

Health Status of Workers in Sugarcane Industry- A Cross-Sectional Study

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ABSTRACT

India has a large sugarcane industry where many people are engaged in this work. Inhalation of sugarcane dust (bagasse dust) causes disease of respiratory system which is commonly described under the heading of hypersensitivity pneumonitis and workplace morbidities in many workers. Present study is conducted to assess Health profile of Sugarcane workers with special references to respiratory problems. The present cross-sectional study was conducted on 200 workers at Sugarcane industry to assess health status of the workers. The sampling was based on the assessment of workers' personal exposures to sugarcane dust during regular working conditions in a pre-determined working section. Sample size calculated based on previous literature. Data regarding age, sex, duration of exposure, co-morbidities, X-ray chest, pulmonary function tests was collected. Chi-square applied. Most of the workers were belonging to age group 21-40 years. 27% were belonging to Engineering Department, 51% workers were working for <5 years, 27% Sugar cane industry workers had history of alcohol consumption and 24% workers were known case of Hypertension. Musculo-skeletal disorders (MSD) were also common. X-ray findings showed were Small basal Opacities seen in 3 workers suggestive of old pneumonia. Workers who were working in c more than 6 years were having more respiratory complaints and abnormal X-ray findings. Health profile of Sugarcane workers had respiratory problems and MSD.

Keywords: Sugarcane industry; Bagasse dust; Health status of workers; Musculo-skeletal problems

Introduction

Sugarcane is tall perennial true grasses of the genus *Saccharum*, tribe Andropogoneae. The main product of sugarcane is sucrose, which accumulates in the stalk internodes. Sugarcane is the world's largest crop. In 2014, FAO estimates it was cultivated on about 23.8 million hectares, in more than 90 countries, with a worldwide harvest of 1.69 billion tonnes. The five major producers, in decreasing amounts of production, were India, China, Thailand and Pakistan. [1] India has a large sugarcane industry where many people are engaged in this work. The process of sugarcane refining is carried out in two main steps in various processing units or sections. In first step pressing of sugarcane and extraction of juice is completed in engineering

section, in second step crystallinesugaris manufactured inmanufacturing sectionofsugar industry.

The workplace environment of engineering section includes high intensity, noise; hightemperature and particularly the high concentration of dust i.e. clay dust and bagasse dust.Inhalation of bagasse dust causes disease of respiratory system which is commonly describedunderthe heading of hypersensitivity pneumonitis [2].Sugar cane industry workers have witnessed respiratory and other health effects like renal insufficiency, heat stress related issues and burnout due to excess stress working in non-conducive environment [3-5].Occupational heat strain has important health and productivity outcomes and should be recognized as a public health problem.Respiratory symptoms due to sugar cane dust can be attributed to microenvironment and the producing areas with effective application of ergonomic principles. The present study was planned with objective to assess health status and morbidity pattern of workers among sugarcane industry and to find association between duration of exposure and respiratory complaints among sugarcane industry workers. Sugar cane industrial Occupational related hazards have a huge impact on workers’ overall health and should not be neglected [8-10].

MaterialandMethods

The present study was conducted at Sugarcane industry, Sangli, Maharashtra to assess health status of the workers. It is a cross-sectional observational study from January 2021 to April 2022 for one and half year. The sampling was based on the assessmentof workers’ personal exposures to sugarcane dust during regular working conditions in a pre-determinedworking section. Sample size was calculated using open epi software. Study done by Masthi et al in Mandya has showed that 55% (p) had one or other burden of the disease in sugar cane industry workers. With 95% confidence interval, error of 10% sample size calculated was 100 [11].Totalnumberof200workersenrolledinthestudy.The most exposed employee or maximum riskemployees’ strategywasusedtodeterminethesamples(NIOSH,1977).Thissamplingrepresented all occupations and tasks performed in industry. Data regarding age, sex, duration ofexposure,co-morbidities, X-raychest, pulmonaryfunctiontests wascollected. All data were entered in Windows Microsoft excel sheet and analyzed using SPSS version 22.

Descriptive statistics applied where ever needed and to check for association Chi-square test was used. Confidentiality and autonomy of the participants were maintained and study started after Institutional ethical committee clearance. Chest X ray was done by Potable X Ray machine, GE.

