Original article

Assessment of PEFR and FEF_{25-75} in Female SLE Patients and their Relationship with Duration of the Disease

Hussain D[1], Majid F[2], Zahir M[3], Sultana O[4], Begum S[5]

Abstract:

Background: Systemic Lupus Erythematosus (SLE) is an autoimmune disorder which affects multiple organs of human including lungs. ***Objectives:*** To assess PEFR and FEF_{25-75} in SLE patients and to correlate them with the duration of the disease. ***Method:*** This cross-sectional study was carried out in the Department of Physiology, BSMMU, Dhaka, from January 2010 to December 2010. A total number of 120 female subjects were selected, among which 30 were age and BMI matched apparently healthy subjects for comparison (control) and 90 were patients of SLE (study group). All the patients were matched for age, sex and BMI. Based on the duration of the disease, patients were subdivided into B1 (1-6 months), B2 (2-5 years) and B3 (6-10 years). Controls were selected from the community and the patients from the Out Patient Department (OPD) of SLE clinic, Department of Medicine, BSMMU, Dhaka. (PEFR) and FEF_{25-75} of all the subjects were measured by a Digital MicroDL spirometer. For statistical analysis Independent Sample 't' test, One way ANOVA test and Pearson's correlation coefficient test were performed as applicable. ***Results:*** The mean percentage of predicted values of lung function parameters in healthy female subjects were within normal ranges. The mean percentage of predicted values of PEFR and FEF_{25-75} were significantly lower in all study groups when compared to control. Again, the mean percentage of predicted values of PEFR and FEF_{25-75} were significantly lower in the patients of Group B3 compared to Group B2. Moreover, these comparisons were significantly lower when compared to Group B1. The differences of the mean percentage of predicted value of PEFR, FEF_{25-75} were non-significantly lower in Group B2 when compare to Group B1. In addition, FEF_{25-75} were positively correlated with duration of SLE in group B2 but negatively correlated in B3. On the other hand PEFR was negatively correlated with duration of SLE in both B2 and B3. All these values were statistically non-significant. ***Conclusion:*** These pulmonary functions decrease in SLE female and the reduction is inconsistently associated with duration of the disease.

Keywords: PEFR; FEF_{25-75}; SLE

DOI: http://dx.doi.org/10.3329/bjms.v13i4.20588
Bangladesh Journal of Medical Science Vol. 13 No. 04 October '14. Page: 416-420

1. Dilroze Hussain, Assistant Professor, Department of Physiology, Kumodini Womens Medical College, Mirjapur, Tangial.
2. Farjana Majid, Assistant Professor, Department of Microbiology, Tairunnessa Memorial Medical College, Tongi, Gazipur.
3. Muneera Zahir, Assistant Professor, Department of Anatomy, Central Medical College, Comilla
4. Ohida Sultana, Assistant Professor, Department of Physiology, Kumodini Womens Medical College, Mirjapur, Tangial.
5. Shelina Begum, Professor, Department of Physiology, Bangabandhu Sheikh Mujib Medical University(BSMMU) Bangladesh.

Corresponds to: Dilroze Hussain, Assistant Professor, Department of Physiology, Kumodini Womens Medical College, Mirjapur,Tangial. **Email:** dilrozehussain@gmail.com

Introduction: Systemic lupus erythematosus (SLE) is a multisystem disorder in which pleuropulmonary involvement is very common. SLE is about nine times as common in women as in men[1]. They also suggested that, the peak age of onset of this multisystemic disorder might be 20 to 50 years. The prevalence of SLE in the USA is approximately 15 to 50/100000 of which highest is among African Americans[2]. In other population the prevalence varies between 1:1000 and 1:10000[1].In India found a point prevalence of 3 per 100000[3].There is no standard statistical data in SLE in Bangladesh[3].

SLE may affect all the components of the respiratory system, including upper airways, lung parenchyma, pulmonary vasculature, pleura, and respiratory muscles[4,5]. The clinical presentation of lung involvement ranges from mild, self-limited, pleuritic chest pain to fatal pulmonary hemorrhage[6]. Subclinical pulmonary involvement has been reported from autopsy series with a prevalence of 93%[7]. A few percentages (4-5%) of SLE patients with lung disease have the clinical symptoms of lung disease[8]. Lung involvements may exaggerate gradually and may be the vital cause of morbidity and mortality of SLE patient[9].

