IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 3 Ser. 16 (March. 2019), PP 59-65
www.iosrjournals.org

Comparison of Anthropometric and Pulmonary Function Parameters in Diabetes & Healthy Controls

IramJaan[1], Mir Maroosha Farooq [1], Mumtaz Gowher[2], Varun Malhotra[3]
[1]Senior resident, SKIMS medical college Srinagar, [2]LecturerSKIMS medical college Srinagar, [3] AIIMS, Bhopal.
Corresponding Author: IramJaan

Abstract: *Obesity is becoming a pandemic these days. People are overweight and are losing the joy of self control. Lack of exercise, poor dietary habits lead to hypertension and diabetes mellitus. We wanted to scientifically compare anthropometric and pulmonary function parameters in Diabetes & Healthy Controls. The present study was a case control hospital based study conducted in the Department of Physiology in collaboration with the Department of Internal Medicine and Department of TB and Chest in Santosh Medical College and Hospital, Ghaziabad. The study included 50 type II diabetic patients and 50 healthy persons, confirmed by normal blood glucose levels, as control group.Significant effect of BMI was observed on FVC and FEV 1. Diabetic patients with BMI < 30 kg/m^2 had higher percentage of the predicted FVC and FEV1 to those with BMI > 30kg/m^2. An inverse relation was observed between waist circumference (WC) and FVC and FEV1 in both male and female diabetic patients. The aforesaid observations clearly establish the fact that chronic hyperglycemia and upper body adiposity in diabetic patients cause restrictive type of pulmonary dysfunction as is evidenced by significant reduction in FVC, FEV1 and FEV1/ FVC ratio.*

Date of Submission: 20-03-2019 Date of acceptance: 06-04-2019

I. Introduction

Obesity is becoming a pandemic these days. People are overweight and are losing the joy of self control. Lack of exercise, poor dietary habits lead to hypertension and diabetes mellitus.

Overweight and obesity may account for as many as 15-30% of deaths from coronary heart disease and 65-75% of new cases of DM[1]. Diabetes is one of the most common chronic childhood diseases[2]. Blood pressure and hypertension prevalence rates are much higher in men than in women, demonstrating gender dichotomy in blood pressure[3]. Excessive body fat and hypertension are important public health challenges in both economically developing and developed countries[4].

There is one another widely used method to gauge the nutritional status, especially obesity is Body Mass Index [BMI], which equals to {weight[in kg] ÷ height[in m^2]} It can be used as an indicator for tracking body size throughout the life cycle[5]. BMI is positively and independently associated with morbidity and mortality from hypertension, Type II Diabetes Mellitus and other chronic diseases[6]. The BMI is an attempt to qualify the amount of tissue mass[muscle, fat and bone] in an individual and then categorize that person as underweight [<18.5], normal weight [22-24] or obese [>30] based on that value. The BMI trait is influenced by both genetic and non-genetic factors and it provides a paradigm to understand and estimate the risk factors for health problems[7]. The BMI ranges are based on relationship between body weight and disease and death[8]. Overweight and obese individuals are at an increased risk for the diseases like coronary heart disease, dyslipidemia, Type II Diabetes mellitus, gall bladder disease, hypertension, osteoarthritis, sleep apnea, strokes, cancers [9].We wanted to scientifically compare anthropometric and pulmonary function parameters in Diabetes & Healthy Controls

II. Material And Methods

The present study was a case control hospital based study conducted in the Department of Physiology in collaboration with the Department of Internal Medicine and Department of TB and Chest in Santosh Medical College and Hospital, Ghaziabad. The study included 50 type II diabetic patients and 50 healthy persons, confirmed by normal blood glucose levels, as control group. Control group were matched to the patients by age, and WC. The patients were collected randomly from the outpatient department of internal medicine. Pulmonary function test was conducted in collaboration with the department of TB and Chest in Santosh Medical College and Hospital.

Selection of subjects

Diabetic patients on oral medication and/or insulin administration for last 5 years of age group of 40-60 yrs were included in the study. An informed consent was taken. Patients who had a history of smoking,

chewing tobacco, chronic obstructive pulmonary disease, Asthma , Interstitial lung disease, Acute respiratory tract infection, occupational diseases like pneumoconiosis, neuromuscular diseases, chest surgeries or other major surgeries were excluded from the study.

