Article

FVC, FEV_1 and FEV_1/FVC% in Patients with Depressive Illness and their Relationships with the level of Depression

Shausheen Islam[1], Nasim Jahan[2], Nayma Sultana[3], Rezina Akter[4]

Abstract

Background: Depressive illness is a common psychological disorder which affects various organs including lungs. Many studies have reflected decreased lung functions in patients with depressive illness. **Objective:** The present study was undertaken to measure some pulmonary function parameters in diagnosed female patients with depressive illness to evaluate their lung functions status. **Methods:** This cross-sectional study was carried out in the Department of Physiology, SSMC, Mitford, Dhaka, from 1st July 2009 to 30th June 2010 on 30 female patients with depressive illness, age ranged from 20-40 years. Depressed patients (study group) were divided into patients with minor depressive illness (group-B_1) and patients with major depressive illness (group- B_2). For comparison, 30 age and BMI matched apparently healthy subjects (control group-A) were also studied. The study groups were selected from the Out Patient Department of Psychiatry, SSMC, Mitford, Dhaka and the control group was selected by personal contact. Pulmonary function parameters like FVC, FEV_1, FEV_1/FVC%, of all subjects were measured by digital spirometer. Statistical analysis was done by using appropriate method as applicable. **Results:** All the pulmonary function parameters except FEV_1/FVC% were significantly ($p<0.001$) lower in patients with depressive illness in comparison to those of control. Again, pulmonary function parameters like FVC ($p<0.01$), FEV_1 ($p<0.05$) showed significant negative correlation with the level of depression in patients with major depressive illness. **Conclusion:** This study reveals that some pulmonary functions may be reduced in patients with depressive illness especially in major depressive patients which is negatively related with level of depression.

Key words: FVC, FEV_1, depressive illness.

J Bangladesh Soc Physiol. 2010 December; 5(2): 94-100
For author affiliations, see end of text.

http://www.banglajol.info/index.php/JBSP

Introduction

Depressive disorder is a common and disabling illness affecting a rising percentage of world's population[1]. It is associated with multiple types of health hazards like diabetes mellitus, cardiovascular system disease, alzeimer's disease and lung function impairment[2]. Different genetic, biologic and environmental factors may contribute to the pathogenesis and pathophysiology of depressive disorder[4]. Depression is a serious medical condition. It can occur in persons of all genders, ages and backgrounds [3]. Women are more affected than male and the ratio is 2:1.[3]

The basic biologic cause of depression is abnormalities in the release of neurotransmitters like serotonin, acetylcholine and catecholamine [4]. Environmental factors include the stressful life events such as loss of beloved one, presence of any disease, poverty, drug abuse etc.[5] Some researchers supported the relationship among stress, neurotransmission and mood disorder[3].

So, depression may affect the physiological functions and may be a contributing factor for the prolongation of distress of a physical illness [6]. It is proved that a person's psychological status may influence respiratory sensations and may

have respiratory symptoms without being affected by any respiratory disease [7].

There is a strong positive association between the psychological status and respiratory symptoms in healthy person [8]. The pulmonary functions such as Forced Vital Capacity (FVC), Forced Expiratory volume in first second (FEV_1), Percentage of Forced Vital Capacity and Forced Expiratory volume in first second ((FEV_1/FVC %,), may be reduced in patients with depressive illness [9,10,11]. Depressive disorder can be categorized into minor, major and dysthymic or chronic depressive disorder. Some researchers reported that pulmonary function status was correlated with level of depression [9].

Now a days, the number of patients with depressive disorder are increasing surprisingly with various types of depression related complications. But unfortunately most of them remain undiagnosed until produce any complications. It can affect an individual's physical function, especially lung function parameters. It is very important to detect the depressed patient with their physical disabilities and provide proper treatment, otherwise depressive patient may commit suicide. In Bangladesh assessment of pulmonary functions among mentally ill patients have not yet been done, but pulmonary functions assessment in other cases such as in smokers (Wakil 2001), aresenicosis (Habiba 2006), diabetes (Omar 2008), etc. were done. Therefore, the present study has been undertaken to assess some aspects of pulmonary function status in diagnosed depressed patients to detect the presence of any abnormalities.

