directed towards arterialization of of blood and any alteration in the respiratory activity also tends to alter the body homeostasis. Pulmonary function test are non invasive tests that shows how well the lungs are working. The test measures lung volumes, capacities and rates of flow . Normal value of PFTs varies from person to person. The present study was done in Burla, Sambalpur, a part of Western Odisha where sporadic cases of bronchial asthma are high. Many medical students, who had no previous history of asthma, developed the disease sporadically after they came here. The present work had been taken to evaluate the different lung volumes in healthy individuals with aid of spirometer.

The aim of the study was to determine the normal values of various PFT measured spirometrically for healthy school children as there are no values reported previously in this region. The objective was to use the idea to bring out the reason for such sporadic cases of asthmatic here.

II. Material and method

The present study was conducted in the PG Department of Physiology, VIMSAR. The cases for the study were selected from Government High School, Burla from December 2015 to October 2017. 72 boys of age group 10-15 years were taken as study group.

Exclusion criteria - History of cardiopulmonary disease, smoking and physical abnormality of chest wall.

Basic data of the students noted were-

1- Age in years
2- Height in centimetre(cm)
3- Weight in Kilogram(Kg)

PFT was done using IncoBenedict –Roth Spirometer.

Mean and Standard Deviation of Tidal Volume, Vital capacity, Inspiratory Reserve volume and Expiratory Reserve Volume of the 72 children were calculated. Also the Vital Capacity in relation to height, weight, age and body surface area(BSA) calculated.

Statistical analysis was done by help of Window Excel.

III. Result

All the 72 children were taught and made familiar with Benedict-Roth's Spirometer. All the above mentioned Pulmonary Function Tests were done and the results obtained were expressed in the following tables.

Table-1

Sl.No	Parameter	Mean	S.D (±)
1	Tidal Volume (TV) in ml	366.64	54.74
2	Inspiratory Reserve Volume(IRV) in ml	834.31	258.54
3	Expiratory Reserve Volume(ERV) in ml	426.21	87.85
4	Inspiratory capacity(IC) in ml	1200.80	282.49
5	Vital Capacity	1627	340.82

TABLE 2- Vital capacity in ml in relation to age-

Sl. No.	Age(YRS)	Number Of Students	Vital capacity(Mean in ml)	Std Dev(±)
1	10	11	1208.81	88.7
2	11	9	1409.04	238.2
3	12	12	1542.33	261.41
4	13	14	1669.41	286.10
5	14	16	1792.90	246.22
6	15	10	2060.13	152.94

TABLE 3- Vital capacity in ml in relation to height-

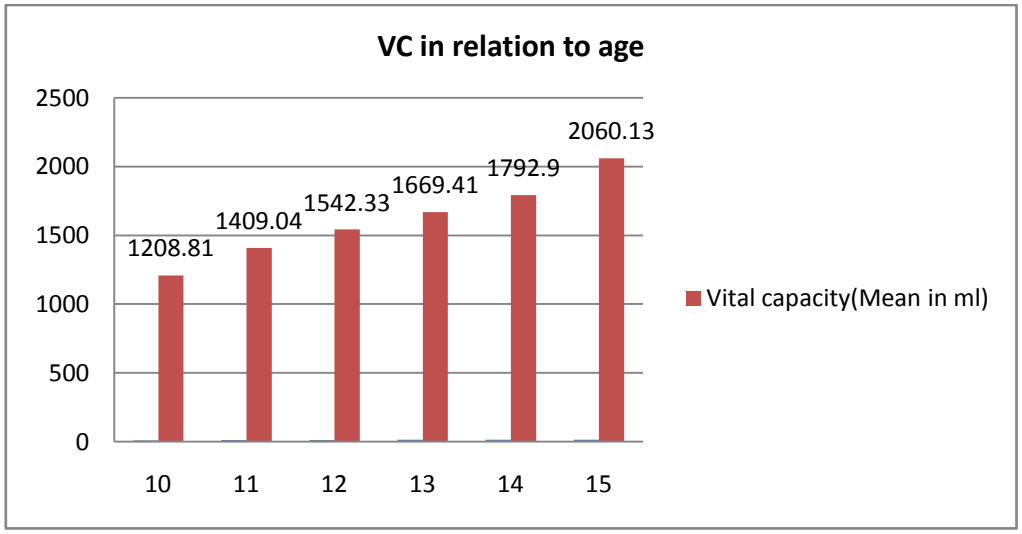
Sl. No.	Height in cm	Number Of Students	Vital capacity(Mean in ml)	Std Dev(±)
1	116 - 125	4	1154.27	114.11
2	126 - 135	12	1264.15	352.17
3	136 - 145	23	1499.72	236.60
4	146 - 155	24	1866.00	260.82
5	156 - 165	4	1995.27	103.62
6	166 - 175	3	2014.26	277.25

