Research Article
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Respiratory symptoms, lung function and dust exposure among workers in grain milling industries in Dar Es Salaam, Tanzania

Abstract

Background: Workers in grain milling industries are exposed to grain dust released during milling processes. Exposure to grain dust is associated to various respiratory symptoms such as phlegm, breathlessness, and cough and wheezing and it also leads reduced lung function. This study aimed at determining grain dust exposure levels and the prevalence of respiratory symptoms and Lung function among grain mill workers Dar es Salaam.

Methodology: A descriptive cross sectional study was used to collect information on Respiratory symptoms among 264 grain mill workers and 100 controls by using a Questionnaire. Lung function tests were carried out on 180 grain mill workers and 68 controls by using an easy one spirometer while Personal dust exposure was measured on 30 grain mill workers and 5 controls by using PVC filters of 8µm pore size on two piece filter cassette mounted on Sidekick Casella (SKC) pump. P value of less than 0.05 was used as criteria for significant association. Ethical clearance was approved by the ethical clearance board of Muhimbili University of Health and Allied Sciences research and publication Committee.

Results: Grain workers were exposed to higher levels of total dust with GM 12.15mg/m^3 (GSD 1.53) than the control GM mg/m^3 (GSD). Most of the workers in grain milling industries 66.7% were exposed to dust concentrations above the OEL (10mg/m^3). The Prevalence of respiratory symptoms was higher among grain mill workers, (51.1%, 41.3%, 33.7%, 17%and 9.8% for cough, phlegm, breathlessness, tightness and wheezing respectively than in controls (28%, 19%, 21%, 8% and 5% for cough, phlegm, breathlessness, tightness and wheezing respectively. 26% and 21% of Grain workers were exposed to higher levels of total dust with GM 12.15 mg/m3(GSD 1.53) than control GM 0.17 mg/m3 (GSD 0.35).

Conclusion: Exposure to grain dust in a working environment causes the increase in work related respiratory symptoms and reduced lung function. This study recommends the use of control measures to decrease dust exposure level among mill workers, also periodic medical examination should be conducted to assess workers health. A cohort study nationwide might give yield a more generalized outcome.

Keywords: dust, respiratory symptoms, grain milling industries, Tanzania

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Introduction

Worldwide exposure to organic particulates is a major key factor for injuries and death. They account for 1.6 million, 3.8 million and 1.3 million annual deaths due to asthma, Chronic obstructive pulmonary diseases (COPD) and pneumoconiosis, respectively.[1] It is estimated that 12 percent of chronic obstructive airway diseases are from occupational exposure to airborne particulates.[2] These occupational illnesses, injuries and deaths affect developing countries more than others due to lack of adequate technical and economic capacity to reach occupational health and safety standards.[3] Though most of these respiratory diseases are irreversible they can be prevented through various engineering, administrative and personal protective measures.

In Tanzania the burden of respiratory disease is very high, where low respiratory infection is the second leading cause of years of life lost due to premature deaths the country.[4] A study done on health people in Kinondoni Dar es Salaam showed the high prevalence (6.1 and 5.8) for COPD Stage one and COPD stage two respectively. Another study done on individual visiting primary health care in Tanzania showed a prevalence of chronic air flow obstruction of 7.2%.

Milling industry is a worldwide trade involving the processing of wheat, durum, corn or maize, rice, and other grains into flour, semolina, meals, and other products. The increase in production of staple grains also has brought forth the increase in grain processing industries employing the vast number of workers, hence contributing to increased individual income as well as the rise in national economy. However on the other hand grain milling can be dangerous to the life and health of the workers due to the dust that is released in milling processes such as cleaning, hulling, milling and packaging.[5]

This dust is a complex mixture of organic and inorganic materials, mainly comprising the cellulose-based seed coating and the carbohydrate.[6–11] It may also contain large number of contaminants including silica, fungi and their metabolites (aflatoxin), bacterial endotoxins, insects, mites, mammalian debris and various chemical additives such as pesticides and herbicides.[12–14] Workers in grain milling industries can be exposed to grain and flour dust during the milling processes, which may result in a range of acute and chronic respiratory symptoms and reduced lung function.