METHODS

A detailed medical history was taken from patients. The patients for participation in the study were divided into two Groups:

Group 1: Type II diabetic patients on oral and/or insulin administration (50 subjects)

Group 2: apparently healthy subjects, matched for age, BMI and waist circumference (50 subjects)

General physical examination was performed on all the subjects.

A) Physical parameters

- **Height:** A vertical measuring rod was fixed to the wall and the subjects were asked to remove the shoes and stand on flat floor in front of the measuring rod with feet parallel and heels, buttocks, shoulders and back of head touching upright side. The head was held comfortably erect with lower border of the orbit in the same horizontal plane as the external auditory meatus. The arms were kept hanging by the sides in natural manner. The horizontal bar of the measuring rod was lowered to touch the head. The height was recorded to the nearest centimetre (Cm). [45]
- **Weight:** The platform beam balance (Krupas, N. Delhi) was used to record the weight. The subjects were asked to remove the shoes and wear minimum clothings and stand on the center of the platform. The reading was recorded to the nearest kilogram(Kg).
- **Body Mass Index (BMI)** from Quetelet's index i.e.

Weight (kgs)/Height (m^2)

BMI interpretation[10]

BMI < 16.00 Grade 3 thinness

BMI 16.00 – 16.99 Grade 2 thinness

BMI 17.00- 18.49 Grade 1 thinness

BMI 18.5- 24.99 Normal range

BMI 25.00 – 29.99 Grade 1 overweight

BMI 30.00 – 39.99 Grade 2 overweight

BMI>40.00 Grade 3 overweight

- **Waist circumference (WC)**(in cms)

It was measured at the mid point between the lower border of the rib cage and iliac crest.

WC > 102 cm in men- obese

WC > 88 cm in women-obese[11]

- **Hip Measurement**

Subject stood erect with arms at the sides and feet together. There should be maximum extension of the buttocks. The tape was placed around the buttocks in a horizontal plane. It did not compress the soft tissue. The measurement was recorded to the nearest 1 cm.

- **Waist Hip ratio (WHR)**- Circumference of waist divided by that of hips.

WHR> 0.9 for men – obese

WHR > 0.85 for women – obese[11]

Biochemical Parameters

Estimation of blood glucose levels was done by Glucometer (OptiumXceed, Abbot, Alameda, USA) Statistical analysis was performed using Computer Software Microsoft Excel and SPSS version 21(IBM Inc.). Chi squared test was used to compare nominal data and student t test was used for the comparison of other types of data. A p value of < 0.05 was taken as significant.

III. Results

Anthropometric data (Table 1)

Variables	Diabetic patients (n=50)	Control group (n=50)
Age(years) Mean +SD	**40-60 (50.4+ 8.2)**	**40-60 (48.2+ 6.8)**
Gender (male/female)	**21/29**	**20/30**
BMI(kg/m^2)* Mean + SD	**17.9-40 (27.6+3.3)**	**17.5-38.5 (24.9+4.2)**
WC (cms) Mean + SD	**65- 125 (86.2+13.8)**	**69-118 (93.9+12.2)**

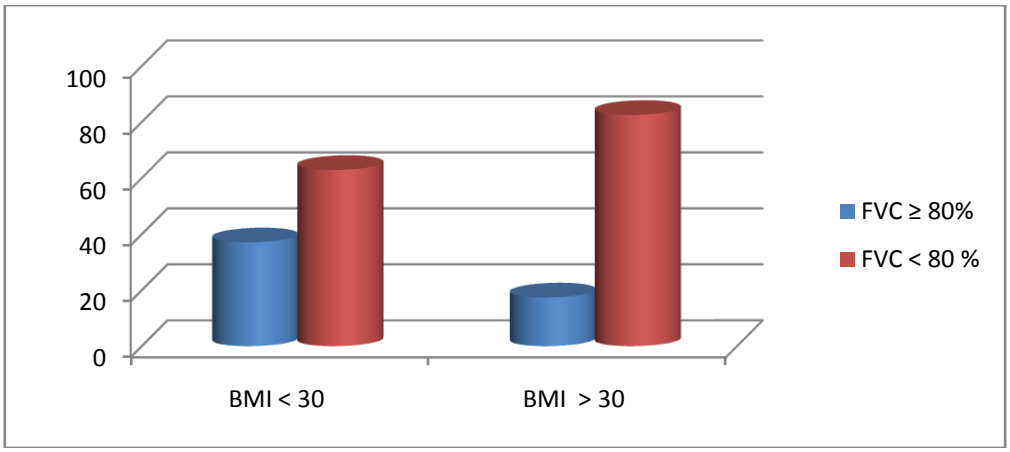
***P<0.0002**

The effect of BMI on the percentage of the predicted FVC in diabetic patients (Table2)

