

**A STUDY ON SPIROMETRIC EVALUATION OF LUNG VOLUME RESTRICTION IN PREDIAGNOSED CASES OF SKELETAL FLUOROSIS**Abhijit Mandal<sup>1</sup>, Souvik Ray<sup>2</sup>, Sumanta Kumar Mandal<sup>3</sup>, Tapas Roy<sup>4</sup>, Rikta Mallik<sup>5</sup>, Debasis Deoghuria<sup>6</sup>**HOW TO CITE THIS ARTICLE:**

Abhijit Mandal, Souvik Ray, Sumanta Kumar Mandal, Tapas Roy, Rikta Mallik, Debasis Deoghuria. "A Study on Spirometric Evaluation of Lung Volume Restriction in Prediagnosed Cases of Skeletal Fluorosis". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 27, July 07; Page: 7558-7562, DOI: 10.14260/jemds/2014/2935

**ABSTRACT:** Fluorosis is an important public health problem in India. Skeletal changes and mottled enamel may result when drinking water contains excess fluoride. Due to involvement of ribcage skeletal fluorosis causes restrictive lung disease causing reduction in vital capacity. This cross sectional observational study has been done on 55 pre diagnosed patients of skeletal fluorosis, they have been classified according to MMRC dyspnea grading & lung volume has been measured. Among 55 patients, 43 patients (78.18%) have shortness of breath, it also has been seen that 13.95% patients have MMRC grade 4 dyspnea, i.e. too breathless to leave the home & 21.81% of cases have FVC < 34% of predicted, i.e. very severe lung volume restriction.

**KEYWORDS:** Fluorosis, Dyspnea, MMRC, FVC

**INTRODUCTION:** In human nutrition, fluorine plays a dual role; to prevent dental caries at a certain level of intake and can cause serious damages in bony and dental tissues.<sup>1</sup> Skeletal changes and mottled enamel may result when drinking water content of fluoride exceeds 2 ppm.<sup>2</sup> Fluorosis is an important public health problem in 24 countries, including India, which lies in the geographical fluoride belt that extends from Turkey to China and Japan through Iraq, Iran and Afghanistan.<sup>3</sup> The available data suggest that 15 States in India are endemic for fluorosis (fluoride level in drinking water >2 mg/l), and about 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis.<sup>4</sup> Due to involvement of ribcage skeletal fluorosis causes restrictive lung disease causing reduction in vital capacity.<sup>5, 6</sup> The present study has been done to spirometrically evaluate lung volume restriction in prediagnosed cases of skeletal fluorosis.

**MATERIALS & METHOD:** The study has been done on 55 prediagnosed patients of skeletal fluorosis by dept. of pulmonary medicine & dept. of community medicine in a tertiary care hospital over a period of three years. It is a cross sectional observational study. The patients have been evaluated with detailed history, clinical examination; necessary blood investigation, chest X- ray, sputum AFB, spirometry & other relevant investigation and the data have been analyzed. There is no ethical or financial objection regarding this study.

**RESULT:**

1. Maximum number of patients (30.91%) is in the age group of 21-30 years.
2. Among 55 patients 31 are male (56.36%), 24 are female (43.63%). The male: female ratio 1.29: 1.
3. Most of the patients are presented with back pain (81.82%) & shortness of breath (78.18%).

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4. Among 43 patients presenting with shortness of breath, 13 patients have grade 1 dyspnea, 10 have grade 2 dyspnea & 6 patients have grade 4 dyspnea.
5. 21.81% of cases have FVC <34% of predicted, i.e. very severe lung volume restriction.
6. Incidentally among 55 patients, 6 have sputum positive pulmonary tuberculosis, 5 patients have smear negative pulmonary TB.

**DISCUSSION:** From the table no. 1 it has been observed that most of patients are in the age group of 21-30 years. However 14.54% of patients are in the age group of <20 years, whereas 5.45% patients are over 60 years. So, fluorosis can affect all age group including the pediatric age group also. This finding is supported by several prevalence studies all over India.<sup>7,8</sup>

In the present study, the male: female sex ratio 1.29: 1. Sex has some influence on development of endemic fluorosis, particularly skeletal fluorosis which can affect labourers and farmers who do hard manual work and carry heavy load on their head. <sup>5</sup>Actual sex distribution in fluorosis patients can only be assessed by community survey.

Regarding clinical presentation, most of the patients are presented with back pain (81.82%) & shortness of breath (78.18%). This finding is supported by several other studies.<sup>9-11</sup>

From the table no. 3, it has been seen that 13.95% patients have MMRC grade 4 dyspnea, i.e. too breathless to leave the home & table no. 4 shows 21.81% of cases have FVC < 34% of predicted, i.e. very severe lung volume restriction. In skeletal fluorosis, the patients often complain pain and stiffness in the back, especially in the lumbar region, followed by dorsal and cervical spines. Restriction of the spine movements is the earliest clinical sign of skeletal fluorosis. The combined effects of kyphosis, scoliosis, and rotation of the spine reduce the compliance of the chest wall and increase the recoil pressures of the chest wall and the respiratory system at any given lung volume.<sup>11,12</sup>

Also, in a recent study on effect of chronic fluorosis on lipid peroxidation and histology of lung tissues in first and second generation rat shows loss of alveolar architecture, emphysematous areas, desquamation of alveolar epithelium and alveolar congestion and marked destruction of lung tissue.<sup>13,14</sup>

Now, whether mere chest wall restriction or associated fluoride induced changes in lung parenchyma is responsible for shortness of breath and low FVC – a larger study with emphasis on lung histopathology probably will solve this problem.

Incidentally among 55 patients, 6 have sputum positive pulmonary tuberculosis & 5 patients have smear negative pulmonary TB diagnosed with sputum smear examination & chest x-ray & treated with ATD under DOTS. Kyphoscoliosis due to skeletal fluorosis, associated with episodes of acute exacerbation particularly due to respiratory tract infection.<sup>15</sup> A larger study on cases of pulmonary tuberculosis associated with skeletal fluorosis with new insight on pulmonary defense mechanism will probably help to know whether fluorosis is a risk factor for pulmonary tuberculosis or not.

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Age in years	No. of patient	Percentage
<20	8	14.54
21-30	17	30.91
31-40	13	23.63
41-50	8	14.54
51-60	6	10.91
>60	3	5.45

**Distribution of patients in different age group**

Complaints	No. of patient	Percentage
Back pain	45	81.82
Joint pain & leg pain	37	67.27
Stiffness of major joints	34	61.81
Deformity	21	38.18
Neurodeficit	9	16.36
Visible nodule	18	32.72
Shortness of breath	43	78.18

**Type of clinical presentation**

GRADE	No. of patient	%
0	5	11.62
1	13	30.23
2	10	23.25
3	9	20.93
4	6	13.95

**Classification of shortness of breath according to MMRC**

FVC (% of predicted)	No. of cases	Percentage
<LLN but $\geq 70\%$	7	12.72
< 70% but $\geq 60\%$	15	27.27
<60% but $\geq 50\%$	13	23.63
<50% but $\geq 34\%$	8	14.54
<34%	12	21.81

**Classification of patients according to lung volume restriction**

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Date of Submission: 28/06/2014.  
Date of Peer Review: 29/06/2014.  
Date of Acceptance: 02/07/2014.  
Date of Publishing: 07/07/2014.