

Assessment of health status of workers in sugarcane industry

¹Dr. Mohan M. Raut, M.D. Community Medicine, Associate Professor, Department of Community Medicine, RCSM Govt. Medical College, Kolhapur, Maharashtra.

²Dr. Anurag Gupta, M.D. Community Medicine, Assistant Professor, Department of Community Medicine, RCSM Govt. Medical College, Kolhapur, Maharashtra.

³Mrs. Rajashri L. Salamwade, MSc. Statistics, Statistician, Department of Community Medicine, RCSM Govt. Medical College, Kolhapur, Maharashtra.

Corresponding Author: Dr. Anurag Gupta, M.D. Community Medicine, Assistant Professor, Department of Community Medicine, RCSM Govt. Medical College, Kolhapur, Maharashtra.

How to citation this article: Dr. Mohan M. Raut, Dr. Anurag Gupta, Mrs. Rajashri L. Salamwade, “Assessment of health status of workers in sugarcane industry”, IJMACR- February - 2023, Volume – 6, Issue - 1, P. No. 337 – 344.

Open Access Article: © 2023, Dr. Anurag Gupta, et al. This is an open access journal and article distributed under the terms of the creative commons attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: India has a large sugarcane industry and Maharashtra being one of the largest sugar producers, 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.

Material and Methods: The present cross-sectional study was conducted on 100 subjects at Sugarcane industry to assess health status of the workers who were willing to participate. The sampling was based on the assessment of workers' personal exposures to sugarcane dust during regular working conditions in a pre-

determined working section. Out of them 50 were exposed to dust and 50 were unexposed (control group). The most exposed employee or maximum risk employees' strategy was used to determine the samples (NIOSH, 1977). This sampling represented all occupations and tasks performed in industry. Data regarding age, sex, duration of exposure, co-morbidities, X-ray chest, pulmonary function tests was collected.

Results: The present study was conducted on subjects in sugarcane industry. Most of the subjects, were belonging to age group 21-40 years. 27% were belonging to Engineering Department. 51% subjects were working since <5 years. 27% subjects having history of alcohol consumption, and 24% subjects were known case of Hypertension. Musculo-skeletal problems were also common. 17 subjects complaining about Low back pain.

18 subjects were having complains of cough and 9% dyspnea. Various x ray findings were Small basal Opacities seen in 3 subjects suggestive of old pneumonia. No cases of Bagassosis have been reported so far in any study. Subjects who were working since more than 6 years were having more respiratory complaints and abnormal X ray findings.

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 and Maharashtra being one of the largest sugar producers, 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 crystalline sugar is manufactured in manufacturing section of sugar industry.

The workplace environment of engineering section includes high intensity, noise; high temperature 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 described under the heading of hypersensitivity pneumonitis. ⁽²⁾ Present study is conducted to assess

Health profile of Sugarcane workers with special references to respiratory problems.

Objectives

1. To assess health status and morbidity pattern of workers among sugarcane industry
2. To find association between duration of exposure and respiratory complaints among sugarcane industry workers

Material and methods

The present study was conducted at Sugarcane industry to assess health status of the workers. It is a cross-sectional observational study. A descriptive cross-sectional research design involves measuring the variables once at a single point in time, to provide a perspective on the magnitude of risk of exposure.

A convenience sample was used. Owing to limited time available, data of workers was collected who were willing to participate in the study. The sampling was based on the assessment of workers' personal exposures to sugarcane dust during regular working conditions in a pre-determined working section.

Total numbers of 100 subjects were enrolled in the study. Out of them 50 were exposed to dust and 50 were unexposed (control group). The most exposed employee or maximum risk employees' strategy was used to determine the samples (NIOSH, 1977). This sampling represented all occupations and tasks performed in industry. Data regarding age, sex, duration of exposure, co-morbidities, X-ray chest, pulmonary function tests was collected.