BMI	FVC > 80% predicted	FVC < 80% predicted	Total
< 30 (kg/m^2)	10(37.07%)	17(62.93%)	27
>30 (kg/m^2)	4(17.4%)	19 (82.6%)	23
Total	14	36	50

P < 0.05

In the current study, a significant effect of BMI was observed on FVC and FEV1. Diabetic patients with BMI < 30 kg/m2 had a higher percentage of the predicted FVC and FEV1 compared to those with BMI > 30 kg/m2.

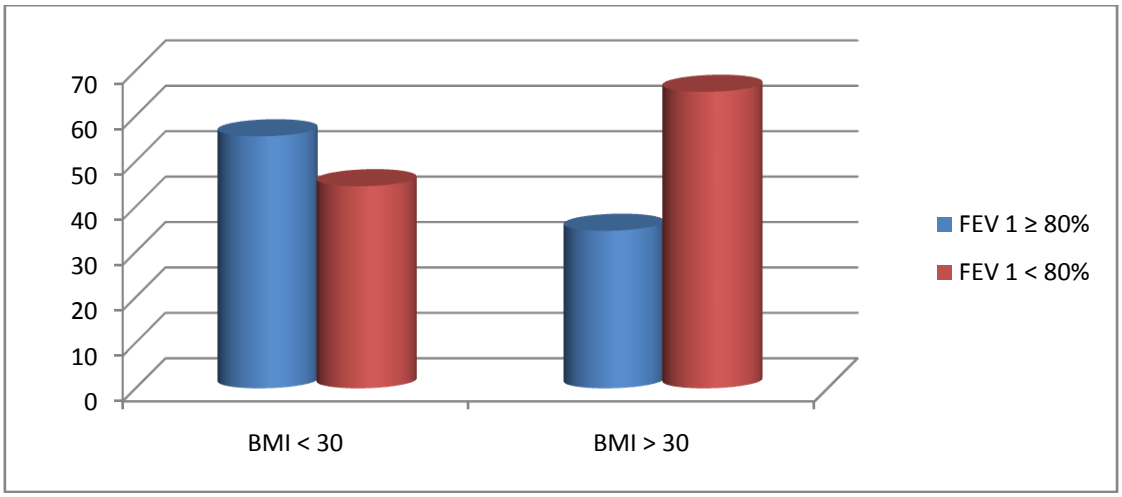


The effect of BMI on the percentage of the predicted FVC in diabetic patients.(Figure A) P < 0.05

The effect of BMI on the percentage of the predicted FEV1 in diabetic patients(Table 3)

BMI	FEV1 > 80% predicted	FEV1 < 80% predicted	Total
< 30 (kg/m^2)	15(55.5%)	12(44.5%)	27
>30 (kg/m^2)	8(34.7%)	15 (65.3%)	23
Total	23	27	50

P < 0.05



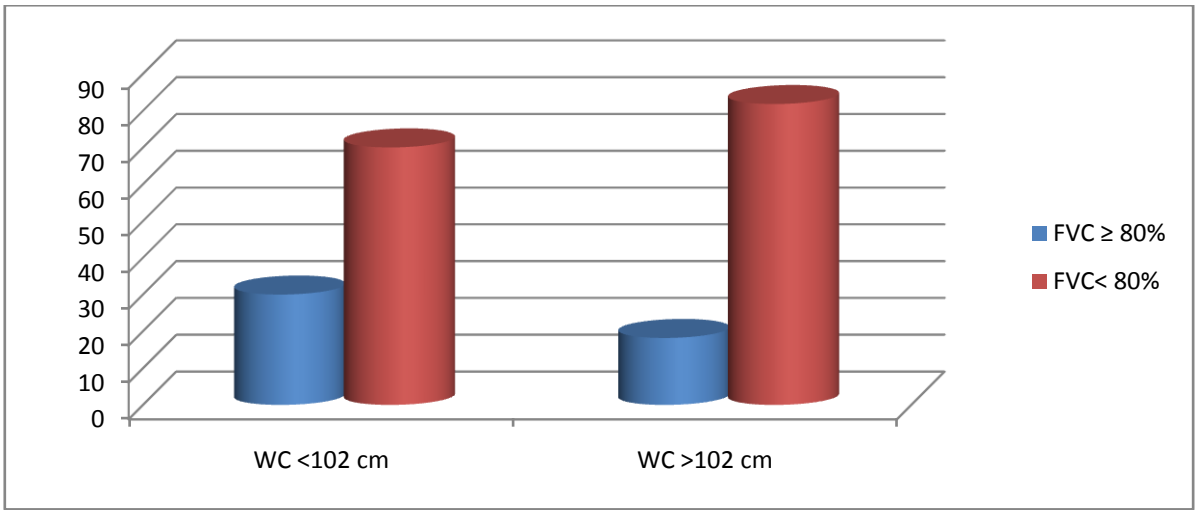
The effect of BMI on the percentage of the predicted FEV1 in diabetic patients. (Figure B) P < 0.05.