Methods

This cross-sectional study was carried out in the Department of Physiology, SSMC, Dhaka, from July 2009 to June 2010. A total number of 60 female subjects with age ranged from 20-40 years were included in this study and all of them belonged to lower socioeconomic status. Among them 30 were patients with depressive illness (Group B-study group). The depressive illness patients were diagnosed by DSM-IV criteria[19] and level of depression was diagnosed by HAD scale (Hospital Anxiety and Depressions Scale)[20] by the psychiatrist. Based on level of depression, depressive patients were again subdivided into Group B_1: patients with minor depressive illness and group B_2**:** patients with major depressive illness**.** Again age, BMI and socioeconomic status matched thirty (30) apparently healthy female subjects without any history of depressive illness were included for comparison and considered as Group-A (Control group). Study protocol was approved by ethical committee of Sir Salimullah Medical College, Dhaka. All the patient were selected from the Out Patient Department of Psychiatry, Sir Salimullah Medical College & Mitford Hospital, Dhaka and Control subjects were from friends, family, relatives and personal contact. Subjects with history of any chest infection for the last 3 months, history of hypertension, diabetes mellitus, chronic renal failure, diagnosed asthmatic patients, alcohol/tobacco user, and smoker were excluded from the study. After selection of the subject objectives and benefits of this study were explained to each subjects and an informed written consent was taken from each subjects. A detail personal, medical, family, socioeconomic, occupational and drug history were recorded in a preformed questionnaire and a thorough physical examinations were done and documented. Height and weight of the subject were measured for calculation of BMI. Then the subjects were examined for the lung function parameters by using a digital spirometer[9]. During clinical examination and biochemical test when any abnormality was detected in any subjects she was referred to specific Department for proper management accordingly. Data were expressed as mean ± SD (Standard deviation). Statistical analysis was done by using SPSS version 16. One-way ANOVA (Post Hoc) test, Bonferroni test, and Pearson's Correlation Coefficient test were done as applicable.

Result

The mean ± SD age and BMI of all the subjects were almost similar and the groups were matched for age and BMI (Table I).

Table I: Age and BMI in different groups (n=60)

Groups	n	Age (years)	BMI (kg/m^2)
A	30	29.70 ± 4.24	23.05 ± 0.86
B_1	12	28.67 ± 4.23	22.55 ± 1.41
B_2	18	29.94 ± 5.31	22.58 ± 1.11
Statistical analysis:			
	p value		
A vs B_1	0.999^{ns}	0.522^{ns}	
A vs B_2	0.999^{ns}	0.451^{ns}	
B_1 vs B_2	0.999^{ns}	0.999^{ns}	

Results are expressed as Mean ± SD. Statistical analysis was done by ANOVA test and then Bonferroni test to compare between two groups. Figures in parentheses indicate ranges.

Group A (Control Group): Apparently healthy female subjects without any depressive illness.

Group B (Study group) Female patients with depressive illness

B_1: Patients with minor depressive illness.

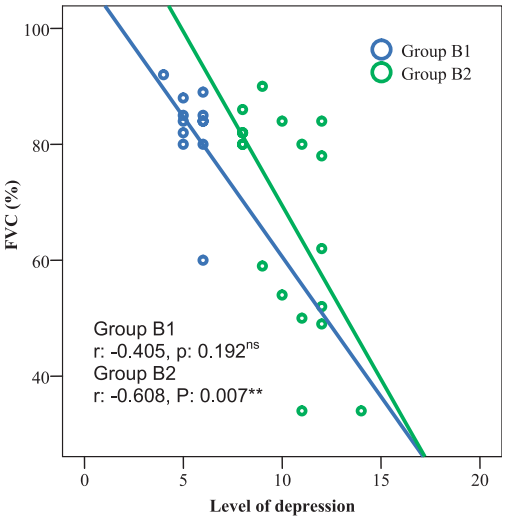
B_2: Patients with major depressive illness.

n = Total number of subjects.

ns = Non significant.