Observations and results

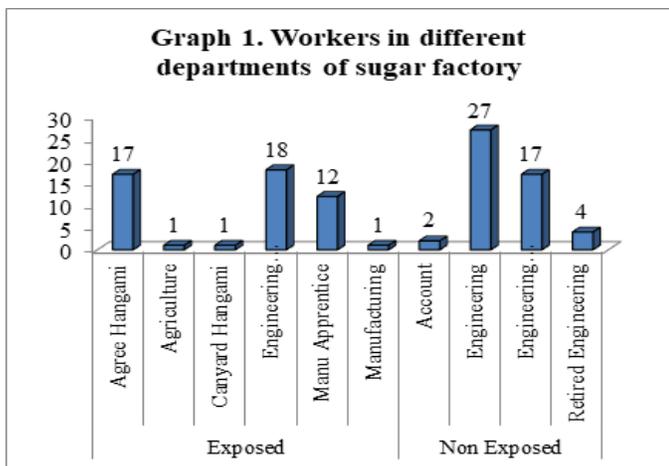
In the present study, out of 100 subjects, most of the subjects, 71% were belonging to age group 21-40 years, followed by 24% subjects from age group 41 to 60

years. Only 5 subjects were from age group 20 years. (Table 1)

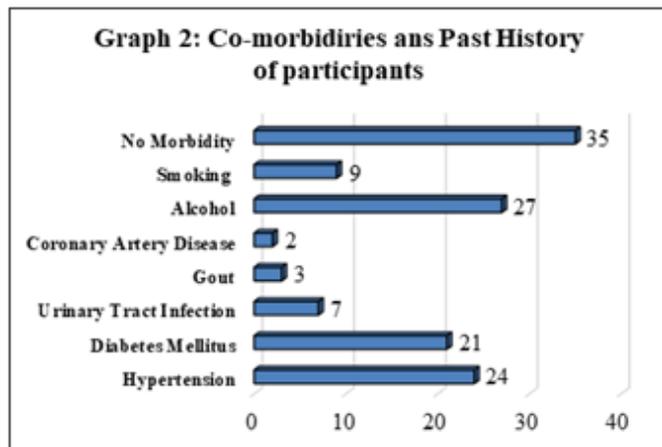
Table 1: Characteristics of the Subjects enrolled

Patients Characteristics		Frequency	Percent
Age Group (Years)	<20	5	5%
	21-40	71	71%
	41-60	24	24%
Years of work	<5	51	51.00%
	6-10	39	39.00%
	>11	10	10.00%
Smoking Pattern	Smoking	9	9.00%
	Alcohol	27	27.00%
Total		100	100.00%

In the present study, out of 100 subjects, most of the subjects, 51% were working since <5 years, 39% subjects were working since 6-10 years and only 10% subjects were working since >11 years. In the present study, out of 100 subjects, 27% subjects having history of alcohol consumption, some occasionally on weekends only and some have only past history of alcohol consumption. 9% subjects were smokers, out of them 6 were having past history of cigarette smoking and only 3 subjects were current and occasional smokers.



In the present study, out of 100 subjects, most of the subjects, 27% were belonging to Engineering Department, 18% subjects were from Engineering Hangami department and 17% were belonging to Agree Hangami and Engineering Apprentice department each. (Graph 1)



In the present study, out of 100 subjects, 24 subjects were known case of Hypertension, 21 were known case of Diabetes Mellitus, 7 were having history of Urinary Tract Infection and 3% subjects were having history of Gout. (Graph 2)

Table 2: Skin Problems among Subjects

Patients Characteristics		Frequency	Percent
Skin Problems	Yes	13	13.00%
	No	87	87.00%
Musculoskeletal Problems	Low back pain	17	17.00%
	Knee Pain	14	14.00%
	Shoulder pain	12	12.00%
	Neck pain	6	6.00%
	Wrist Pain	7	7.00%
Respiratory Complaints	Cough	18	18.00%
	Dyspnea	9	9.00%
	Wheezing	7	7.00%
	Rhinorrhea	3	3.00%
Total		100	100%

In the present study, 13 subjects were suffering from some skin problems like tenia cruris, urticaria, scabies some subjects were having pityriasis versicolor. Musculo-skeletal problems were also common. 17 subjects complaining about Low back pain, 14 subjects about Knee Pain and 12 subjects Shoulder pain. Neck pain and Wrist Pain were less common. 18 subjects were having complains of cough and 9% dyspnea, 7 % Wheezing.

