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RESEARCH ARTICLE

ASSESSMENT OF PULMONARY FUNCTION TESTS AMONG RICE MILL WORKERS

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Abstract

Lung function tests have became an integral part of assessment of pulmonary disease of the respiratory system induced by occupational dusts are influenced by duration of exposure Occupational exposure to rice husk dust have been shown to affect functioning of different systems of the body. The present study was taken up to assess the Pulmonary Function Tests (FEV1/FVC) in rice mill workers.

Methods: The present study was conducted in various Rice mills in and around Kurnool district with due permission of the owners from jan2019 to jan 2020 Fifty non-smoker males in the age group of 20–35 years working in rice mills for more than 1 year formed the study group. Age and sex matched individuals not exposed to rice husk dust served the control group. Pulmonary function parameters FEV1, FVC and FEV1/FVC were assessed using computerised Spirometer during their working hours and were statistically analysed. Results: There was a statistically significant decrease in FEV1, FVC and FEV1% in study group compared to control group with normal.

Conclusion: Dust exposure in the working environment affects the lung function values and increased the respiratory symptoms among the rice mill workers.The above findings point towards adverse effects of rice husk dust on lung function, mainly on lower airways with obstructive pattern of disease.

Introduction:-

The respiratory health effects have been documented in workers exposed to a variety of dusts in small and large scale industries, which generate dusts during their production process [1]. Diseases of the respiratory system induced by occupational dusts are influenced by the type of dust and duration of exposure [2]. Occupational diseases are caused by pathologic responses of the workers to their working environment [3]. Rice mill workers are potentially exposed to organic and inorganic dusts and synthetic chemicals that may have adverse effects on their respiratory health [4]. Several reports have suggested that unprotected dust exposures in agricultural settings may lead to pulmonary fibrosis [5–7]. Grain dust has a long history of association with disease, and its adverse effects.

Keeping in view the hazards of rice husk dust the present study was designed to investigate the susceptibility towards the lung changes (FEV1/FVC) in rice mill workers in comparison to normal young adult individuals.

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Material And Methods:-

The present study was conducted in various Rice mills in and around Kurnool district with due permission of the owners from jan2019 to jan 2020. Ethical clearance was taken from the Institutional Ethical Committee and Consent was taken from each subject.

Total sample sizes of 100 adults were chosen comprising of the Study group and Control group. The study group consisted of 50 males of age group of 20–50 years, who were working in various rice mills for more than 1 year. The control group consisted of 50 males of same age group, who were not exposed to rice husk dust, from the preclinical and paraclinical departments of Kurnool Medical College, Kurnool.

The subjects chosen in the study and the control group had no history of allergic disorders, respiratory disorders like asthma, or any systemic disease and no history of smoking, chewing tobacco, intake of alcohol and no history of previous exposure to rice mill dust.

Age, height, and weight were recorded .Pulmonary functions were tested during work shift using Medspiror® (a self-calibrating computerized spirometer that fulfils the criteria for standardised lung function tests). The parameters studied were, Forced Vital Capacity (FVC), Forced Expiratory Volume in first second (FEV1), FEV1/FVC (FEV1%).

The subjects were familiarised with the setup and detailed instructions were given. All the tests were carried out at the same time of the day, between 8.30AM to 9.30 AM to avoid possible diurnal variations. Tests were performed using the acceptability standards outlined by the American Thoracic Society (ATS) with subjects in a standing position and wearing nose clips. The subjects were asked to breathe forcefully following deep inspiration into the mouthpiece. Expiration was maintained for a minimum period of 3–4 seconds, 3 to 4 trails of maximal inspiratory and expiratory efforts were made and the highest reading was taken for statistical analysis

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Statistical methods employed in the present study were Mean and Standard Deviation, Independent sample t-test and one way analysis of variance using SPSS-16 and compared between the study and control group. The p value less than 0.05 was considered statistically significant.

Results:-

Table 1 shows no significant difference in age, height, weight and BMI between rice mill workers and control subjects indicating samples were homogeneous in nature.

Table1:- Anthropometric parameters of study group compared with their matched controls.

Basic Characteristics	Study group (n=50)	Control group (n=50)	Significance	
			t-value	p-value
Age (years)	32.96 ± 8.12	33.52 ± 6.63	0.37	0.70, NS
Height (mts)	158.7 ± 0.99	159.94 ± 0.07	0.70	0.48, NS
Weight (kgs)	60.14 ± 8.23	62.66 ± 9.66	1.403	0.16, NS
BMI (kg/ m^2)	24.10 ± 5.26	24.53 ± 3.67	0.48	0.63, NS

Table 2:- Shows statistically significant decline in forced vital capacity (fvc), forced expiratory volume in first second (fev1) and fev1/ fvc in rice mill workers than control subjects.

DURATION OF EXPOSURE	n	FVC	FEV_1	FEV_1/FVC
1-10	19	3.21± 0.52	2.92 ± 0.35	92.76 ± 6.13
11-20	20	2.06± 0.29	1.96± 0.28	90.61 ± 6.74
>20	11	1.65± 0.14	1.45± 0.13	85.51± 8.54
ANOVA	P	0.00* HS	0.00* HS	0.028 S

Table 2: comparison of forced vital capacity (fvc), forced expiratory volume in first second (fev1) and fev1/ fvc of study group and control group.