Results

Table1: Distribution of workers in sugar cane industry in industry

PatientsCharacteristics		Frequency	Percent
AgeGroup (Years)	<20	10	5
	21-40	142	71
	41-60	48	24
Yearsofwork	<5	102	51
	6-10	78	39

	>11	20	10
SmokingPattern	Smoking	18	9
	Alcohol	54	27
Hypertension	Present	48	24
Diabetes Mellitus	Present	42	21
SkinProblems	Yes	13	13.00%
MusculoskeletalProblems	Lowbackpain	34	17.00%
	KneePain	28	14.00%
	Shoulderpain	24	12.00%
	Neckpain	12	6.00%
	WristPain	14	7.00%
RespiratoryComplaints	Cough	36	18.00%
	Dyspnea	18	9.00%
	Wheezing	14	7.00%
	Rhinorrhea	6	3.00%

In the present study, out of 200 workers, most of the workers, 71% were belonging to age group 21-40 years, followed by 24% Sugar cane industry workers from age group 41 to 60 years. In the present study, most of the workers in sugar cane industry, 51% were working for less than 5 years, 39% Sugar cane industry workers were working since 6-10 years and only 10% Sugar cane industry workers were working since >11 years. In the present study, out of 100 Sugar cane industry workers, 27% Sugar cane industry workers had history of alcohol consumption and past history of alcohol consumption. 9% Sugar cane industry workers were smokers.

In the present study, 24 % Sugar cane industry workers were known case of Hypertension, 21% were known case of Diabetes Mellitus, 7 were having history of Urinary Tract Infection and 3% Sugar cane industry workers were having history of Gout. (Table 1). In the present study, 13 Sugar cane industry workers were suffering from some skin problems like tinea cruris, urticaria, scabies some Sugar cane industry workers were having pityriasis versicolor. Musculo-skeletal problems were also common. 17 Sugar cane industry workers complaining about Low back pain, 14 Sugar cane industry workers about Knee Pain and 12 Sugar cane industry workers Shoulder pain. Neck pain and Wrist Pain were less common. 18 Sugar cane industry workers were having complains of cough and 9% dyspnea, 7 % Wheezing.

Table 3: Chest X-ray findings of Sugar cane industry workers

Xray Findings	Frequency	Percent
Small basal Opacities	6	3.00%
Rounded Atelectasis	4	2.00%
Lower lobe cavity	2	1.00%
Normal	188	94.00%

Total	200	100.00%
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X ray was done in Sugar cane industry workers who were having one or other respiratory complaints (18 Sugar cane industry workers). Various x ray findings were Small basal Opacities seen in 6 Sugar cane industry workers suggestive of old pneumonia. Rounded Atelectasis seen in 4 Sugar cane industry workers suggestive of bronchitis and asthma, Lowerlobe cavity was seen in only 2 subject suggestive of old treated case of Tuberculosis. Rest of workers were having Normal Xray findings.

Table4: Association between Duration of Exposure and Morbidities:

Morbidities		Year of work (Duration of Exposure)			P Value*
		<5	6 to 10	>11	
Respirable Complaints	Yes	0(0.0%)	24(30.7%)	12(60%)	<0.001
	No	102(100%)	54(69.3%)	8(40%)	
Chest Xray	Abnormal	0(0.0%)	6(7.7%)	6(30%)	<0.001
	Normal	102(100%)	72(92.3%)	14(70%)	

*Chi-square test

Sugar cane industry workers who were working since more than 6 years were having more respiratory complaints as compared to the Sugar cane industry workers working since < 5 years. Association was found to be significant. Sugar cane industry workers who were working since more than >11 years were having abnormal X ray findings as compared to the Sugar cane industry workers working since < 10 years. Association was found to be significant.

Table5: Association between Exposure to Bagasse and Respiratory Symptoms

Morbidities		Exposure to Bagasse		Total	P value*
		Exposed for more than 5 years	Exposed for less than 5 years		
Clinically Significant Respiratory Complaints	Yes	18(9%)	18(9%)	36(18%)	0.02*
	No	82(41%)	82(41%)	164(82%)	
Smoking	Yes	12(6%)	32(16%)	44(11%)	0.2
	No	94(94%)	82(84%)	176(89%)	
Diabetes Mellitus	Yes	22(22%)	20(20%)	42(21%)	0.8
	No	78(78%)	80(80%)	158(79%)	
Pulmonary Function Test	Abnormal	3(1.5%)	2(1%)	3(3%)	

	Normal	96(48%)	98(49%)	97(97%)	0.5
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*Chi-square test 18(9%) of those workers who had exposure to Bagasse had Clinically Significant Respiratory Complaints compared to those who had lesser exposure and this association between Respiratory complaints and Duration of exposure. Smoking, Diabetes Mellitus and Pulmonary Function Test were not found statistically significant with Duration of Exposure.