Large numbers of subjects in Bangladesh are affected by SLE. Usually they are treated by the physician with an aim to relieve the symptoms ignoring the prevention of pulmonary complications. For that cause, pulmonary involvement in SLE may remain undiagnosed for a long period. Early diagnosis of lung involvement is beneficial in most patients for therapy and could have an important effect on therapeutic strategies[4,31]. Therefore early detection of lung involvement is important in patients with SLE[4].

Many researchers have investigated pulmonary functions in this group of patient abroad [5,10-16]. In our country, several investigators studied on SLE[3,17] . With the best of our knowledge, no such study has been undertaken to explore the pulmonary function status in SLE patients in Bangladesh.

The aim of the present study was to investigate the pulmonary involvement of SLE patients whose do not have the clinical symptoms and sign of lung disease. This study also observed the extent of lung involvement with the duration of SLE.

The outcome of this study may act as a source of background information for guiding the clinicians about the risk of pulmonary complications while treating the SLE patients.

Method: For this study, 90 female patients of SLE were selected from the Out Patient Department (OPD) of SLE clinic, Department of Medicine, BSMMU, Dhaka (study group).The study group was selected according to the updated American College of Rheumatology (ACR) revised criteria of SLE[18]. In this study, the study population was subdivided into B_1 (1-6 months), B_2 (2-5 years) and B_3 (6-10 years) on the basis of duration of disease. Disease duration was characterized as the duration from the date of physician diagnosis until the date at first study visit. For comparison, 30 ages (20 to 40 years), BMI (19.73 to 25.6 kg/m^2) matched apparently healthy female persons (control) were collected from different areas of Dhaka city by personal contact.

After selection, all the subjects were thoroughly informed about the aim, benefit and study procedure. Informed written consent was obtained. she was requested to attend the Department of Physiology at 7.30 am in a fasting state on the day of examination. Then she was requested to attend the Department of Physiology at 7.30 am in a fasting state on the day of examination. A detail personal, medical, family, socioeconomic, occupational and dietary history was recorded in a preformed questionnaire. Thorough physical examination was done and documented. Any subject with diabetes mellitus (Fasting plasma glucose >7 mmol/dl[19]) or with H/O diagnosis of systemic hypertension (SBP ? 140 and DBP ? 90 mm of Hg[20]), with H/O any pulmonary comorbidity (e.g, bronchiectasis, pulmonary fibrosis, pneumonectomy, lobectomy) or any other systemic disease (e.g, rheumatoid arthiritis, connective tissue disorder) or with H/O any heart disease, renal insufficiency(?1.5mg/dl) were excluded from the study[21]. All the subjects were under drug treatment and do not have the clinical symptoms and sign of lung disease.

Then the subject was examined for the lung function parameters by using a Digital Spirometer, described by Clement Clark International, in the Respiratory laboratory of Department of Physiology, BSMMU (Annexure-1). Lung function was assessed by Peak expiratory flow rate (PEFR) and Forced mid expiratory flow of FVC (FEF_{25-75}).

Data were expressed as mean ± SD (Standard deviation). One-way ANOVA test was done to compare

among the groups and Independent sample't' test was done to compare between the groups. Pearson's Correlation Coefficient test was done to correlate the spirometric variables with duration of disease. p value <0.05 was accepted as level of significance.