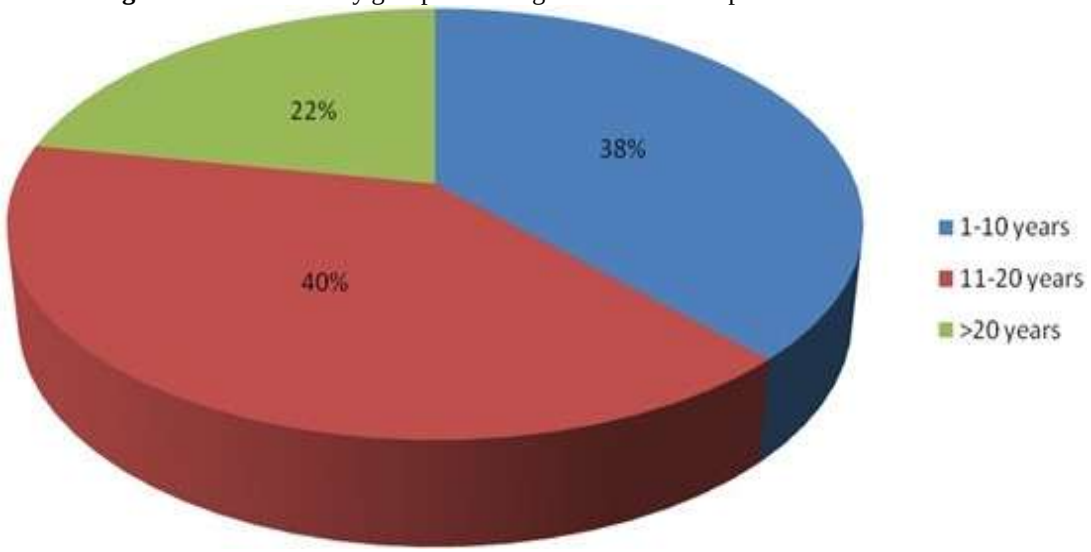
All data presented are in Mean ± SD
[p>0.05 – Not significant(NS),p<0.05 – Significant (S), p<0.01
Highly significant(HS)*]

Table 3:- Shows statistically highly significant reduction in FVC, FEV1and significant reduction in FEV1/ FVC with duration of exposure. Table 3: comparison of forced vital capacity (fvc), forced expiratory volume in first second (fev1) and fev1/fvc with relation to duration of exposure to rice mill dust.

PARAMETER	Mean±SD		*t*-Test	*p- value*
	Study Group (n=50)	Control Group (n=50)		
FVC(L)	2.40 ± 0.75	3.32 ± 0.59	6.72	0.000*
FEV_1	2.21± 0.65	3.14± 0.53	7.71	0.000*
FEV_1/FVC	91.39± 6.98	95.09 ± 3.53	3.34	0.001*

HS: Highly significant, S: Significant.
Fig1:shows division of study group according to duration of exposure to rice husk dust. Out of 50 cases 19 were exposed to1-10 years (38%), 20 were exposed to 11-20 years (40%) and 11(22%) were exposed to >20 years

Fig 1:- Division of study group according to duration of exposure to rice husk dust.



Discussion:-

The prevalence of occupational lung disease varies from 15 – 30% in various parts of India(9).The lung with its extensive surface area high blood flow and thin alveolar epithelium is an important area of exposure with the substances in the envoirnment(10).They are usually induced by extended exposure to irritating or toxic substances that may cause acute or chronic respiratory ailments; however severe single exposure can also generate chronic lung diseases(11).

Rice mill dust is a complex organic dust with varied composition, including particles of husk, cuticular hair, pollen, bacteria and mucous spore. It is a respiratory sensitizer and chronic exposure to it affects the pulmonary functions and stimulates allergic response(12).when dust are inhaled macrophages dissolve the dust particles by surrounding them but the continuous exposure can lead to an overload situation so that the macrophages cannot deal and completely clear the particles. The particles are lodged in the airways and are responsible for setting up the inflammatory reaction, leading to restrictive and obstructive lung diseases(12).

Pulmonary Function Tests have opened a new era towards scientific approach in diagnosis, prognosis and management of pulmonary disorders by the early recognition of their alteration in industry workers who are constantly exposed to various dust pollutants and to institute protective and preventive measures to minimize the hazards of exposure to polluted environments(13). Ideally the provision of appropriate monitoring programmes in industry should be an integral part of primary health care initiatives developed for working place with growing industrialization in India(14).

In the present study, lung functions in rice mill workers are significantly decreased as compared to their matched controls.
Our study showed decreased FVC in rice mill workers. The decrease in FVC may be due to changes to the bronchii and elastic component of lungs resulting in restrictive type of lung impairment.

Conclusion:-

Our findings point towards the adverse effects of rice mill dust on lung function showing obstructive pattern of disease compared to control group.

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