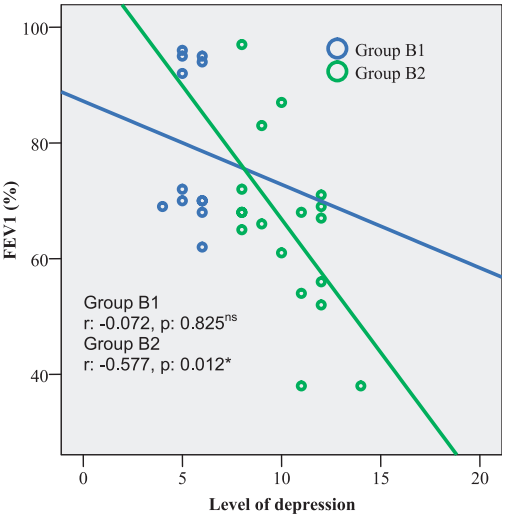
The mean percentages of predicted values of FVC and FEV1 in group B_1 ($p<0.05$) and B_2 ($p<0.001$) were significantly lower than those of group A. Again, these values in group B_2 were significantly ($p<0.01$) lower in comparison to those of group B_1. But, the mean percentage of predicted value of FEV_1 / FVC (%) in group B_1 and B_2 was higher than that of group A though it was statistically not significant. (Table II).

Furthermore, FVC and FEV1 were negatively correlated with level of depression in both the study groups. But these relationships were statistically significant ($p<0.001$ for FVC and $p<0.05$ for FEV_1) only in group B_2 but non significant in group B_1. Again, FEV_1 / FVC (%) showed positive correlation with the level of depression in both the study groups, though it was statistically not significant. (Figure 1,2,3)



B_1: Patients with minor depressive illness.
B_2: Patients with major depressive illness
**= $p<0.01$

Figure 1: Correlation of percentage of predicted value of FVC with level of depression in study groups (n=30)



B_1: Patients with minor depressive illness.
B_2: Patients with major depressive illness
*=$p<0.05$

Figure 2: Correlation of percentage of predicted value of FEV_1 with level of depression in study groups (n=30)

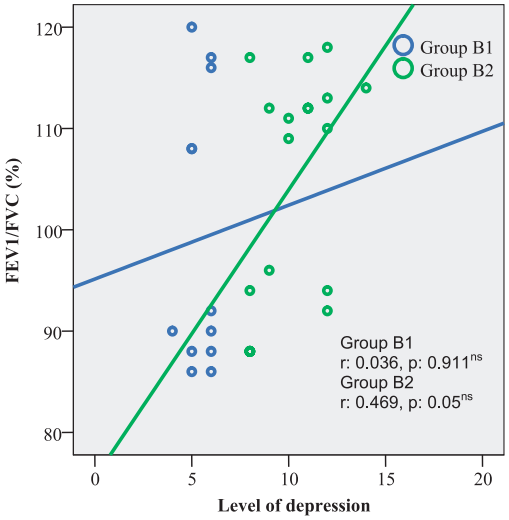
Table II: Percentage of predicted values of FVC, FEV_1 and FEV_1 / FVC (%) in different groups (n=60)

Groups	n	FVC (%)	FEV_1 (%)	FEV_1 / FVC (%)
A	30	95.13± 7.20	90.47± 5.57	98.97± 6.26
B_1	12	82.75 ± 7.98	79.42 ± 13.47	99.08 ± 13.51
B_2	18	67.78 ± 18.49	65.56 ± 14.96	104.72 ± 11.33

Statistical Analysis

	p value		
Groups	FVC(L)	FEV_1 (L)	FEV_1 / FVC (%)
A vs B_1	0.010*	0.013*	0.999^{ns}
A vs B_2	0.000***	0.000***	0.152^{ns}
B_1 vs B_2	0.004**	0.003**	0.369^{ns}

Results are expressed as Mean ± SD. Statistical analysis was done by ANOVA test for comparison among the groups and then Bonferroni test to compare between two groups.
Group A (Control Group): Apparently healthy female subjects without any depressive illness.
Group B (Study group) Female patients with depressive illness
B_1: Patients with minor depressive illness.
B_2: Patients with major depressive illness.
* = P<0.05 , **= p<0.01, ***p<0.001
n = Total number of subjects.
ns = Non significant.



