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Original Article

An Observation of the Ventilatory Variables in Irritable Bowel Syndrome (IBS) Patients

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ABSTRACT

Introduction: *Irritable bowel syndrome (IBS) is a common gastrointestinal disorder characterized by abdominal pain, bloating, and bowel disturbances. While the association between IBS and other organs, such as the lungs, has been suspected for some time, it has not been thoroughly explored. The aim of the study was to observe the ventilatory variables in IBS patients of different duration and to correlate them with the duration of the disease.* ***Methods and materials:*** *This cross-sectional study was conducted in the Department of Physiology of Bangabandhu Sheikh Mujib Medical University, Shahbagh, Dhaka, from July 2010 to June 2011.* ***Results:*** *The results showed that almost all the ventilatory variables were significantly lower in the IBS patients compared to the healthy controls. Additionally, the variables were also lower in IBS patients with longer duration compared to those with shorter duration, and in group B3 compared to group B2. Furthermore, all variables were positively correlated with the duration of IBS in group B1 and FVC, FEV1 was positively correlated and FEV1/FVC% was negatively correlated with the duration of IBS in group B2. All variables were negatively correlated with the duration of IBS in group B3, but the values were not statistically significant.* ***Conclusion:*** *IBS patients have lower pulmonary function compared to healthy subjects, with longer duration of the disease showing greater decrease. The exact cause of this is unknown, but it is suggested that inflammation, autonomic dysfunction, and psychological disturbances may be contributing factors.*

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INTRODUCTION

Irritable bowel syndrome (IBS) is a chronic continuous or remittent functional gastrointestinal disorder, characterized by abdominal pain, bloating, and bowel disturbance [1]. This disease holds a major share in gastrointestinal tract-related health problems. The male-female ratio of this disorder was 1:1.36 and the highest incidence was found in those between 15 to 44 years of age [2]. However, extra-intestinal symptoms are common in patients with IBS, such as urinary symptoms, sexual dysfunction, primary fibromyalgia, bronchial hyperresponsiveness, and asthma [3-6]. According to the literature, IBS is multifactorial in origin. Several environmental factors, psychosocial stressors, altered gut flora along with abnormal gastrointestinal motility and secretion, altered visceral perception, and dysregulation of the brain-gut axis involving abnormal function in the enteric, autonomic, and central nervous system contribute to the pathophysiology of IBS [7-9]. A direct relationship between IBS and broncho-pulmonary disease has been suspected since 1991 [6]. Bronchial hyperresponsiveness was found more in IBS patients than controls10. Several investigators from different countries reported spirometric evidence of impaired lung functions in IBS patients [5,10-12]. Within these variables, FVC, FEV1, and FEV1/FVC% were commonly evaluated and shown to be lower when compared to the control [5,10,12-14]. In Bangladesh, the prevalence rate of IBS is 7.7% and its incidence in our country is increasing day by day [5]. A large number of these patients suffer physically as well as mentally from anxiety and depression due relapsing nature of the symptoms [15-16]. Usually, they are treated by the physician to relieve the symptoms only. However, the association of this disease with other organs especially the pulmonary system has not been evaluated clearly and is often ignored, due to its relation with anxiety. To the best of our knowledge, the presence of pulmonary involvement in IBS patients along with its association with the duration of the disease has not been observed yet [5, 10-12]. Therefore, this present study has been designed to observe the spirometric lung function status in IBS patients and also to evaluate their association with the duration of this disease. Accordingly, this study may reveal the importance of screening the pulmonary functions in IBS patients for better diagnosis and management by clinicians as well as it may act as a source of background information guidelines for better management of these patients.

METHODS AND MATERIALS

This cross-sectional study was conducted in the Department of Physiology of Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbagh, Dhaka, from July 2010 to June 2011. Hundred five aged 20-45 years of female irritable bowel syndrome patients were included in the study group. They were enrolled in OPD of Gastroenterology, BSMMU. For comparison 35 age, BMI, socioeconomic status, and occupation-matched apparently healthy females were studied as control. Based on the duration of the disease, patients were again subdivided into B1 (newly diagnosed patients), B2 (patients of 2 to 5 years), and B3 (patients of 5 to 10

years). All the lung functions variable were assessed by measuring FVC, FEV1and FEV1/FVC%, with a portable Digital Micro DL spirometer. For statistical analysis Independent Sample 't test, One-way ANOVA test, Chi-square test, and Pearson's correlation coefficient test were performed.