The effect of WC on FVC and FEV1 in diabetic patients. (Table 4)

An inverse relationship is observed between WC and FVC and FEV1 in both male and female diabetic patients.

WC	FVC > 80% predicted	FVC < 80% predicted	Total
<102 cm	3(30%)	7(70%)	10
>102 cm	2(18.2%)	9 (81.8%)	11
Total	5	16	21

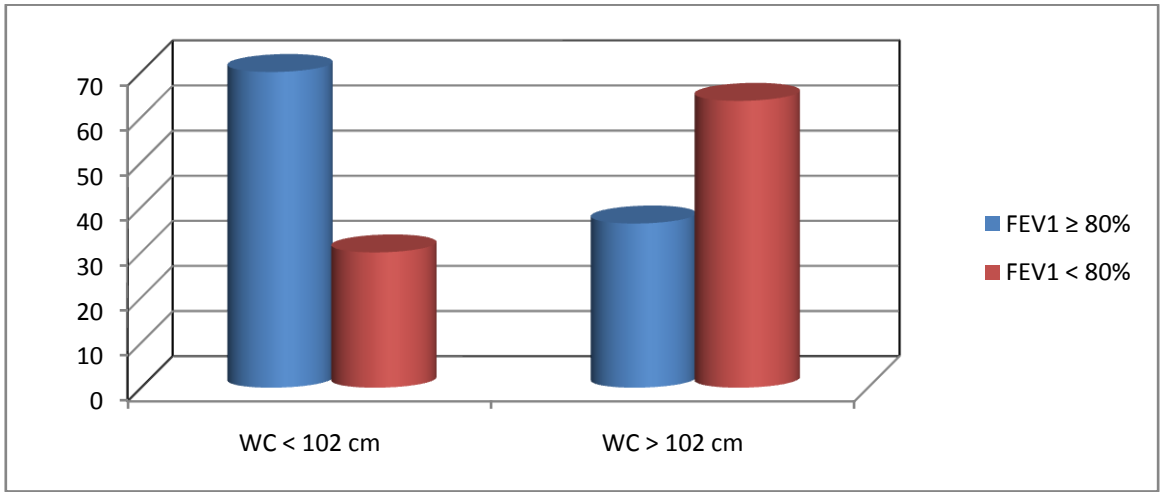
P < 0.05



The effect of WC in male diabetic patients on the percentage of the predicted FVC. P <0.05 (Figure C).
The effect of WC in male diabetic patients on the percentage of the predicted FEV 1 (Table 5)

FEV1 < 80% predicted	Total	WC	FEV1 > 80% predicted
3(30%)	10	<102 cm	7(70%)
7 (63.6%)	11	>102 cm	4(36.4%)
10	21	Total	11