B_1: Patients with minor depressive illness.
B_2: Patients with major depressive illness

Figure 3: Correlation of percentage of predicted value of FEV_1/FVC% with level of depression in study groups (n=30)

Discussion

The present study was undertaken to observe some pulmonary function parameters in female patients with depressive illness. For this, the pulmonary function parameters such as FVC, FEV_1,/FVC% were measured in this group of patients. According to Hospital Anxiety and depression scale (HAD scale) their levels of depression were also measured. Again, correlations of all these parameters with levels of depression were also studied in order to observe any relationship among them. All these pulmonary function parameters were also studied in apparently healthy age and BMI matched control females in order to compare these values with the study groups.

In this study, values of FVC, FEV_1, FEV_1/FVC % of healthy subjects were within normal limit and almost similar to the findings reported by the various investigators from different

countries[11,12] as well as in our country [13,14,15]. In this study, mean of percentage of FVC and FEV_1 were significantly lower in patients with major depressive illness than those of patients with minor depressive illness and of controls. Again, these values were significantly lower in patients with minor depressive illness when compared to those of controls. Almost similar findings were observed by several investigators from different countries [10,11,15]. But in their study, they did not divide depressive illness patients into minor and major groups.

Again, no significant difference of percentage of predicted value of FEV_1/FVC% ratio was observed between patients with major depressive illness, patients with minor depressive illness and healthy control subjects. Similar findings were observed by different researchers in different countries [10,11].

In the present study, pearson's correlation coefficient (r) test was performed to observe relationships of all the lung function parameters with the level of depression in study groups.

Forced vital capacity (FVC) and FEV_1 were negatively correlated with the level of depression in study groups. But these relationships were statistically significant in patients with major depressive illness but non significant in patients with minor depressive illness. Again, in this study, FEV_1/FVC% showed positive correlation with the level of depression in both the study groups, though it was statistically non-significant.

Various mechanisms have been proposed for the changes in pulmonary functions in patients with depressive disorder. Some investigators suggested that psychomotor slowing that occurred in depressive illness may cause decreased activities of lung as well as other activities of daily life. It has also been reported that muscle power is decreased in depressed patients. In addition, sleep disturbance which is a common feature of depression has affect on muscle strength in patient with depressive illness[11]. Again, some researchers suggested that dyspnea score is increased in patients with depressive illness though their pulmonary functions were normal [6].

Moreover, it has been suggested that depressed patients demonstrate parasympathetic hyper-responsiveness[17]. Some investigators suggested that there may be a strong parasympathetic discharge in emotionally stressed depressed patients[15]. It has also been suggested that during negative mood state in depressed patients their lung functions are lowered due to bronchial hyerresponsiveness. Again, patients with depression may have elevated plasma cortisol level [18]. It has been assumed that, there may be defects in the function of autonomic nervous system such as alpha-adrenergic and cholinergic hyper-responsiveness and beta-adrenergic hypo-responsiveness has been found in asthmatic patients as well as in depressive patients[17].

In the present study, the measured values of all the pulmonary function parameters in almost all the study subjects were significantly lower in comparison to those of their predicted values. This may be due to their poor nutritional status, as they belonged to lower socioeconomic class. Moreover, in this study pulmonary function parameters were lower in patients with depressive illness than those of healthy control, as evidenced by their measured value. These impaired pulmonary function parameters are not only due to their poor nutritional status, as BMI of all the subjects were within reference range. Other factors like loss of appetite, pessimistic thoughts, and sleep disturbances may also be responsible for decreased muscle strength in the patients of the present study, as supported by their HAD scale. In this study it has also been observed that, pulmonary function parameters

are more deteriorated in patients with major depressive illness in comparison to those of patients with minor depressive illness, supported by negative correlation of FVC, FEV_1 and PEFR with level of depression in the patients of present study.

However, the exact mechanism involved for the lowered lung functions in female with depressive illness as mentioned earlier cannot be elucidated from this type of study. Further studies regarding this aspect in both sexes are required for clarification.

Conclusion

This study reveals that some pulmonary functions may be lower in female patients with depressive illness especially in patients with major depressive illness and the pulmonary functions are negatively correlated with level of depression.

Acknowledgement

Authors of this study are thankful to the authority of Department of Psychiatry, SSMC, for their nice cooperation during sample collection. The authors also acknowledge the partial financial support from the research grant of DGHS of Bangladesh.

