Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr ICV 2018= 82.06

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Assessment of effect of glycemic control on spirometric variables in patients of type II diabetes mellitus

[1]Tony Luke Baby, [2]Zakhi Ahmed

[1]Associate Professor, Department of Respiratory Medicine, PK Das Institute of Medical Sciences, Palakkad, Kerala, India
[2]Professor, Department of Emergency Medicine, PK Das Institute of Medical Sciences, Palakkad, Kerala, India

ABSTRACT:
Background: To assess the effect of glycemic control on spirometric variables in patients of type II diabetes mellitus. **Material and Methods:** One hundred twenty type II DM patients of both genders were divided into 2 groups of 55 each. Group I comprised of patients with good control HbA1C ≤ 7%. Group II had diabetes mellitus with poor glycemic control HbA1C > 7%. Parameters such as age, height (m), weight (kg), body mass index (BMI) were measured. All the subjects underwent fasting blood sugar level, postprandial blood sugar level, HbA1C, HsCRP (high-sensitivity C-reactive protein), serum ferritin, serum fibrinogen and pulmonary function test such as FVC (forced vital capacity), forced expiratory volume in 1 second (FEV1), FEV1/ FVC, FEV1% (FEV1 as percentage of FVC), PEFR (peak expiratory flow rate), MMEF (maximum mid expiratory rate), SVC (slow vital capacity) were performed. **Results:** Group I had 40 males and 30 females and group II had 35 males and 35 females. Percentage predicted FEV1 was 100.4 and 80.5, percentage predicted FVC was 102.8 and 72.1, percentage predicted FEV1% was 96.2 and 99.0, percentage predicted PEFR was 114.2 and 92.7, percentage predicted SVC was 82.5 and 74.5 and percentage predicted MMEF was 85.3 and 81.7 in group I and II respectively. The difference was significant (P< 0.05). **Conclusion:** Pulmonary functions were decreased significantly increased in uncontrolled diabetics.
Keywords: peak expiratory flow rate, diabetes mellitus.

Received: 15 May, 2019 Accepted: 22 June, 2019

Corresponding author: Zakhi Ahmed, Associate Professor, Department of Respiratory Medicine, PK Das Institute of Medical Sciences, Palakkad, Kerala, India

This article may be cited as: Baby TL, Ahmed Z. Assessment of effect of glycemic control on spirometric variables in patients of type II diabetes mellitus. J Adv Med Dent Scie Res 2019;7(7):271-273.

INTRODUCTION

There are 150 million diabetics worldwide. India has more than 3 crores of persons with diabetes mellitus (DM) or one-fifth of the global burden earning ignominy diabetic capital. The incidence of type 2 diabetes has been steadily increasing in urban areas to 8.4%.[1] Diabetes mellitus common metabolic disorders that share the phenotype of hyperglycemia. It includes reduced insulin secretion, increased insulin resistance, decreased glucose utilization, and increased glucose production.[2]

Adults with type 2 diabetes have lower forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC) values than the healthy population.[3] Moreover, an inverse association has been observed between fasting plasma glucose (FPG), glycosylated hemoglobin (HbA_{1c}), and spirometric values. Longitudinal studies have also documented a faster decline of FVC and FEV1 among patients with type 2 diabetes than that observed in their counterparts without diabetes.[4] More importantly, data from the Fremantle Diabetes Study showed that for every 1% increase in the HbA_{1c} level, an FVC decline of 4% predicted value was observed. Although lung damage and respiratory abnormalities were of moderate magnitude and even subclinical, there could be a long-term deleterious impact. In this regard, a 10% decrease in FEV1 was an independent predictor of all-cause mortality in the population with type 2 diabetes.[5]We performed this study to assess the effect of glycemic control on spirometric variables in patients of type II diabetes mellitus.

MATERIAL &METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected

one hundred twenty type II DM patients of both genders. Patients' consent was obtained before starting the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 55 each. Group I comprised of patients with good control HbA1C ≤ 7%. Group II had diabetes mellitus with poor glycemic control HbA1C > 7%. Parameters such as age, height (m), weight (kg), body mass index (BMI) were measured. All the subjects underwent fasting blood sugar level, postprandial blood sugar level, HbA1C, HsCRP (high-sensitivity C-reactive protein), serum ferritin, serum fibrinogen and pulmonary function test such as FVC (forced vital capacity), forced expiratory volume in 1 second (FEV1), FEV1/ FVC, FEV1% (FEV1 as percentage of FVC), PEFR (peak expiratory flow rate), MMEF (maximum mid expiratory rate), SVC (slow vital capacity) were performed. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table I: Patients distribution

Groups	Group I	Group II
Status	HbA1C ≤ 7%	HbA1C > 7%.
M:F	40:30	35:35

Group I had 40 males and 30 females and group II had 35 males and 35 females (Table I).