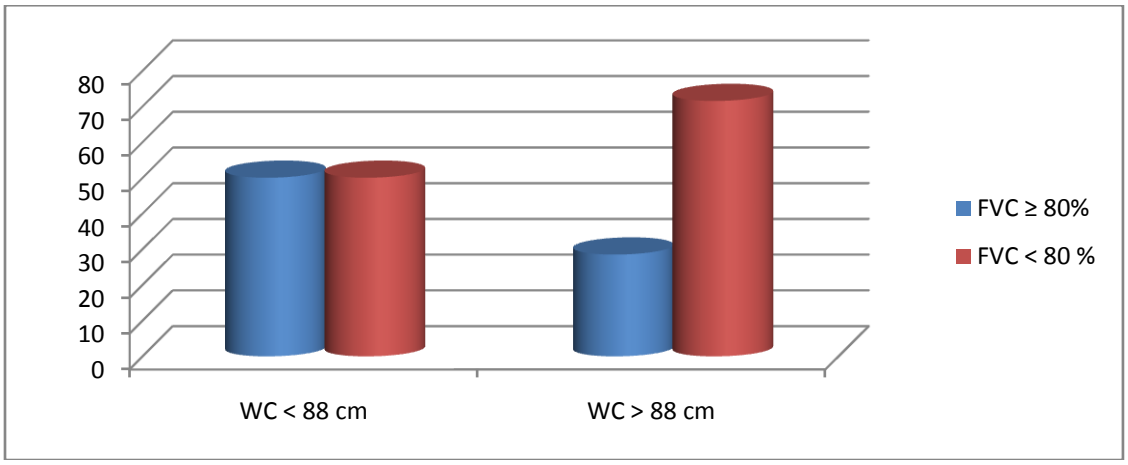
P < 0.05



The effect of WC in male diabetic patients on the percentage of the predicted FEV 1. P < 0.05. (Figure D)
The effect of WC in female diabetic patients on the percentage of the predicted FVC. (Table 6)

WC	FVC > 80% predicted	FVC < 80% predicted	Total
<88 cm	4(50%)	4(50%)	8
>88 cm	6(28.5%)	15 (71.5%)	21
Total	10	19	29

P < 0.05

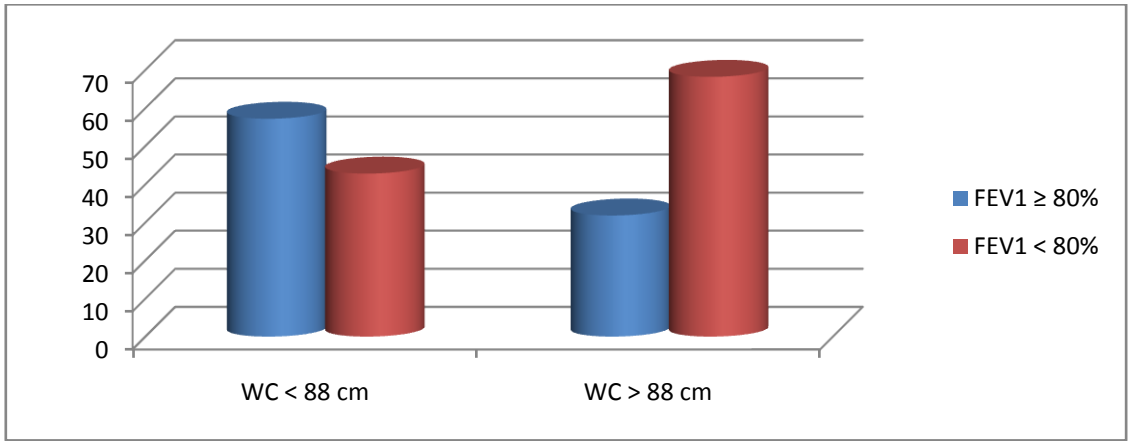


The effect of WC in female diabetic patients on the percentage of the predicted FVC.(Figure E) P < 0.05.

The effect of WC of female diabetic patients on the percentage of the predicted FEV1. (Table 7)

WC	FEV1 > 80% predicted	FEV1 < 80% predicted	Total
<88 cm	4(57.2%)	3 (42.8%)	7
>88 cm	7(31.8%)	15 (68.2%)	22
Total	11	18	29

P < 0.05



The effect of WC of female diabetic patients on the percentage of the predicted FEV1.(Figure F) P < 0.05

IV. Discussion

In this study, there was no significant effect of the age of the diabetic patients on FVC and FEV1, while gender revealed a significant effect only on FEV1. This may be explained by effect of DM that overcomes the physiological effect of age and gender on FVC and FEV1.