Table I: Age and BMI in different groups (n=120)

Groups	Age (Years)	BMI (Kg/m^2)
A (n=30)	30.9±5.5 (20-39)	22.56±1.33 (19.73-25.14)
B_1 (n=30)	28.8±4.08 (21-36)	22.66±1.8 (18.66-26.16)
B_2 (n=30)	29.2±4.5 (21-40)	22.84±1.5 (18.97-26.75)
B_3 (n=30)	29.5±5.2 (20-42)	23.02±.9 (21.33-25.2)

Statistical analysis:

Groups	p value (Age)	p value (BMI)
A vs B_1vs B_2 vs B_3[a]	0.414 ns	0.443 ns
A vs B_1[b]	0.102 ns	0.810 ns
A vs B_2[b]	0.219 ns	0.450 ns
A vs B_3[b]	0.333 ns	0.126 ns
B1 vs B_2[b]	0.677 ns	0.682 ns
B1 vs B_3[b]	0.549 ns	0.351 ns
B2 vs B_3[b]	0.834 ns	0.598 ns

Data were expressed as mean ± SD. Figures in parentheses indicate ranges.
a = one way ANOVA, b = independent sample t - test.
BMI = Body Mass Index.
Group A: Apparently healthy subjects (control group)
Group B: SLE patients (study group)
B1 : Patients with 1-6 months.
B2 : Patients with 2-5 yrs.
B3 : Patients with 6-10 yrs.
*** = significant (p<0.001)
** =significant (P<0.01)
* = significant (P<0.05)
ns = non significant (p > 0.05)
n = number of subjects

The mean percentage of predicted values of lung function parameters in healthy female subjects were within normal ranges.
The results of both of the lung function parameters are shown in Table II

Results: The mean± SD of age and BMI of all the

Table II: Mean percentage of predicted value of PEFR anFEF25-75in different groups(n=120)

Groups	PEFR	FEF_{25-75}
A (n=30)	86.1±8.06 (70-99)	77.26±7.93 (62-97)
B_1 (n=30)	63.93±18.93 (40-109)	63.06±16.45 (28-92)
B_2 (n=30)	55.9±14.13 (31-99)	60.03±15.75 (32-90)
B_3 (n=30)	47.83±12.48 (80-32)	50.56±13.89 (22-83)

Statistical analysis:

Groups	p value	p value
A vs B_1vs B_2 vs B_3[a]	0.000***	0.000***
A vs B_1[b]	0.000***	**0.000*****
A vs B_2[b]	**0.000*****	**0.000*****
A vs B_3[b]	**0.000*****	**0.000*****
B1 vs B_2[b]	**0.077** ns	**0.468** ns
B1 vs B_3[b]	**0.000*****	**0.002****
B2 vs B_3[b]	**0.023***	**0.01****

Data were expressed as mean ± SD. Figures in parentheses indicate ranges.
a = one way ANOVA, b = independent sample t - test.
Group A: Apparently healthy subjects (control group)
Group B: SLE patients (study group)
B1 : patients with 1-6 months.
B2 : Patients with 2-5 yrs.
B 3: Patients with 6-10 yrs.
*** = significant (p<0.001)
** =significant (P<0.01)
* = significant (P<0.05)
ns = non significant (p > 0.05)
n = number of subjects

subjects were almost similar and groups were matched for age and BMI (Table I).

The mean percentage of predicted values of PEFR and FEF_{25-75} were significantly (p<0.001) lower in all study groups when compared to control. Again, the mean percentage of predicted values of PEFR was significantly lower in the patients of Group B_3 compared to Group B_2 (P<0.05) and Group B_1(p<0.001) and also the mean percentage of predicted values of FEF_{25-75} was significantly lower in the patients of Group B_3 compared to Group B_2(P<0.01) and Group B_1(P<0.01). The differences of the mean percentage of predicted value of PEFR, FEF_{25-75} were non significantly(p > 0.05) lower in Group B_2 when compare to Group B_1.