Table II: Assessment of parameters

Parameters	Group I	Group II	P value
Percentage predicted FEV1	100.4	80.5	0.01
Percentage predicted FVC	102.8	72.1	0.02
Percentage predicted FEV1%	96.2	99.0	0.15
Percentage predicted PEFR	114.2	92.7	0.05
Percentage predicted SVC	82.5	74.5	0.04
Percentage predicted MMEF	85.3	81.7	0.11

Percentage predicted FEV1 was 100.4 and 80.5, percentage predicted FVC was 102.8 and 72.1, percentage predicted FEV1% was 96.2 and 99.0, percentage predicted PEFR was 114.2 and 92.7, percentage predicted SVC was 82.5 and 74.5 and percentage predicted MMEF was 85.3 and 81.7 in group I and II respectively. The difference was significant (P< 0.05) (Table II).

DISCUSSION

Diabetes mellitus is a public health problem and has reached an epidemic proportion. Microvascular and macrovascular complications are the important cause of morbidity affecting various organ systems in diabetic patients.[6] Several theories explain how glycosylation and oxidative stress leads to impaired collagen and elastin cross linkage with reduction in elasticity and strength of connective tissue which cause complications in diabetes.[7] An extensive microvascular circulation and the abundant connective tissue in the lung raise the possibility that the lung may also be a target organ in diabetes.[8,9] We performed this study to assess type of headache in children.

Our results showed that Group I had 40 males and 30 females and group II had 35 males and 35 females. Meyyammai et al[10] in their study a total of 64 patients with type 2 diabetes mellitus were included. Effect of diabetes mellitus on spirometric values explored a reduction in FVC, FEV1. There was a restrictive pattern of Pulmonary abnormality though patients were asymptomatic. There was a correlation between reduced Pulmonary function values, duration of diabetes mellitus, glycemic control.

Our results showed that percentage predicted FEV1 was 100.4 and 80.5, percentage predicted FVC was 102.8 and 72.1, percentage predicted FEV1% was 96.2 and 99.0, percentage predicted PEFR was 114.2 and 92.7, percentage predicted SVC was 82.5 and 74.5 and percentage predicted MMEF was 85.3 and 81.7 in group I and II respectively. Adeoti et al[11]aimed at estimating the spirometric indices in type 2 diabetes mellitus patients. A total of 146 participants with 73 patients with T2DM and 73 control groups. There were no significant differences in the age, body mass index, and gender distribution of the diabetics and control. However, patients with diabetes had higher SBP (133.2±20.17 mmHg vs 111.6±6.5 mm Hg.

Gutiérrez-Carrasquilla et al[12] in their study 60 patients with type 2 diabetes and forced expiratory volume in 1 s (FEV1) ≤90% of predicted. Spirometric maneuvers were evaluated at baseline and after a 3-month period in which antidiabetic therapy was intensified. Those with an HbA_{1c} reduction of ≥0.5% were considered to be good responders (n = 35). Good responders exhibited a significant improvement in spirometric values between baseline and the end of the study (forced vital capacity [FVC]: 78.5 ± 12.6% vs. 83.3 ± 14.7%, P = 0.029]; FEV1: 75.6 ± 15.3% vs. 80.9 ± 15.4%, P = 0.010; and peak expiratory flow [PEF]: 80.4 ± 21.6% vs. 89.2 ± 21.0%, P = 0.007). However, no changes were observed in the group of nonresponders when the same parameters were

evaluated. Similarly, the initial percentage of patients with a nonobstructive ventilatory defect and with an abnormal FEV1 decreased significantly only among good responders. In addition, the absolute change in HbA_{1c} inversely correlated to increases in FEV1 ($r = -0.370$, $P = 0.029$) and PEF ($r = -0.471$, $P = 0.004$) in the responders group. Finally, stepwise multivariate regression analysis showed that the absolute change in HbA_{1c} independently predicted increased FEV1 ($R^2 = 0.175$) and PEF ($R^2 = 0.323$). In contrast, the known duration of type 2 diabetes, but not the amelioration of HbA_{1c}, was related to changes in forced expiratory flow between 25% and 75% of the FVC.