The heart needs to work more if there is more fat tissue around the capillaries. The need to reduce fat in woman accumulated in the hips and males in abdomen form is essential to give rest to the heart and promote longevity. By right eating and exercise the patients were counselled to follow health laws [12,13]

Many studies have reported a significant relationship between hypertension and risk factors such as age, BMI, smoking and physical inactivity[14].Regular activity is a key part of managing diabetes along with proper meal planning taking medications as prescribed and stress management. When we are active, our cells become more sensitive to insulin so it can work more efficiently. Our cells also remove glucose from the blood using the mechanism totally separated from insulin during exercise. Therefore, physical activity has important health benefits for children and young adolescents and is also associated with more resistible biological cardiovascular disease risk factor profiles by lowering blood pressure, maintaining the lipoprotein levels and decreases the adiposity and thus enhancing their abilities to perform daily tasks[15].

Lazarus *et al.* [16] found the decrease in FVC and FEV1 in patients with hyperinsulinemia over 20 years follow-up independent of age, adiposity, and cigarette smoking.Murthy M [17]concluded from their study that males with diabetes tended to be affected more than females, attaining lower levels of their percentage of predicted values.Adeyeye O O*et al.*,[18] found that increase in age and longer duration of diabetes has a potential for longer exposure of the lung in diabetics to longer inflammatory processes and end glycation products which

are part of the diabetes process and their consequences. In this scenario, possible acceleration of the physiological decline effect of ageing on the pulmonary functions may occur. Their results showed that age correlated negatively and significantly with the PEFR, FEV1, and the FVC.

The current study revealed a significant relation between BMI and reduced both FVC and FEV1. Cross-sectional studies have demonstrated an inverse relationship between FEV1 and both BMI and waist circumference. This is of particular importance because FEV1 is an independent predictor of all-cause mortality [19,20].

Significant association is also documented between waist circumference of type 2 diabetic patients and the reduction in FVC and FEV1. This finding agrees with the French study which demonstrated that mild abdominal adiposity, even with a normal BMI, is associated with a lower FVC. Abdominal obesity causes a reduced inspiratory capacity (thus reducing both FEV1 and FVC) by making descent of the diaphragm into the abdomen more difficult and is associated with increased thoracic fat which reduces chest wall compliance[21].

The presence of low-grade chronic inflammation could be considered as a contributing factor to pulmonary abnormalities detected in obese diabetic patients. Similar to the active implication of proinflammatory adipokines in the development of insulin resistance associated with obesity, a potential interaction between abnormal adipose tissue activity, systemic inflammation and pulmonary function has been suggested [22]. Given that, pro-inflammatory cytokines levels have been reported to be higher in obese type 2 diabetic individuals compared with those without diabetes [23].

V. Conclusion

By right eating, exercise and right thinking the patients were counselled to follow health laws.Two words makes a person healthier: Eat less.There are lots of reasons for people to lose weight- to be healthier, to look better, to feel better , to have more energy. No matter what the reason, successful weight loss and healthy weight management depend on sensible goals and expectations. The foundation of a successful weight loss program remains a combination of a healthy diet and exercise customized for you. Simply reducing food intake to lose weight can lead to a decline in muscle mass and bone density. So even though the weight goes down, resting metabolism is reduced making the body more prone to putting on fat. More skeletal muscle can prevent "rebound" weight gain. Exercising half hour daily for 5-7 times a week can help lose weight, improve fitness.Significant effect of BMI was observed on FVC and FEV 1. Diabetic patients with BMI < 30 kg/m^2 had higher percentage of the predicted FVC and FEV1 to those with BMI > 30kg/m^2. An inverse relation was observed between waist circumference (WC) and FVC and FEV1 in both male and female diabetic patients. The aforesaid observations clearly establish the fact that chronic hyperglycemia and upper body adiposity in diabetic patients cause restrictive type of pulmonary dysfunction as is evidenced by significant reduction in FVC, FEV1 and FEV1/ FVC ratio.

References

[1]. Jousilahti P, Tuomilheto J, Vartiainen E, Pekkanen J, Puska P. body weight, cardiovascular risk factors and coronary mortality, 15 year follow-up of middle-aged men and women in Castern Finland. Circulation. 93:1372-79,1996.

[2]. Alemzadeh R, Wyatt D. Diabetes mellitus in children. In;Kleigman RM, Behrmann RE, Jenson HB, Stenton BF, editors Nelson Textbook of Pediatrics. 18th Ed. Philadelphia, Pa;Saunder Elsevier; 2007.p.2406.

[3]. Ashwani et al, gender differences in anthropometric biochemical parameters and B.P. Dissertation submitted to Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka, 2012.