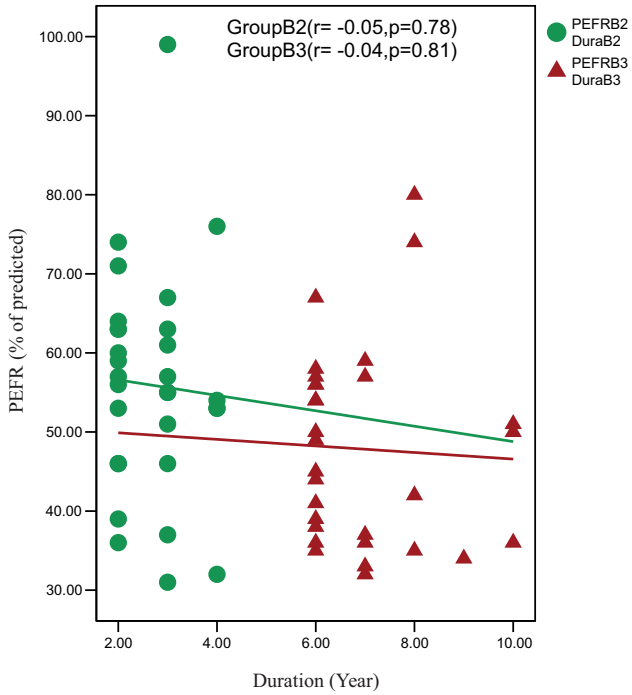

Figure III: Correlation of percentage predicted value of PEFR with duration of SLE in different groups (n = 60)

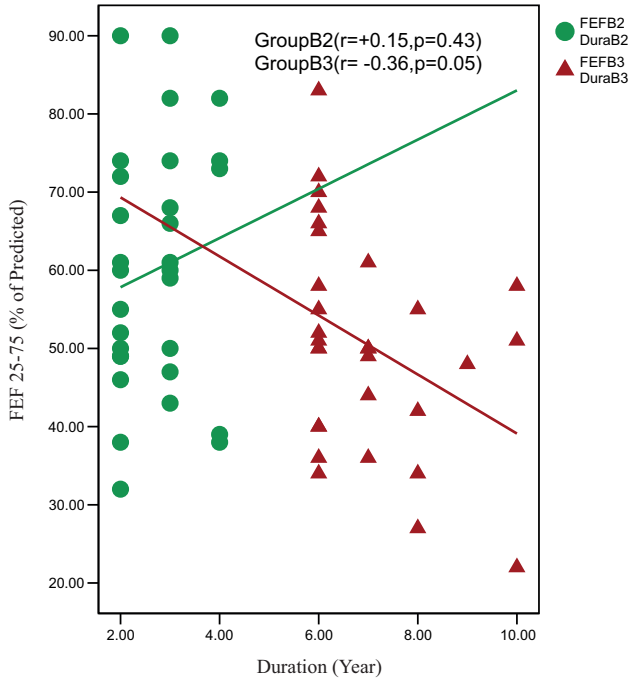

Figure IV: Correlation of percentage predicted value of FEF25-75 with duration of SLE in different groups (n = 60)

Correlation of the study variables with the duration of the disease in SLE are shown in Figure III and IV. FEF_{25-75} were positively correlated with duration of SLE in group B_2 but negatively correlated in B_3 on the other hand PEFR was negatively correlated with duration of SLE in both B_2 and B_3. All these values were statistically non significant

Discussion: The present study was undertaken to observe spirometric pulmonary function in female patients of SLE. In this study, values of lung function parameters of healthy subjects were within physiological limit and were almost similar to those reported by different investigators of abroad[14] as well as in our country[22,18].

PEFR were significantly (p<0.001) lower in patients of SLE with different duration than those of healthy control subjects. Again, this parameter was lower in patients of 2-5 years duration compared to patients of 1 to 6 months duration. However, this ventilatory parameter was significantly lower in patients of SLE with 6-10 years duration compared to 1 to 6 months duration (p<0.001) and 2-5 years duration (p<0.05).No similar observation was available for comparison.

FEF_{25-75} in different groups of patients was significantly (p<0.001) lower than those of control subjects. This finding was consistent to the finding of other investigators[10, 16, 24].

Again, this parameter was lower in patients of 2-5 years duration compared to patients of 1 to 6 months duration. On the other hand, this ventilatory parameter was significantly lower in patients of SLE with 6-10 years duration compared to 1 to 6 months duration (p<0.01) and 2-5 years duration (p<0.01). This finding was consistent to the finding of other investigators[16].

The exact mechanism of development of pulmonary lesion in SLE is not clear. Several investigators of different countries suggested different mechanism for lung involvement. Decreased lung compliance in SLE indicates restrictive features which were probably due to interstitial fibrosis due to inflammatory changes of interstitial tissue[2,14,25]. Moreover, some researchers suggested restriction of lung volumes can be due to pleurisies and pleural effusions[13, 25, 26, 27].