Grain dust varies in size with aerodynamic sizes ranging from 4 to 30mm.[3] In dusty areas, up to 20% of the flour dust particles have

small aerodynamic sizes,[11] which can enter easily in the respiratory tract of an exposed person and can cause or aggravate pulmonary and respiratory diseases among exposed workers. Wagh et al.[15] reported a reduced lung efficiency of flour mill workers in India because of excessive exposure to fine organic dust prevalent in the workplace environment. Moghaddasi et al[13] reported that dust pollution adversely affected the forced vital capacity and forced expiratory volume in one second (FEV_1) of exposed workers with mean flour dust concentration of 28mg/m^3.

The study in Iran found higher exposure levels of up to 390mg/m^{-3} of total dust and 89mg/m^{-3} inhalable dusts.

Several studies shows workers milling industries to exhibit a variety of clinical manifestations including wheezing, phlegm, breathlessness, febrile reactions, grain fever, lung fibrosis, allergic alveolitis, impairment of lung function and chronic obstructive pulmonary disease.[2,3,6,7,10,14,16–21] Studies done in in Nigeria and South Africa shows high prevalence of respiratory symptoms (49.5%, 46%) respectively.[3,7]

There is limited information on the grain dust exposure levels, prevalence of respiratory symptoms and reduced lung function among workers in developing countries including Tanzania where there is poor industrial setup, low level of technology and machine automation. Therefore, the aim of this study to determine concentration of dust exposure, contributing factors and associated respiratory health symptoms among workers'.

Material and method

Study area and study population

A descriptive comparative cross sectional study was conducted in small and medium scale milling industries in Ubungo and Kinondoni districts in Dar es Salaam. Purposive sampling technique was used to select four wards with the highest number of milling machines in Ubungo and kinondoni Municipalities. The control group consisted of office attendants from various offices in Ubungo and Kinondoni Municipalities in Dar es Salaam. Controls were obtained in similar environmental setting as the exposure group (grain mill workers). At every industry where workers were sampled also the attendants from the nearby office where sampled. The grain mill workers and control group were matched for the major social demographic characteristics including age, sex, height, and weight and education level. The controls included people who had never worked in grain milling industries before.

Study set up

Grain mill workers included the following job categories: cleaners, hullers, winnowers and millers. Grain milling processes started with grain cleaning so as to separate dust, chaffs and other debris from the grain by using sifters, then the cleaned grain was socked with water and hulled in a machine to remove husk. Then after the grain is winnowed to separate husks from the grain and finally the grain is milled to obtain the flour. In these machines all processes were done in the same room with a very minimal space in between each process. The milling premises had very poor ventilation. Works had no personal protective equipment except few women most of them were winnowers who covered their mouth with a piece of cloth. The inclusion criteria for this study were those workers who have been working for at least one year and have been working at least 5 hours daily for 5 days or more in a week. Workers with known permanent illness like heart disease were excluded in the study.

Ethical issues

Ethical clearance was approved by the ethical clearance board of Muhimbili University of Health and Allied Sciences research and publication Committee. Permission to participate in the study was obtained from the Municipal council. The researchers introduced themselves and explained the purpose of the study and requested the workers to participate in the study. Workers who were willing to participate were given a consent form to fill and sign.

Questionnaire

The interview was carried out at the start of the working day by using the standardized questionnaire (the Modified British respiratory questionnaire). The questionnaire included questions on socio-demographic and individual characteristics of worker, respiratory symptoms (cough, phlegm, wheezing, chest tightness, breathlessness etc.) smoking, occupational exposure (duration of the job, working days and hours per week and exposure to other sources of pollution other than the grain dust).

Lung function test

An easy one spirometer was used to conduct a Lung function tests to the grain mill workers and controls. The tests were performed in a standing position without a noise clip. The participant were asked to inhale to the maximum and then put the mouthpiece and exhale as fast and long as possible for a period of not less than 6 sec. Each worker performed the test at least three times where the best value for $FEV_{1,}$ (FVC) and FEV1/FVC were recorded. Spirometric parameters such as FEV_1, FVC, FEV_1/FVC, was studied for each participant.

Dust exposure measurement

The PVC filters were desiccated for 24 hours and weighed and given an identification number prior to sampling. During sampling SKC pump was attached around the waist of the each participant. The filter cassette holder was attached in the breathing zone of the participant. The flow rate of the pumps was adjusted to operate at a rate of 2.0litres/min and was checked after every four hour for the 8 hour working shift. After sampling, filter cassettes were sealed and transported to MUHAS multipurpose laboratory where the gravimetric analysis of filter was be done by using Mettler Toledo xp205 micro balance with the capacity of weighing 0.01mg to 220g.