Inclusion criteria:

- Female patients diagnosed with irritable bowel syndrome (IBS)
- Aged between 20 and 45 years
- Enrolled by random sampling from the Outpatient Department of Gastroenterology of BSMMU

Exclusion criteria:

- History of heart diseases (such as valvular disease, and ischemic heart disease)
- Diabetes mellitus (blood glucose level 2 hrs after breakfast ≥ 11.1 mmol/L)
- Chronic renal failure (> 1.36 mg/dl)

RESULTS

In this study, all the groups were matched for age & BMI, [Table I]. Almost all the ventilatory variables were significantly lower in all the study groups in comparison to healthy controls (Table II). In addition, all the study variables were lower in the IBS patients of longer duration when compared to the patients with shorter duration [Table II].

Table I: Age & BMI, in different groups (n=140)

Groups	Age	BMI(Kg/m2)
	Mean±SD, Year	Mean±SD, Range
A(n=35)	28.06±4.14 (20-36)	22.56±1.36 (19.15-24.9)
B1(n=35)	28.86±5.38 (20-36)	22.79±1.66 (19.15-24.65)
B2(n=35)	29.72±5.03 (22-37)	22.72±1.99 (18.73-24.8)
B3(n=35)	30.5±5.45 (22-37)	22.70±1.26 (19.15-24.77)

Data were expressed as mean±SD. Figures in parentheses indicate ranges. A= apparently healthy (control), $B_{1=}$ (newly diagnosed IBS patients), $B_{2=}$ (Patients of IBS with 2-5 years duration), B_{3}= (Patients of IBS with 5-10 years duration), n = number of subjects

Table II: FVC, FEV_1 and FEV_1/FVC ratio in different groups (n=140)

Groups	FVC	FEV1	FEV1/FVC ratio
	Mean±SD, Range	Mean±SD, Range	Mean±SD, Range
A (n=35)	91.6±7.15 (81-103)	90.8±6.64 (81-102)	99.36±6.41 (90-110.87)
B1 (n=35)	87.19±6.54* (81-100)	88.33±5.65 (81-104)	98.93±7.92 (79.63-110.35)
B2 (n=35)	85.53±9.49*** (55-101)	81.61±6.99***, ### (58-91)	95.86±8.16 (78.57-108.43)
B3 (n=35)	83.44±9.81*** (53-95)	77.64±10.98***, ### (43-89)	93.34±11.91***, ## (58.11-107.4)

Data were expressed as mean±SD of % of Percentage of the predicted value. Figures in parentheses indicate ranges. Statistical analysis was done by independent sample 't-test.

A= apparently healthy (control), B_1= (newly diagnosed IBS patients), B_2= (Patients of IBS with 2-5 years duration), B_3= (Patients of IBS with 5-10 years duration). n = several subjects.

A vs B_1 or B_2 or B_3 = * ; B_1 vs B_2 or B_3 = # B_2 vs B_3= !

(*, #, ! = $p \leq 0.05$) ; (**, ##, !! = $p \leq 0.01$) ; (***, ###, !!! = $p \leq 0.001$).

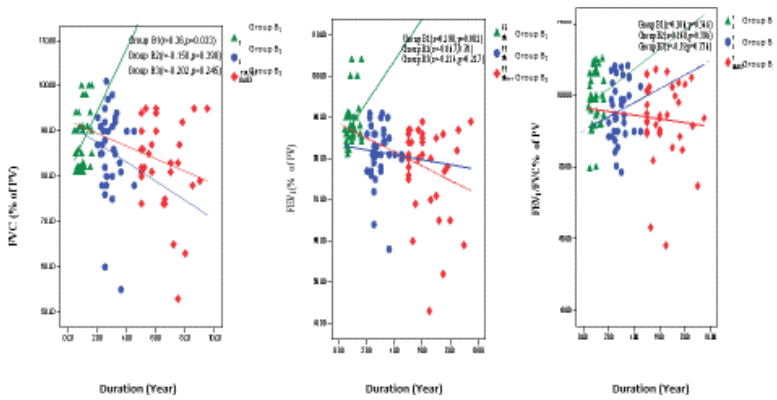

Figure 1: FVC, FEV_1, and FEV_1/FVC% were negatively correlated with duration, in IBS patients of longer duration

DISCUSSION

The purpose of the present study was to evaluate the pulmonary function status of IBS patients and to correlate them with the duration of the disease. To assess the lung function status, FVC, FEV1, and FEV1/FVC% were measured in IBS patients with different durations of the disease. All these variables were also studied in apparently healthy age, BMI, socioeconomic status, and occupation-matched female subjects for comparison.