X ray was done in subjects who were having one or other respiratory complaints (18 subjects). Various x ray findings were Small basal Opacities seen in 3 subjects suggestive of old pneumonia. Rounded Atelectasis seen

in 2 subjects suggestive of bronchitis and asthma, Lower lobe cavity was seen in only 1 subject suggestive of old treated case of Tuberculosis. 94 subjects were having Normal X ray findings. (Table 3)

Table 3: Chest X-ray findings of Subjects

X ray Findings	Frequency	Percent
Small basal Opacities	3	3.00%
Rounded Atelectasis	2	2.00%
Lower lobe cavity	1	1.00%
Normal	94	94.00%
Total	100	100.00%

Table 4: Association between Duration of Exposure and Morbidities

Morbidities		Years of work (Duration of Exposure)			Total	P value
		<5	6 to 10	>11		
Respirable Complaints	Yes	0 (0.0%)	12 (30.77%)	6 (20%)	18 (18%)	<0.001
	No	51 (100%)	27 (69.23%)	4 (40%)	82 (82%)	
Chest X ray	Abnormal	0 (0.0%)	3 (7.69%)	3 (30%)	6 (6%)	<0.001
	Normal	51 (100%)	36 (92.31%)	7 (70%)	94 (94%)	
Total		51 (100%)	39 (100%)	10 (100%)	100 (100%)	

Subjects who were working since more than 6 years and >11 years were having more respiratory complaints as compared to the subjects working since < 5years. Association was found to be significant. Subjects

whowere working since more than >11 years were having abnormal X ray findings as compared to the subjects working since < 10 years. Association was found to be significant.

Table 5: Association between Exposure and Respiratory Symptoms

Morbidities		Exposure		Total	P value
		Exposed	Non-Exposed		
Respiratory Complaints	Yes	9 (18%)	9 (18%)	18 (18%)	NA
	No	41(82%)	41 (82%)	82 (82%)	
Smoking	Yes	3 (6%)	8 (16%)	11 (11%)	0.205
	No	47 (94%)	42 (84%)	89 (89%)	
Diabetes	Yes	11 (22%)	10 (20%)	21 (21%)	0.807
	No	39 (78%)	40 (80%)	79 (79%)	

Pulmonary Function Test	Abnormal	2 (4%)	1 (2%)	3 (3%)	0.550
	Normal	48 (96%)	49 (98%)	97 (97%)	
Total		50 (100%)	50 (100%)	100 (100%)	

In the present study, out of 50 exposed subjects, 9 (18%) developed respiratory symptoms and out of 50 non-exposed subjects, 9 (18%) developed respiratory symptoms. Association was not found to be significant. Out of 50 exposed subjects, 3 (6%) were smokers and out of 50 non-exposed subjects, 8 (16%) were smokers. Exposed subjects were known to have less smoking or avoid smoking as they may be at risk of developing respiratory problems. Association was not found to be significant.

In the present study, out of 50 exposed subjects, 11 (22%) were diabetic and out of 50 non-exposed subjects, only 10 (20%) were diabetic. Diabetes was found to be lesser in subjects who were not exposed. Association was not found to be significant. Out of 50 exposed subjects, 2 (4%) were having abnormal pulmonary function test (PFT) and out of 50 non-exposed subjects, only 1 (2%) were having abnormal pulmonary function test (PFT). Abnormal pulmonary function test (PFT) was found to be more in subjects who were exposed. Association was not found to be significant.

Discussion

In the present study, out of 100 subjects, most of the subjects, 71% were belonging to age group 21-40 years, followed by 24% subjects from age group 41 to 60 years. Only 5 subjects were from age group 20 years. All subjects were males. Similar findings were seen in a Descriptive study by Rahul Bisht et al (2016) (14) on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that 36% of employees were in the age group of 47 -56 years. These findings are comparable with the

findings of a study by S.A. Nayaka wadi (2014) et al(2)on lung function test of subjects in sugar industry during working period, they found that subjects are middle aged; the age ranges from 39 to 42 years.