Data management and analysis

The collected data were coded and then entered into Statistical Package for Social Sciences (SPSS) for cleaning and analysis. Descriptive statistics such as frequency, proportions cross tabulations, mean and Standard derivation were used to summarize and describe the relationship between independent and dependent variables. Respiratory symptoms were expressed in prevalence, dust exposure levels and lung function parameters were expressed in mean and standard deviation. Bivariate analysis using Chi square and binary logistic regression was done to compare categorical variables where as independent t-test and ANOVA was used for continuous variables.

Results

Social demographic characteristics of the study participants

A total of 364 workers participated in this study and response rate was 100%. A total of 264 workers were from grain milling industries and 100 office attendants from various offices as controls. Table 1

below shows the comparison in Social demographic characteristics of the respondents. The age of the grain mill workers ranged between 18 and 62 years with a mean of 32.43 years (SD 8.505) while the age range of the control group ranged between 21 and 61 with a mean of 35.02 (SD 8.304). The mean weight of grain mill workers was 62.87kg(SD = 9.682) while that of the controls was 62.38 kg(SD 8.676), the mean height of the grain mill workers was 163.08 cm(SD 7.495)while that of the controls ware 160.57cm (9.014) as shown in Table 1. There was no significant different the anthropometric parameters (age, height and weight) between grain millers and the controls. The grain mill workers did not differ significantly from the control in duration of employment and previous work in dust jobs p>0.05. However there was a significance deference in smoking habit and education level between gain millers and the controls p<0.05.

Table 1 Socio - demographic characteristics of grain mill workers and controls

Parameters	Mill workers n=264	Controls n=100	p- value
	Mean(SD)	Mean(SD)	
Age (yrs.)	32.43(8.505)	35.02(8.303)	0.09
Height (cm)	62.87(9.681)	62.38(8.676)	0.66
Weight (kg)	163.08(8.1 99)	160.57(9.014)	0.07
Duration of employment < 5 years	153(58%)	65(65%)	0.269
5 years and above Education level None	111(42.0) 16(6.1%)	35((35%) 0 (0.0%)	0.000*
Primary	238(90.2%)	61(61%)	
Secondary	9(3.4%)	39(39%)	
Tertiary Smoking history Smokers	1(0.4%) 43(16.3%)	0 (0.0%) 19(19%)	0.000*
Non smokers	221(83.7%)	81(81%)	
Previous work in dust jobs	20(7.7%)	4(4.0%)	0.322

*P <0.05

Prevalence of respiratory symptoms among grain mill workers and the control group

The grain mill workers had a significantly higher prevalence of respiratory symptoms compared to controls. The leading respiratory symptom reported was cough with the prevalence (51.1%) among the grain mill workers while among control it was reported to be (28%) as shown in Table 2. The difference in prevalence of respiratory symptoms reported between grain mill workers and the control groups was statistically significant for cough, phlegm, chest tightness and breathlessness p<0.05.

Relationship of respiratory symptoms between grain mill workers and control group

The odds of having respiratory symptoms were higher among grain mill workers than in controls. Even after adjusting for the possible confounders (age, previous respiratory illness, previous work in dust jobs and smoking habit) the odds of respiratory symptoms were still higher among grain mill workers than in controls (Table 3).

Table 2 Prevalence of respiratory symptoms between grain mill workers and controls

	Mill workers (N=264)	Control (N=100)		
Respiratory symptoms	n (%)	n (%)	Odds ratio	p-value
Cough	135(51.1)	28(28)	1.826	0.000*
Phlegm	109(41.3)	19(19)	2.173	0.000*
Wheezing	26(9.8)	5(5)	1.969	0.204
Chest tightness	45(17)	8(8)	2.130	0.044*
Breathlessness	91(34)	21(21)	1.641	0.018*

*P <0.05

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Table 3 Unadjusted and Adjusted Odds Ratio of Respiratory Symptoms among Grain mill Workers and Controls

Respiratory Symptoms	Un-Adjusted odds ratio(95%CI)	*Adjusted odds ratio(95%CI)
Cough	2.69(1.634-4.43)	2.603(1.543-4.392)
Phlegm	2.99(1.719-5.230)	2.806(1.562-5.042)
Chest tightness	2.363(1.072-5.209)	2.797(1.181-6.628)
Breathlessness	1.979(1.149-3.409)	1.845(1.011-3.368)

*Adjusted for age, previous respiratory illnesses, previous work in dust jobs and smoking habit

Comparison of lung function indices between grain mill workers and controls

Table 4 Shows that the mean lung function parameters (FVC, FEV_1, FEV_1/FVC, and PEFR) between grain mill workers and the controls. There was an observed deference in lung function parameters between the two groups. The difference observed was statistically significant for FVC and FEV_1/FVC, P<0.05. However the difference observed in FEV1 and PEFR between the groups was not statistically significant. The mean PEFR values obtained for the flour mill workers (516.72l/min) and controls, 575.37l/min, were within normal limits though the flour mill workers had significantly lower PEFR values compared with controls, p<0.05.