In this study, values of all the lung function variables of healthy subjects were within the normal range and were almost similar to those of the observation of various investigators [10-12]. In this study, the FVC, FEV1, and FEV1/FVC%, of IBS patients of different durations were lower than those of apparently healthy subjects. Almost similar findings were reported by several investigators from different countries [10,12,13]. In addition, these variables were lower in patients of longer duration than in shorter duration. From the present study, the exact mechanism of pulmonary involvement in IBS patients cannot be elucidated. However, several investigators from different countries suggested different mechanisms for pulmonary involvement in this specific group of patients [10-12]. It has been suggested that the decrement of different ventilatory variables in IBS patients may be due to continuous low-grade inflammation of GIT which may release different chemical mediators, such as serotonin, VIP, Histamine, NO, Substance P, Acetylcholine [10-12]. As a consequence, these chemical mediators may spread through either systemic circulation or lymphatic circulation to affect the respiratory organs [17]. In addition, it has also been suggested that it may be due to autonomic dysfunction preceded by CNS dysregulation [6, 10-12]. They also suggested that this CNS dysregulation may cause increased blood flow and microvascular permeability of the above-mentioned chemical mediators to cause smooth muscle contraction which might be the responsible factor for bronchoconstriction and airflow limitations in IBS patients. Moreover, this autonomic dysfunction may increase airway mucous secretion and tonicity of airway smooth muscle, causing airflow limitation in this group of patients [10-13, 18,19]. Again, some investigators suggested that IBS patients suffer from anxiety, depression, and psychological disturbance and it may cause increased release of the hypothalamic corticotrophin-releasing hormone to activate mast cell secretion of chemical mediators [7-9, 20-22]. As a consequence, there may be increased airway mucous secretion and tonicity of airway smooth muscle to cause airflow limitation in this group of patients. Various investigators reported abdominal bloating, distension, and abdominal pain as common clinical presentations of IBS patients, [9, 23-24]. They suggested that this pain may inhibit viscerosomatic reflex to cause inhibition of abdominal muscle tone. As a consequence, abdominal muscle activity may be inhibited during respiratory movement and ultimately may affect the forceful ventilatory variables in this group of patients. Moreover, bloating and abdominal distension in IBS patients may be caused by exaggerated diaphragmatic decent whichmay be a notable contributory factor for the decrement of ventilatory variables in our study patients.

Limitation of the study

The study evaluated the pulmonary function status of IBS patients and found that their lung function variables were lower than healthy subjects and the exact mechanism of pulmonary involvement in IBS patients cannot be elucidated from this study.

CONCLUSION

In conclusion, the present study demonstrates that IBS patients have lower pulmonary function compared to apparently healthy subjects. Furthermore,

the decrease in pulmonary function was more pronounced in patients with longer durations of the disease. Although the exact mechanism of pulmonary involvement in IBS patients remains unclear, it is suggested that low-grade inflammation of the gastrointestinal tract, autonomic dysfunction, and psychological disturbances may contribute to the development of pulmonary dysfunction in this group of patients. The findings of this study highlight the importance of considering a pulmonary function in the management of IBS patients, particularly those with longer disease duration. Further research is needed to elucidate the underlying mechanisms and to develop effective strategies for the prevention and management of pulmonary dysfunction in IBS patients.

RECOMMENDATION

Based on the study's findings, several suggestions may be made. First and foremost, pulmonary function tests should be taken into account while evaluating and treating IBS patients, especially those who have had the condition for a longer period. The creation of efficient treatment plans may be aided by more investigation into the underlying causes of lung involvement in IBS patients. Lastly, medical professionals need to be aware of the possible effects that psychological issues may have on pulmonary function in IBS patients and should think about including these issues in their therapeutic strategy. Lastly, lifestyle changes like regular exercise and quitting smoking may help IBS patients with their pulmonary function.

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