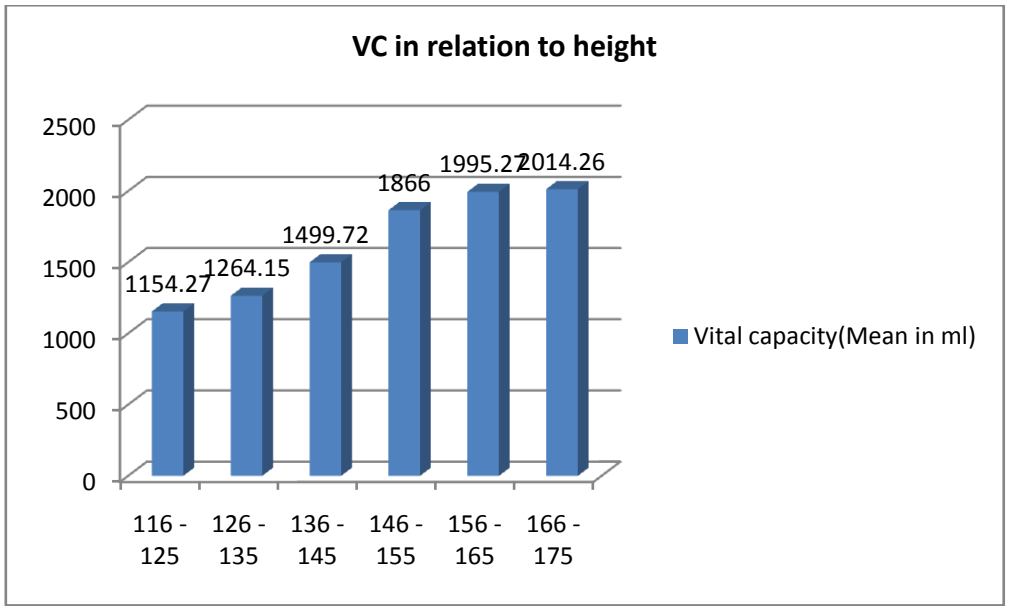
Table 4- Vital capacity in ml in relation in Body Surface Area m^2–

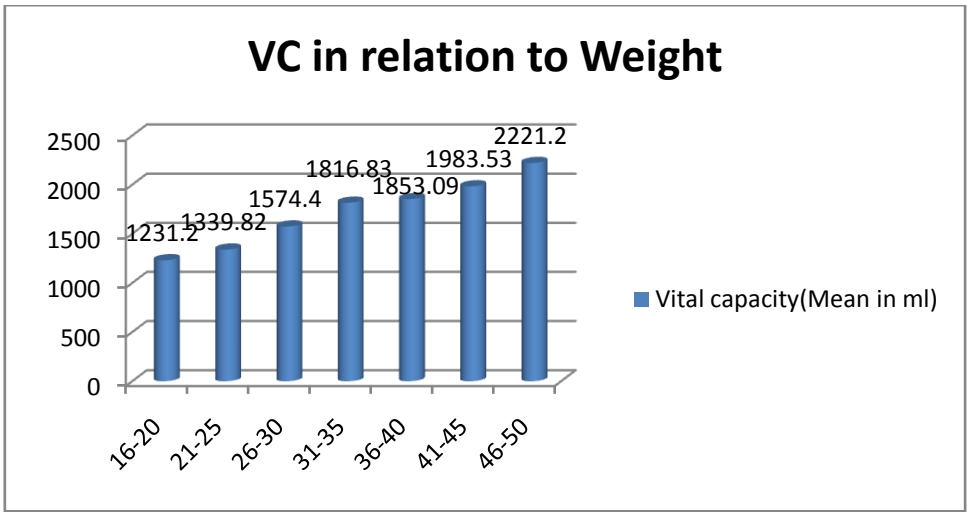
Sl.No	BSA	Number Of Students	Vital capacity(Mean in ml)	Std Dev(±)
1	0.81-0.9	9	1224.36	181.21
2	0.91-1.00	13	1327.46	107.4
3	1.01-1.10	11	1548.30	248.17
4	1.11-1.20	10	1675.41	252.60
5	1.21-1.30	16	1912.17	190.48
6	1.31-1.40	8	1918.58	136.96
7	1.41-1.50	2	2010.85	14.76
8	1.51-1.60	1	2328.90	-

Table 5- Vital capacity in ml in relation to weight in Kg-

Sl.No	weight	Number Of Students	Vital capacity(Mean in ml)	Std Dev(±)
1	16-20	7	1231.20	201.73
2	21-25	17	1339.82	147.21
3	26-30	11	1574.40	263.59
4	31-35	12	1816.83	288.43
5	36-40	13	1853.09	204.41
6	41-45	6	1983.53	76.42
7	46-50	2	2221.20	152.31




VC in relation to height
2500
2000
1500
1000
500
0
1154.27
1264.15
1499.72
1866
1995.27
2014.26
116 - 125
126 - 135
136 - 145
146 - 155
156 - 165
166 - 175
Vital capacity(Mean in ml)