Lung function defects between grain mill workers and the control

Lung function tests were conducted on 174(65.9%) workers in milling industries out of 264 workers while among control group 34 workers performed the lung Function test. Only 144 (80.4) mill workers were able to achieve acceptable maneuvers while 19(13.5%) participants were unable to achieve acceptable maneuvers even after 8 blows and 11(6.3%) obtained non reproducible maneuvers. The prevalence of air flow obstruction was (26%) for mill workers while in the control group were none. and the prevalence of lung restriction defect among grain mill workers was 23% obstruction defect FEV_1/FVC>70.

Dust exposure levels

Grain mill workers were exposed to higher dust concentrations than the controls. The mean dust exposure concentrations on grain mill workers 13.43(GSD=7.53) mg/m^3 ranging from 5.43-46.46mg/m^3 While that of the control was 0.175(SD=0.35)mg/m^3, over a mean sampling time of 8 hours. The results show that 67% of grain mill workers were exposed to dust concentrations above the occupational exposure limits of 10mg/m^3 for 8hours set by American Conference of Governmental Industrial Hygienists (ACGIH).

Grain dust exposure levels between similar exposure groups

The workers were divided into four similar exposure groups according to jobs they perform (grain cleaning, hulling, winnowing and milling). Workers in grain cleaning had higher mean dust concentrations than other working groups while workers in winnowing section had the lowest dust concentrations as shown in Table 3. The mean total dust concentration was 13.43mg/m^3 (SD=7.53) and the GM was 12.15mg/m^3 (GSD 1.53). 66.7% of the grain mill workers were exposed above the OEL set by ACGIH as shown in Table 5 (Table 6).

Respiratory symptoms and associated predictors among grain mill workers

Multivariate logistic regression analysis showed that cough was significantly associated with duration of employment, cigarette smoking and previous respiratory illnesses P–value 0.000, 0.017 and 0.047 respectively while previous work in dust jobs was not associated with cough.

Also working duration and previous wok in dust jobs were significantly associated with phlegm p-value <0.05. Wheezing was significantly associated with previous respiratory illnesses p-value>0.001, but it was not associated with other factors. Also breathlessness was associated with duration of employment, cigarette smoking and previous respiratory illnesses with p-value<0.05 (Table 7).

Table 4 Lung function Indices between grain mill workers and controls

	Grain mill workers	Control		
Parameter	mean(SEM) n=144	Mean(SEM) n= 20	t	p
FEV1(l/min)	2.799(0.057)	2.92(0.103)	-0.758	0.45
FVC(l/min)	3.938(0.12)	3.43(0.137)	2.778	0.007*
FEV1/FVC%	74.67(1.168)	84.07(1.492)	-2.945	0.004*
PEF(l/min)	448.31(9.62)	468(25.07)	-717	0.474

*P<0.05

Table 5 The average dust exposure concentration between grain mill workers and the control

Exposure groups	n	AM(ASD)mg/m^3	GM mg/m^3(SD)	Range	t	P-Value	% above the OEL
Grain mill worker	30	13.43(7.53)	12.08(1.53)	5.43-46.66	3.886	0.000	67
Control	5	0.175(0.35)	0.172(0.35)	0.135-0.22			0

Citation: Ulanga AJ, Mamuya SH, Sakwari G, et al. Respiratory symptoms, lung function and dust exposure among workers in grain milling industries in Dar Es Salaam, Tanzania. *MOJ Public Health.* 2021;10(1):23–29. DOI: 10.15406/mojph.2021.10.00354

Table 6 Distribution of personal dust exposure levels between similar exposures groups among grain milling workers