Vanidassane et al[13] enrolled 100 patients with type 2 diabetes were divided into two groups depending on control of diabetes (group A–HbA1C ≤ 7% and group B-HbA1C > 7%). All the subjects selected underwent detailed evaluation including testing for HbA1C, HsCRP (high-sensitivity C-reactive protein), serum ferritin and serum fibrinogen, along with pulmonary function testing. Percentage predicted FVC (forced vital capacity), FEV1 (forced expiratory volume in 1 second) and SVC (slow vital capacity) were significantly reduced, while mean values of inflammatory markers [fibrinogen ($p < 0.001$) and hsCRP ($p < 0.002$)] were significantly higher in uncontrolled diabetes group. There was a significant negative correlation between FEV1 ($r = –0.739$, $p < 0.001$), FVC ($r = –0.370$, $p < 0.001$), SVC ($r = –0.635$, $p < 0.001$) with HbA1C. HbA1C had a positive correlation with hsCRP ($r = –0.308$, $p < 0.002$) and fibrinogen ($r = 0.388$, $p < 0.001$).

CONCLUSION

Pulmonary functions were decreased significantly increased in uncontrolled diabetics.

REFERENCES

1. Panner Selvam A. Gross hyperglycemia, domiciliary management in a rural set up. Manual of advanced Postgraduate course in Diabetology 1998; 18:170-175.
2. Kasper, Fauci, Hauser, Longo, Jameson, Loscalzo, Harrisons principals of Internal Medicine, 19th edition 2015 vol 2, 2392-2453.
3. Benbassat Carlos A, Ervin Stern, Mordechai Kramer, Joseph Lebzelter, Ilana Blum, Gershon Fink. Pulmonary function in patients with Diabetes Mellitus. The Am J Med Sci 2001; 322(3):127-132.
4. Sandler Malcom.Is the Lung a ‘Target Organ’ in Diabetes Mellitus. Arch Intern Med.1990; 150:1385-1388.
5. Wendy A. Davis, Matthew Knuiman, Peter Kendall, Valerie Grange, Timothy M.E. Davis, Glycemic Exposure Is Associated With Reduced Pulmonary Function in Type 2 Diabetes The Fremantle Diabetes Study Diabetes Care 2004;27:752–757.
6. Marvisi M, Lino Bartolini L, del Borrello P, Brianti M, Marrani G, Guariglia A, et al. Pulmonary Function in non-insulin-dependent diabetes mellitus. Respiration 2001; 68: 268-72.
7. Walter R, Beiser A, Rachel J et.al., Association between glycemic state and lung function. The Framingham Heart Study. American Journal of Respiratory and Critical Medicine, 2003; (167): 911-916.
8. Davis Timothy ME, Mathew Knuimann, Peter Kendall, Reduced pulmonary function and its association in type2 Diabetes. Diabetes Reasearch and Clinical Practice, 2000; 50:52-159.
9. Kanya Kumari DH, Nataraj S M, Devaraj H S. Correlation of duration of diabetes and pulmonary function tests in type 2 diabetes mellitus patients. International Journal of Biological and Medical Research. 2011; 2(4): 1168-1170
10. Meyyammai CT, Gladstone Vijayakumar V, Gopalakrishna P. Study of Spirometric Evaluation In Type 2 Diabetes Mellitus. Annals of the Romanian Society for Cell Biology. 2020 Dec 30:56-61.
11. Adeoti AO, Raimi TH, Fadare JO, Ibidapo R. Spirometric Indices in Type 2 Diabetes Mellitus Patients in a Nigerian Tertiary Institution. European Journal of Medical and Health Sciences. 2021 May 7;3(3):10-4.
12. Gutiérrez-Carrasquilla L, Sánchez E, Barbé F, Dalmases M, López-Cano C, Hernández M, Rius F, Carmona P, Hernández C, Simó R, Lecube A. Effect of glucose improvement on spirometric maneuvers in patients with type 2 diabetes: the sweet breath study. Diabetes Care. 2019 Apr 1;42(4):617-24.
13. Vanidassane I, Malik R, Jain N. Study of pulmonary function tests in type 2 diabetes mellitus and their correlation with glycemic control and systemic inflammation. Advances in Respiratory Medicine. 2018;86(4):172-8.