Reduce values of both the lung function parameters in the present study groups and comparatively lower values were observed in patients of longer duration denotes decreased lung compliance and airflow obstruction which is most likely probably due to interstitial fibrosis due to inflammatory changes of interstitial tissue[2,28, 25] and direct weakness of the respiratory muscle in SLE conceivably as part of more generalized muscle disorder[29,30]. Again decreased these lung functions in SLE patients may be due to neurological involvement. So, restrictive features all together may develop in patients with SLE.

Again, reduced values of PEFR, FEF_{25-75} were found with different duration of SLE. These indicated that duration of disease influences the degree of deterioration of lung but were not supported by the significant negative correlation of these parameters with duration of SLE.

Conclusion: This study revealed that pulmonary ventilatory functions are lower in female patients of SLE as shown by lower percentage of predicted values of lung function parameters like PEFR & FEF_{25-75} in comparison to the values of healthy female subjects. All these functional decrement may be the consequence of interstitial fibrosis as well as bronchial narrowing, neurological involvement or respiratory muscle weakness as a result of the involvement of lung structure in widespread chronic inflammatory process of SLE.These values are not signifacently Furthermore, some lung function is inversely related to the duration of disease and some are directly related to the duration of disease. Therefore, from this study it may be concluded that pulmonary function decrease in SLE female and the reduction is inconsistently associated with duration of the disease.

References:

1. Kumar P, Clark M. Kumar and Clark clinical medicine. 6thed.London: *Elsevier Saunders*;2005;574-576.
2. Hahn BH. Systemic Lupus Erythematosus. In: Kasper D, Braunwald E, Fauc AS, Hausen SL, Longo DL. editors. Harrison's principles of Internal medicen. *NY: MC Graw-Hill*; 2005.1960-67.
3. Roy JS, Das PP, Datta A. SLE in pregnancy. *BSMMU J.* 2010;**3**(1):54-59.
4. Kakati S, Doley B, Pal S, Deka UJ. Pulmonary Manifastations in Systemic Lupus Erythematosus with special reference to HRCT. *JAPI.*2007;**55**:839-841.
5. Paran D, Fireman E , Levartovsky D, Elkayam O, Kaufman I, Litinsky I, Caspi D, Koifman B, Keren G, Schwrz Y. Pulmonary dysfunction in Systemic lupus erythematosus and anty-phospholipid syndrome patients. *Scandinavian Journal of rheumatology*. 2007;**36**(4):285-290. http://dx.doi.org/10.1080/03009740601153816
6. Brasington RD, Furst DE. Pulmonary disease in systemic lupus erythematosus. *Clin Exp Rheumatol.*1985;**3**(3):269-76.
7. Ropes MW. Systemic Lupus Erythematosus. Cambridge, Mass: Harvard University Press;1976.
8. Torre O, Harari S. Pleural and pulmonary involvement in systemic lupus erythematosus. Presse Med. 2011 Jan;40(1 Pt 2):e19-29. doi: 10.1016/j.lpm.2010.11.004. *Epub* 2010. http://dx.doi.org/10.1016/j.lpm.2010.11.004
9. Kamen DL, Strange C. Pulonary disfunctions of systemic Lupus Erythematosus. *Clin Chest Med*. 2010;**31**:479-488. http://dx.doi.org/10.1016/j.ccm.2010.05.001
10. Ong YY, Chew CH, Feng PH. Pulmonary function in systemic lupus erythematosus. *Singapore Medical Journal*.1978;**19**:1.

11. Silberstein SL, Barland P, Grayzel AL, Koerner SK. Pulmonary dysfunction in systemic lupus erythematosus: prevalence classification and correlation with other organ involvement. *J Rheumatol.*1980;**7(**2):187-95.