Discussion

The present study was a cross sectional study carried out for a period of one and half years among Sugar cane industry workers. All were male workers. Xray findings like Small basal Opacities suggestive of old pneumonia, Rounded Atelectasis seen in Sugar cane industry workers suggestive of bronchitis and asthma, Lower lobe cavity was seen in only patient suggestive of old treated case of Tuberculosis. In the present study, 27% Sugar cane industry workers having history of alcohol consumption, some occasionally on weekends only and some have only past history of alcohol consumption. 9% Sugar cane industry workers were smokers, out of them 6 were having past history of cigarette smoking and only 3 Sugar cane industry workers were current and occasional smokers. These findings are comparable with a study by Rahul Bisht et al on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that majority (33%) of employees were having habit of consuming tobacco [12].

These findings are comparable with the findings of a study by Mireia Gascon et al on Respiratory, allergy and eye problems in bagasse-exposed sugar cane Sugar cane industry workers in Costa Rica, they found that 47.6% Sugar cane industry workers were smokers [13]. In the present study, Sugar cane industry workers were known to have Hypertension and Diabetes Mellitus. These findings are comparable with a study by Rahul Bisht et al on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that 20% of employees were suffering from hypertension [12]. Non communicable diseases are very common and their complications must be looked among industrial workers during periodical examination. Non communicable diseases add on to the risk of Pneumoconiosis in industrial workers [14,15]. Respiratory symptoms like cough, wheezing and chest pain were noted in the present study. Similarly in a study by Mireia Gascon et al on Respiratory, allergy and eye problems in bagasse-exposed sugarcane Sugar cane industry workers in Costa Rica, they found that 25% Sugar cane industry workers in the bagasse group reported more SOB. In the present study, Sugar cane industry workers who were working more than 6 years were having more respiratory complaints as compared to the Sugar cane industry workers working since < 5 years which had statistically significant association. Systematic review also suggest that air borne pollutants can damage the respiratory tract among industrial workers [16]. Similar findings are seen in a study by Nitin S Nikhade et al on pulmonary function test in Sugar cane industry workers of sugar factory, Pravaranagar, Maharashtra, they found that the highest prevalence of pulmonary impairment was found in ≥ 31 yrs exposed Sugar cane industry workers [17-20]. Study done by Maky et al also showed similar findings air borne pollutants can damage the respiratory tract especially effecting pulmonary tissue and impairing Pulmonary function test drastically [18]. Pre placement examination of industry workers especially those occupations which predisposes for developing lung related health issues seems to be neglected [19]. Personal protective equipment's matching the occupation must be considered and it's the need of hour to

prevent occupation related pneumoconiosis [20].

Conclusions

Sugarcane industries are highly heterogeneous place where workers have to expose different health risks depending on the working activity. Poor working condition results ergonomic problems viz musculoskeletal disorder, repetitive work strain, and respiratory problems. Musculoskeletal discomfort was found maximum in low back and knee for cane workers performing manual lifting and carrying task. It was followed by complaints of cough and dyspnea. Various x ray findings were Small basal Opacities seen in few Sugar cane industry workers suggestive of old pneumonia. ***No cases of Bagassosis have been reported so far in any study.*** Sugar cane industry workers who were working since more than 6 years were having more respiratory complaints and abnormal X ray findings. Limitations of the study were few. No causal association could be established.

It was a single centered study, hence generalization of the results could not be done. The present study recommends to do aperiodical examination every 6 months and conduct air monitoring to measure worker exposures and ensure that controls are providing adequate protection for workers. Maintaining dust control systems to keep workers in good working environment is essential. Sugar cane industry workers should be supplemented with the use of respirators. Instruction about the use and care of appropriate protective equipment including protective clothing and respiratory protection is necessary. Special attention regarding the development of signs and symptoms of Bagassosis should always be kept in mind.

Conflict of Interest

The authors declare that they have no competing interests.

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