Author affiliations

*1. Shausheen Islam, Senior lecturer, Department of Physiology, Jalalabad Ragib Rabeya Medical College. E-mail: ishausheen @yahoo.com.

2. Professor Nasim Jahan, Professor and Head, Department of Physiology, Sir Salimullah Medical College, Dhaka. E-mail: prof.dr.nasimjahan @gmail.com

3. Nayma Sultana, Assistant Professor, Department of Physiology, Sir Salimullah Medical College, Dhaka. E-mail: nayma_sultana@yahoo.com

4. Rezina Akter, Associate Professor, Department of Physiology, Sir Salimullah Medical College, Dhaka. E-mail:rezina.akter@yahoo.com

* *For correspondence*

References

1. Kessler RC, Bergiund P, Demier O, Jin R, Koretz D, Merkangas KR, Rush AI, Walters EE, Wang P. The epidemiology of major depressive disorder. Journal of the American medical association. 2003; 289 (3): 3095 – 3105.

2. Belmaker RH, Agam G. Major depressive disorder. N Eng J Med. 2008; 358: 55-68.

3. Depression: The invisible culprit. Community health needs assessment. 2001 http:// www.nimh.nih.gov/publicat/depression.cfm.

4. Depression: In depth report. New York Times. 2008. http://www.nytimes.com/apa.com.

5. Cassano P, Fava M. Depression and public health: an overview. Journal of Psychosomatic Research. 2002; 53(4): 849-857.

6. Rao M. Depression in the physically ill. Primary Psychiatry. 2008; 15(9): 44-50.

7. Chetta A, Foresi A, Emilio M, Olivieri D. Psychological implications of respiratory health and disease. Respiration. 2005;72:210-215.

8. Dales RE, Spitzen WO, Sehechter MT, Suissa S. The influence of psychological status on respiratory symptom reporting. Am Rev Respir Dis. 1989; 139: 1459-1463.

9. Mukadder C, Sahin G, Yazici AE, Yazici K, Ozisik. Pulmonary muscle strength, pulmonary function tests and dyspnea in women with major depression. Journal of Women's health. 2004;13:93-98.

10. Goodwin RD, Chuang S, Nicole S, Daniel M and Pine DS. Association between lung function and mental health problems among adults in the United States. American Journal of Epidemiology. 2006; 12: 1-6.

11. Boettger S, Wetzig F, Puta C, Donath L, Muller H, Gabrid HW, Bar KJ, Physical fitness and heart rate recovery are decreased in major depressive disorder. Psychosomatic Medicine. 2009; 71:519-523.

12. Akter P. Assessment of some aspects of spirometric lung function status in hypothyroid female [M Phil thesis]. [Dhaka]: Bangabandhu Sheikh Mujib Medical University;2009.

13. Polly ZA. Study on some aspects of lung function status and their relationships with serum estrogen and progesterone levels in postmenopausal women [M Phil thesis]. [Dhaka]: Bangabandhu Sheikh Mujib Medical University;2007.

14. King B, Cotes JE. Relation of lung function and exercise capacity to mood and attitudes to health. Thorax. 1989;44:402-409.

15. Ritz T, Steptoe A. Emotion and pulmonary function in asthma: Reactivity in the field and relationship with laboratory induction of emotion. Psychosomatic Medicine. 2000; 62:808-815.

16. Krommydas GC, Konstantions I, Nikiforos VA, Evangelia K. Depression and pulmonary function in outpatients with asthma. Respiratory medicine. 2004; 98: 220-224.

17. Wright RJ, Cohen S, Rodrigez M. Review of Psychological stress and asthma: an intregrated biopsychosocial approach. Thorax. 1998; 53: 1066-1074.

18. Merali Z, Palkovits M, Faludi G, Anisman H. Dysregulation in the suicide brain: mRNA expression of CRH receptors and GABA receptor subunits. J of Neuroscience. 2004;24(6): 1478-1485.

19. Gelder M, Mayou R, Cowen P. Shorter Oxford Textbook of Psychiatry. 4th ed. New York: Oxford University Press; 2001.283p.

20. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta psychitr Scand. 1983; 67: 361-370.