12. Eisenberg H, Dubois EL, Sherwin RP, Balchum OJ. Diffuse Interstitial Lung Disease in Systemic Lupus Erythematosus. *Ann Intern Med*.1973;**79**:37-45. http://dx.doi.org/10.7326/0003-4819-79-1-37

13. Chick TW, Dehoratius RJ, Skipper BE, Messner RP. Pulmonary disfunction in Systemic Lupus Erythematosus without pulmonary symptoms. *J Rhumatol*.1976;**3**: 262-268.

14. Amra B, Mirzael MR, Bonakdar ZS, Golshan M. Respiratory Muscle Funcion and Spirometry in Patients with Systemic Lupus Erythematosus. *Tanaffos*. 2006;**5**:53-58.

15. Eichacker PQ, Pinsker A, Epstein A, Schiffenbauer J, Grayzel A. Serial pulmonary function testing in patients with systemic lupus erythematosus. *Chest*.1988; **94**:129-30. http://dx.doi.org/10.1378/chest.94.1.129

16. Andonopoulas A, Condantopoulos SH, Calanapoulas V, Drosos AA, Acritidis NC, Moutsopou HM. Pulmonary function of non-smoking patients with systemic lupus erythematosus. *Chest.*1988;**94**:312-15. http://dx.doi.org/10.1378/chest.94.2.312

17. Parvin N, Dus DK, Haque FRM, Nabi M, Haque MM. Cutaneous Manifestation of Systemic Lupus Erythematosus. *Journal medicine*.1997;**8**:44-48.

18. Gill LM, Quisel AM, Rocca PV, Walters DT . Diagnosis of Systemic Lupus Erythematosus. *Am Fam Physician*.2003;**68**(11):2179-2187.

19. WHO Definition, Diagnosis and Classification of Diabetes Mellitus and its complication. Report of a WHO Consultation. Geneva: *WHO*; 1999

20. Colledge NR, Walker BR, Ralston SH. Davidson's Principles and Practice of Medicine. 21st ed. China: *Elsevier Limited*; 2010.

21. American Diabetic Association. Clinical Practical Recommendation. Diabatic Care.2008:31(Suppl):S8.

22. Ali MO, Begum S, Begum N, Ali T, Ferodusi S. PEFR and FEF25-75 in type 2 diabetis mellitus and their relationship with it's duration. *J Bangladesh Soi Physiol*. 2010;**5**(1):14-19.

23. Akhter P. Assesment of some aspects of spirometric lung function status in hypothyroid female. [M. Phil Thesis] [Dhaka]. Bangabandhu Sheikh Mujib Medical University; 2009.130.

24. Tsang HYH, Lee SL, Wong K, Lau YL. Prevention of respiratory function abnormalities in asymptomatic Chinese patients with juvenile onset systemic lupus erythematosus. *HKJ Paediatr*. 2006;**11**:199-204.

25. Jongste JCD, Neijens HJ, Duiverman EJ, Bogaard JM, Keffebijn KF. Respiratory tract disease in Systemic Lupus Erythematosus. *Archives of disease in children*,1986; **61**:478-483. http://dx.doi.org/10.1136/adc.61.5.478

26. Guleria R, Pangtey G. Lung in SLE. *Indian Journal of rheumatology*.2007;**2**(4): 131-132. http://dx.doi.org/10.1016/S0973-3698(10)60055-6

27. Kumar V, Abbas AK, Fausto N, Aster JC. Robbins and Cotran Pathologic Basis of disease. 8th ed. India: *Elsevier Saunders*; 2010;215-220.

28. Martin L. The essential for patient care and evaluation. St. Louis: Mosby Yearbook Company; 1987;172-186.

29. Isenberg DA, Snaith ML. Muscle disease in systemic lupus erythematosus: a study of its nature, frequency and cause. *J Rheumatol* 1981;**8**:917-24.

30. Dubois EL. The clinical picture of systemic lupus erythematosus. 2nd edition. Los Angeles; *University of Southern California Press*,1974:262-65.

31. Weninrib L, Sharma OP, Quismorio FP. A longterm study of interstitial disease in Systemic Lupus erythematosus. *Semi Arthritis Rheum*. 1990;**20**:48-56. http://dx.doi.org/10.1016/0049-0172(90)90094-V