VC in relation to Weight
2500
2000
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1231.2
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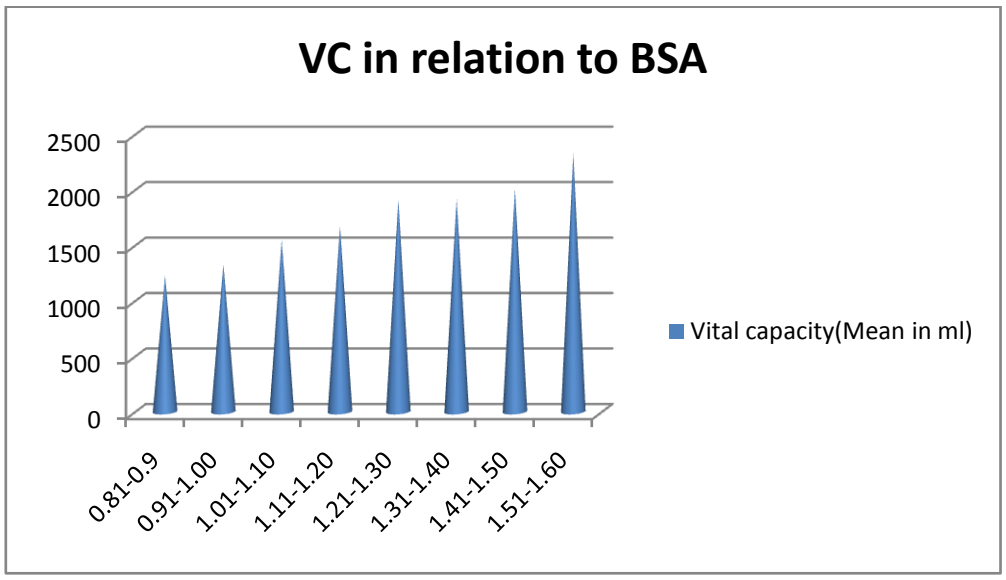
16-20
21-25
26-30
31-35
36-40
41-45
46-50
Vital capacity(Mean in ml)


VC in relation to BSA
2500
2000
1500
1000
500
0
0.81-0.9
0.91-1.00
1.01-1.10
1.11-1.20
1.21-1.30
1.31-1.40
1.41-1.50
1.51-1.60
Vital capacity(Mean in ml)

IV. Discussion

In clinical practice the interpretation of a given lung function test value under pathological state depends upon its comparison with the normal values in health of the same individual. The mean vital capacity in age group of 10-15 yrs is found to be 1627 ml. It is comparable to other Indian workers, Singh and Prabhakaran(1957)[1] who worked on 111 subjects in the age group 6-16 years and reported vital capacity as 1725 ml.

The lower values of vital capacity might be primarily due to difference in body size of test groups in different setup as well as different geographic environment of the same age group. In addition, the poor nutritional status leads to poor growth spurt, muscular growth, physical fitness and working capacity. Western countries showed a higher value for vital capacity due to high rate of metabolism and increased Oxygen consumption, which leads to higher pulmonary ventilation. Also there is increased depth of pulmonary excursion. In warmer climates just reverse condition prevail, so that normal standards are bound to be low.

Vital capacity in relation to weight is quite as par with that reported by Levitzky et al(1991)[2] and Utell et al (1982)[3] and Vital capacity in relationship with body surface area is comparable to that of studies of Lyons et al (1960)[4,5] and Ferris et al(1952)[6], keeping the age group in the same range.

An abrupt rise in vital capacity around 15 years in boys was noted. This is attributed to the increase rate of growth and other profound changes like increase in chest size and muscle mass which occurs at this age due to puberty.

V. Conclusion

Despite enormous medical literatures relating to pulmonary function tests in children, in various journal and periodicals in addition to text book description, the current study was attempted to set a standard for our laboratory. The encouragemet for such a study also equally attributes to increased geographical distribution of respiratory disease in this zone of the state.

The results were compared with those of other workers of both Indians and other countries and found to be lower. This might be primarily due to difference of body size and environmental conditions. In addition, poor nutritional status leads to poor body built, muscular growth, physical fitness and working capacity. The high value in West may be attributed to the well balanced diet, the high rate of metabolism and favourable climate condition which leads to increase in pulmonary efficiency.

All the findings in present study are even on lower side when compared with other Indian workers. So it is assumed that the environment in this zone has some effect on it and it will help the pulmonologists to find the cause for this lower values and to take remedial measures.

References

[1]. Singh and Prabhakaran- Singh H D and Prabhakaran S.: Pulmonary Function Studies, JIMA, 29:169, 1957.
[2]. Levitzky et al : Pulmonary physiology, Brit J Chest Dis, pp. 327-331,1991.
[3]. Utell M J et al: Pulmonary function studies among infant and adolescents, Archieves, 43: 183-187, 1982.
[4]. Lyon H A, Tanner R W: J of Applied Physiology, 17, p 603, 1962
[5]. Lyon H A, Tanner R W, Ticco T : Pulmonary Function Studies in children. Amer. Jour Dis Child, 100:196,1960.
[6]. Ferris B G, Whittenberger J L and Gallagher J R : Maximum Breathing Capacity and Vital Capacity in male children and adolescents. Paed., 9:p659-669, 1952.

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