In the present study, out of 100 subjects, most of the subjects, 27% were belonging to Engineering Department, 18% subjects were from Engineering Hangami department and 17% were belonging to Agree Hangami and Engineering Apprantice department each. In the present study, out of 100 subjects, most of the subjects, 51% were working since <5 years, 39% subjects were working since 6-10 years and only 10% subjects were working since >11 years. Similarly in a study by Rahul Bisht et al (2016) (14) on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that majority (81%) of employees were having working experience more than 10 years.

In the present study, out of 100 subjects, 27% subjects having history of alcohol consumption, some occasionally on weekends only and some have only past history of alcohol consumption. 9% subjects were smokers, out of them 6 were having past history of cigarette smoking and only 3 subjects were current and occasional smokers. These findings are comparable with a study by Rahul Bisht et al (2016) (14) 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. These findings are comparable with the findings of a study by Mireia Gascon (2011) et al (15)on Respiratory, allergy and eye problems in bagasse-

exposed sugar cane subjects in Costa Rica, they found that 47.6% subjects were smokers

In the present study, out of 100 subjects, 24 subjects were known case of Hypertension, 21 were known case of Diabetes Mellitus, 7 were having history of Urinary Tract Infection and 3% subjects were having history of Gout. These findings are comparable with a study by Rahul Bisht et al (2016)⁽¹⁴⁾ on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that 20% of employees were suffering from hypertension and 15% of employees were suffering from chest pain.

In the present study, out of 100 subjects, 13 subjects were suffering from some skin problems like tenia cruris, urticaria, scabies some subjects were having pityriasis versicolor. Similarly in a study by Rahul Bisht et al (2016)⁽¹⁴⁾ on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that 16% of employees were suffering from skin problems like eczema, 8% of employees were suffering from skin infection.

In the present study, out of 100 subjects, Musculo-skeletal problems were also common. 17 subjects complaining about Low back pain, 14 subjects about Knee Pain and 12 subjects Shoulder pain. Neck pain and Wrist Pain were less common. Similar findings were seen in a Descriptive study by Rahul Bisht et al (2016)⁽¹⁴⁾ on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that 42% of employees were having back, joint or muscle problems and 19% of employees were suffering from neck problems.

Out of 100 subjects, 18 subjects were having complains of cough and 9% dyspnea, 7 % Wheezing. Similarly in a study by Mireia Gascon (2011) et al⁽¹⁵⁾ on Respiratory,

allergy and eye problems in bagasse-exposed sugar cane subjects in Costa Rica, they found that 25% subjects in the bagasse group reported more SOB. X ray was done in subjects who were having one or other respiratory complaints (18 subjects). Various x ray findings were Small basal Opacities seen in 3 subjects suggestive of old pneumonia. Rounded Atelectasis seen in 2 subjects suggestive of bronchitis and asthma, Lower lobe cavity was seen in only 1 patient suggestive of old treated case of Tuberculosis. 94 subjects were having Normal X ray findings. No cases of Bagassosis have been reported so far in any study.

Similar findings were seen in a Descriptive study by Rahul Bisht et al (2016)⁽¹⁴⁾ on prevalence of occupational health hazards among employees of selected sugarcane factory in Deharadun, they found that only 1% of employee was suffering from bronchitis, 6% of employees were suffering from cough with sputum, 4% of employees were suffering from asthma, 15% of employees suffering from cough with chest pain, 12% of employees were suffering difficulty in breathing.