Similar exposure groups	No. Samples	AM(SD)	GM(GSD)	Range	% above the OEL
Grain cleaning	11	17.18(10.4)	15.45(1.54)	11.21-46.46	90.9
Hulling	5	13.25(5.27)	12.44(1.49)	8.34-19.19	60
winnowing	8	10.05(4.63)	9.25(1.53)	5.43-19.71	37.5
Milling/ packaging	6	11.17(2.01)	11.04(1.18)	9.63-15.03	66.7
Total	30	13.43(7.53)	12.15(1.53)	5.43-46.46	66.7

Table 7 Predictors of respiratory symptoms among grain mill workers

Respiratory symptoms	B	SE	OR(95%CI)	P-value
Cough				
Duration of employment	-1.527	0.28	0.217(0.0126-0.376)	0.000*
Cigarette smoking	-1.04	0.438	0.353(0.150-0.833)	0.017*
Previous respiratory illnesses	1.599	0.805	0.202(0.042-0.980)	0.047*
Previous work in dust jobs	0.439	0.439	0.690(0.292-1.631)	0.397
Phlegm				
Duration of work	-1.782	0.295	0.168(0.094-0.300)	0.000*
Cigarette smocking	-0.669	0.406	0.512(0.231-1.134)	0.099
Previous respiratory illnesses	-1	0.631	0.368(0.107-1.268)	0.113
Previous work in dust jobs	-0.915	0.433	0.400(0.171-0.936)	0.035*
Wheezing				
Duration of work	-0.212	0.479	0.809(0.316-2.067)	0.657
Cigarette smocking	0.449	0.661	1.569(0.429-5.720)	0.497
Previous respiratory illnesses	-2.634	0.591	0.072(0.023-0.228)	0.000*
Previous work in dust jobs	0.162	0.639	1.176(0.336-416)	0.8
Chest tightness				
Duration of work	-1.013	0.395	0.363(0.167-0.787)	0.001*
Cigarette smooking	-1.134	0.422	0.322(0.141-0.736)	0.007*
Previous respiratory illnesses	-1.777	0.558	0.169(0.057-0.505)	0.001*
Previous work in dust jobs	0.255	0.497	1.291(0.487-3.421)	0.607
Breathlessness				
Duration of work	-1.395	3.16	0.248(0.133-0.461)	0.000*
Cigarette smocking	-1.381	0.411	1.251(0.112-0.563)	0.001*
Previous respiratory illnesses	-3.271	1.068	0.038(0.005-0.308)	0.002*
Previous work in dust jobs	-0.891	0.449	0.410(0.170-0.989	0.047*

Discussion

Dust exposure level

The workers in grain mill industries were exposed to higher dust levels than controls. The mean concentration was (13.42mg/m^3) among mill workers and (0.175mg/m^3) among the controls, the difference in exposure levels among the two groups was statistically significant $p<0.05$. Grain milling workers, 34% were exposed to total dust concentrations above the occupational exposure limits set by American Conference of Governmental Industrial Hygienist.[22] The results in our study lower concentrations compared to the study done in India where the exposure concentration among flour mill industries reached the average of 56.68mg/m^3.[23] The average total dust concentration in some milling industries varied up to 40mg/m^3.[7,12,15,23]

In our study, the workers in grain cleaning section had the highest levels of dust concentration (GM=15.45mg/m^3), the lowest exposure concentration (GM 9.04 mg/m^3) The difference in mean concentrations between the groups was not statistically significant when treated with ANOVA $P>0.05$. The reason of this similarity in exposure levels between groups might be due to be fact that all activities were performed in the same room with a small distance between one group and the other. Workers might have had mixed exposure from activities being carried out within the industry. Other studies on grain and flour mill industries found significant difference on exposure levels among similar exposure groups[17,23–25]

Inside the grain milling industries the space was filled with visible dust which was like cloud, particularly around the grain cleaning area and around the milling area. Similar findings were found in studies dine in studies in Nigeria, Iran and South Africa where working stations were filled with cloudy visible dust particularly during cleaning and flour production.[2,6,7,24] This might be due to higher airborne particulates mater from grains that was contaminated with dust and due to emissions from machines during grinding particularly the old and poorly maintained machines.