[4]. Kearney, PM, Whelton, M.Reynods, KWhelton, P.K. and He, J:Worldwide prevalence of hypertension, a systematic review. Journal of Hypertension 22[1],1-9,2004.

[5]. Pi-SunyerFx:Medical Hazards of Obesity. AnnIntern Med 1993;119:655-660.Pi-Sunyer Fx. Medical Hazards of obesity. Ann Intern Med.1993; 119:655-660.

[6]. Fareed M, Afzal M. [2014] Evidence of inbreeding depression on height, weight and BMI. A population based child cohort study. Am J Hum Biol 26:784-795 doi;10.1002/ajhb.22599 PMID 25130378.

[7]. Physical status: The use and interpretation of anthropometry WHO Technical Report Series [Geneva, Switzerland; WHO] 854;1-452.1995 PMID 8594834.

[8]. Executive Summary Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and obesity in adults: The Evidence Report, National Heart, Lung and Blood Institute September 1998 xi-xxx.

[9]. Booth, F.W., Gordon, S.E., Carlson, C.J. and Hamilton, M.T.[2000] Waging War on Modern chronic diseases; primary prevention through exercise biology. Journal of applied physiology, 88 [2], 774-787.

[10]. Jain AK. Manual of Practical Physiology. Ist edition.2000:1198. Vishal Printers. Delhi.

[11]. Park K. Obesity. Park's Textbook of Preventive and Social Medicine 17th Edition. 2003;299. M/S BanarsidasBhanot Publications. Jabalpur, India.

[12]. Varun Malhotra, Om Prakash Jha, Jay Prakash Jha, Shivani Gupta. Correlation of Body Age with anthropometric parameters in students. J. Basic Appl. Res 2016 2(3):277-280

[13]. Sri SriParamhansaYogananda. Scientific Healing Affirmations Part II –Method of Affirmation, Chapter 6. p 47

[14]. Hennessy,E., Hughes, S.O. Goldberg J.P. Hyatt, R.R. and Economos, C.D.[2010]. Parent child interactions and objectively measured Child Physical Activity, a cross-sectional study. International Journal of Behavioral Nutrition and Physical activity, 7,71.

[15]. Dubbert, P.M. Carithers, T.Sumner, A.E.Barbour, K.Clark, B.L.Hall, J.E. and Crook, ED [2002]. Obesity, physical inactivity and risk for cardiovascular disease. American Journal of the Medical Sciences, 324,116-126.

[16]. Lazarus R, Sparrow D, Weiss ST. Baseline ventillatory function predicts the development of higher levels of fasting insulin and fasting insulin resistance index: the Normative Aging study. Eur Respir J.1998; 12: 641-645.
[17]. Murthy M. Changes in lung function tests in type 2 diabetes mellitus. International Jour of Basic Medical Science. 2012;3:54-61.
[18]. Adeyeye OO*, Ogbera OA, Dada AO, Bamisile RT and Brodie Mens A. Correlates of Abnormal Pulmonary Function Tests in .Persons with Type 2 Diabetes Mellitus. J Pulmn Respir. 2014; 5:1.34-38
[19]. Biring MS, Lewis MI, Liu JT et al. Pulmonary physiologic changes of morbid obesity. Am J Med Sci. 1999; 318:293-297.
[20]. Chen Y, Rennie D, Cormier YF, Dosman J. Waist circumference is associated with pulmonary function in normal weight, over weight and obese subjects. Am J Clin Nutr. 2007; 85: 35-39.
[21]. Leone L, Courbon M, Thomas F, Bean K, Je go B, et al. Lung function impairment and metabolic syndrome:the critical role of abdominal obesity. Am J Crit Care Med 2009; 179: 509-516.
[22]. McClean KM, Kee F, Young IS, Elbom JS. Obesity and the lung epidemiology. Thorax .2008; 63: 649-654.
[23]. Bullo M, Garcia- Lorda P, Salas Salvado J. Plasma soluble tumor necrosis factor alpha receptors and leptin levels in normal weight and obese women: effect of adiposity and diabetes. Eur J Endocrinol. 2002; 146: 325-331.

IramJaan. "A Clinicopathological Study of Necrotizing Pancreatitis with Special Emphasis on Need for Surgery and Its Outcome." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 3, 2019, pp 59-65.