Subjects who were working since more than 6 years and >11 years were having more respiratory complaints as compared to the subjects working since < 5years. Association was found to be significant. Similar findings are seen in a study by Nitin S Nikhade et al (2012)⁽¹⁶⁾ on pulmonary function test in subjects of sugar factory, Pravaranagar, Maharashtra, they found that the highest prevalence of pulmonary impairment was found in ≥ 31 yrs exposed subjects (38.89%)

Conclusions

Sugar cane industries are highly heterogeneous place where workers have to expose different health risks depending on the working activity. Poor working condition results in 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 complains of cough and dyspnea. Various x ray findings were Small basal Opacities seen in few subjects suggestive of old pneumonia. No cases of Bagassosis have been reported so far in any study. Subjects who were working since more than 6 years were having more respiratory complaints and abnormal X ray findings.

Recommendations

We recommend to do the personal sampling every 6 months and conduct air monitoring to measure worker exposures and ensure that controls are providing adequate protection for workers. Maintain dust control systems to keep them in good working order and if needed, Subjects should be supplemented with the use of respirators. Instruction about the use and care of appropriate protective equipment including protective clothing and respiratory protection. Enclosure of the process and local exhaust ventilation. Special attention regarding development of signs and symptoms of Bagassosis.

Limitations to study

Many workers are illiterate, so it was not easy to get a proper answer. Sometimes our clinical knowledge and common sense were put to test to gain the expected information from these workers. It was difficult to do follow up of the workers as the duration of the study is very short.

References

1. Kumar HSS, Prakash a G., Hanuman Thapa DC. Diversified Use of Byproducts of Sugarcane and Cotton

- A Review. Int.J.Curr.Microbiol.App.Sci (2018) 7(3): 1616-1634
2. S.A. Nayaka wadi (2014) et al (ref1) A Study of Lung Function Test of Workers in Sugar Industry during Working Period. American Journal of Sustainable Cities and Society 2014;1(3):345
 3. S. Pruthi (1995), The History of Sugar Industry In India, Reliance publishing house, New Delhi.
 4. M. Sivaraman (2005), Intellectual Property Rights and Indian Agriculture, Co-operative Sugar, Vol, 30, No11, July 2005.
 5. Milanowski J, Dutkiewicz J, among agricultural workers in eastern Poland:A study of twenty cases. Ann Agric Environ Med 1998; 5:31-43.
 6. Romeo L, Molle D, Zanoni G, Peretti A, Marangi G, Conrado LG, et al. Respiratory health effects and immunological response to thermoactinomyces among sugar cane workers in Nicaragua. Am Ind Hyg Assoc J 1996 Nov.;57(11):1002-12.
 7. Zhonghua Yu, Fang Yi, Xue Za Zhi. 2010 April;44(4):298-302. www.wikipedia.com
 8. Phoolchund HN. Aspects of occupational health in the sugar cane industry. Br J Ind Med 1992; 49:499-506.
 9. Hearn CED. Bagassosis: An epidemiological, environmental, and clinical survey. Br J Ind Med 1989; 28:152-158.
 10. Herbert SJ. Bagassosis: A study of pulmonary function in 20 cases. New Orleans USA 1986;25(4):285-290.
 11. Devendra K. Amree, Claire Infant- Rivard Andre; Prakash.mDurga ale,Pierre Ernst; Occupational Environment 1999: page no 548-552. last accessed on 12 November 2011.

12. Sugarcane cutting work, risks, and health effects: a literature reviews Marcelli Rocha Leite Rev Saude Publica. 2018; 52:80
13. Rojas P, Stark R, Tembo P. Nurses bring primary health care to industrial workers. World Health Forum 1990;11(1):108
14. Bisht R, Rawat M, Singh N. et al. A Descriptive Study on Prevalence of Occupational Health Hazards among Employees of Selected Sugarcane Factory in Deharadun, Uttarakhand. IOSR Journal of Nursing and Health Science 2016; 5 (4):01-05
15. Gascon M, Kromhout H, Heederik D. et al. Respiratory, allergy and eye problems in bagasse-exposed sugar cane workers in Costa Rica. Occupational and environmental medicine · 2012;1-8
16. Nikhade NS., Sharma P. A Study of Pulmonary Function Test in Workers of Sugar Factory, PravaraNagar, Maharashtra. Int J Med Res Health Sci. 2012;2(1):52-58