Prevalence of respiratory symptoms

Grain mill workers had significantly higher prevalence of respiratory symptoms (58%) than the controls (22%). This findings were similar to the study done in Nigeria where 49.5% of workers reported at least one respiratory symptom.[2] The findings were coherent with other studies which reported higher prevalence of respiratory symptoms among workers in milling industries.[6,7,19,21,26] This may be due high exposure to dust which was reported to cause respiratory disease among the exposed workers.[7,21]

In our study age was found to be associated with the prevalence of respiratory symptoms. Participants aged 35years and above had higher prevalence of respiratory symptoms (59.1%) than the younger ones (44.6%). This is similar to the study conducted in Cairo by Mohammed et al.[27] who found that age had an influence on upper respiratory symptoms. In this study participants had a mean age 35.36years (SD 8.4). Age was found to be associated with breathlessness $p<0.05$, but it was not associated with other respiratory symptoms. Also in other studies age was not a predictor of respiratory symptoms among workers in exposed to grain dust.[3,12,25] The presence of people with younger age might be a contributing factor , the nature of work itself exclude elderly people from the work due to the fact that it requires lifting of heavy loads where orderly people cannot perform such tasks.

In our study workers with longer duration of employment reported a significantly higher prevalence of respiratory symptoms 73.9% than those with shorter duration whose prevalence was 45.5%. Duration of employment was found to be an important factor that influenced the prevalence of respiratory symptoms in a previous study.[11] Another study in Nigeria found higher prevalence of respiratory symptoms among workers with long working duration than those with shorter duration[2] Employment duration was found as a respiratory determining factor in other studies done among workers in grain and flour milling industries.[11,26] Though there was a significant association between respiratory symptoms and previous work in dust jobs p-value>0.05. Cigarette smoking was associated with cough, chest tightness and breathing $p>0.05$.this study was coherent with the other studies.

Lung function impairments

The current study found the reduction in means of all lung function parameters (FEV_1, FVC FEV_1/FVC AND PEF) in grain mill workers than in controls. However the differences in mean values of FEV_1 AND PEF were not statistically significant. The reduction in mean value of FVC and FEV_1/FVC were statistically significant $p<0.05$. The study done in Iran on bakery workers found a significant reduction on mean values of FEV_1 and FVC in bakery workers than in controls,[13]

Another study in India revealed significant reduction on Forced Vital Capacity, Peak Expiratory Flow Rate and Forced Expiratory Volume in one second due to excessive exposure to fine flour dust prevalent in working environment.[15] The reduction in lung function parameters in this study indicated that workers in grain milling industries are at higher risk of getting pulmonary diseases than others working in dust free environments. This study agree to findings from different studies that found a significant increase in lung function impairment among grain and flour mill workers.[2,3,20,27]

In our study the prevalence of lung obstruction impairment (FEV_1/FVC) was 26% among grain mill workers and 0% among the controls. The increase in duration of exposure was found to result in significant decrease in lung function. Workers who had worked in grain mill industries for 5years and above had a significant decrease in FEV_1/FVC than those who had worked below five years<0.05. Similar findings were observed in studies done in Egypt where the reduction in FEV_1/FVC ratio was found to be associated with duration of employment.[14] The present study confirms the findings from other studies which found the reduction in FEV_1/FVC ratio which may be due to reduction in FEv_1 as a result of dust exposure which leads to lung obstruction.[13,14,20,27] From the findings in this study we suggests that dust release during grain milling processes causes adverse effect in lung function parameters and is associated with the dust concentration levels and duration of work (years). In our study Cigarette smoker had higher prevalence 42.4% of lung obstruction defect (FEV_1/FVC<70%) than non-smokers 20.7%, $P<0.05$. A study conducted in Egypt found similar findings where there was a slight decline in lung function among smokers than in non-smokers.[14] The prevalence of restrictive lung function impairment among the grain was significant higher in grain millers than in control.

Conclusion and recommendations

Workers in grain milling industries had higher prevalence of respiratory symptoms compared to the controls, and the prevalence of lung function impairment was higher among the grain mill worker**.** The results in this study showed that workers in grain mill industries in Ubungo were exposed to higher levels of dust above the Occupational exposure limits. Occupational exposure to grain dust was related to respiratory health symptoms among workers. This study recommends that engineering such as provision of proper hoods and ventilation), administrative and personal protective control measures should be put in place in order to improve the working environment and protect workers from higher dust exposure level. Cohort study is recommended to include larger sample nation-wide followed for a period of time might yield a more robust and generalized outcome.

Conflicts of interest

The authors declare that they have no competing interest.

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Authors' contribution

AJU conceptualized the study, participate in the data collection, conduct data analysis and manuscript writing and review the manuscript. SHD conceptualized the study, participate in data analysis and manuscript write up and review the manuscript. JM conceptualized the study, manuscript write up and review. GS data analysis and review the manuscript.

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