Respiratory conditions among workers in a cotton spinning mill in Zambia

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Abstract

Cotton dust, when breathed in, irritates the lungs and exposed workers experience the following symptoms: difficulty in breathing, chest tightness, coughing and wheezing. The current analysis was limited to the objective of determining the proportion of workers experiencing difficulty in breathing, chest tightness, coughing, wheezing and phlegm. A cross sectional study was conducted among workers in a cotton spinning mill. A convenient sample was selected by the management from all work-areas. A structured questionnaire enquiring about the respiratory health was administered to the employees.

A total of 297 employees took part in the study of whom 274 (92.3%) were males. The median age (Q_1, Q_3) for males [29 (26, 34)] was significantly greater ($p<0.001$) than that for females [24 (23, 28)]. The majority of the workers had been in employment for less than one year (46.1%). Fifty (16.8%) of the 297 workers smoked cigarettes (all the 23 females were non-smokers). Wheezing was recorded in 4.4% of the workers, chest tightness (14.5%), cough (19.9%), phlegm (11.4%) and breathlessness (5.7%).The observed generally low rates of respiratory conditions may have been partly due to under-reporting and partly due to sampling bias. An annual medical check-up is recommended for all employees.

Introduction

Cotton dust which is generated through the handling and processing of the cotton causes ill health to the workers. The dust is produced through the process of fabric production from the opening of cotton bolls in the field, harvesting and storing of seed cotton, separation of lint from seed, processing of yarn through to weaving or knitting into fabric. We are concerned in this paper about the effect of the cotton dust that is produced at the textile mills on the health of the workers.

Cotton dust is a colourless, odourless solid. It may contain substances such as: non-cotton matter, bacteria, fungi, soil and pesticides which may have accumulated during the growing of the plant, harvesting of the crop and subsequent processing and storage periods.

Breathing in cotton dust can cause serious, permanent lung damage. The following respiratory conditions are associated with exposure to cotton dust: difficulty in breathing, chest tightness, coughing and wheezing. These conditions are particularly noticeable in workers on the first day at work after being off duty over the weekend or after being off duty for a few days. Workers in cotton mills may also cough phlegm or mucous.

To our knowledge the extent of respiratory conditions associated with cotton dust among workers in cotton spinning mills in Zambia has not been documented. It was, therefore, the objective of this study to determine the prevalence rates of respiratory conditions among workers in cotton textile spinning mills in Zambia.

2. Materials and methods

Study population: The study population was comprised of workers in a cotton spinning mill. The workforce numbered about 1200. Recently an industrial action led to most of the workers being dismissed. As a result most of the workers had been in employment for a few years at the time of the survey.

Study design: Cross sectional study.

2.1 Data collection

Questionnaire: A structured questionnaire was used to obtain information on socio-demographics, and on the signs and symptoms of respiratory conditions.

Sample size and Sampling

We did not have reliable information on the prevalence of respiratory conditions. Upon considering a prevalence of 50±5% in a population size of 1200 workforce, the required minimum sample size was 291. A stratified non-random sample was drawn. The work-area was considered as a stratum. The number of employees selected from each work-area was proportional to the size of the workforce in that work-area.

Data processing and analysis: Data was entered in a computer using Epi data. Range and consistency checks were incorporated in the data entry program. The duplicate files were validated. The completeness of the questionnaires was checked while in the field.

The Yates' corrected Chi-squared test was used to determine associations of qualitative variables. The Epi Info program was used in the analysis. The cut off point for statistical significant was set at 5%.

3 Results

A total of 297 workers took part in the study of whom 274 (92.3%) were males. Male participants (median age = 29; Q_1=26, Q_3=34) were significantly ($p<0.001$) older than the female participants (median age = 24; Q_1=23, Q_3=29). Table 1 shows the distribution of the length of stay in employment. The majority of the workers had stayed in employment for less than one year (46.1%).

Concerning the smoking status of the participants, 50 (16.8%) smoked cigarettes, while 66 (22.2%) of the 297 employees had ever smoked cigarettes.

The major dust control measure limiting the amount of dust in the air was the ventilation system. Dry sweeping

Table 1. Length of stay in employment (Total=297).

Length of stay (years)	number	%
<1	137	46.1
1-4	91	30.6
5+	69	23.2

the floor increased the amount of dust in the air. The amount of dust breathed-in was limited by wearing of mask. Asked how often the workers wore the mask, 222 (74.7%) reported that they always wore the mask, 68 (22.9%) sometimes, and 7 (2.4%) never wore the mask. At the time of the survey, only one person was observed to have a respirator in the dustiest place of the mill but was not using it.

Associations of age, length of stay in employment and wearing of mask with respiratory conditions are shown in Table 2. No significant associations were observed. Overall, wheezing was reported in 13 (4.4%) of the workers, chest tightness 43 (14.5%), cough 59 (19.9%), phlegm 34 (11.4%) and breathlessness 17 (5.7%).

Discussion and conclusion

The current study is the first one to document the extent of respiratory conditions in a cotton spinning mill in Zambia. The study was conducted in a workforce with the majority of the employees having worked for a few years. It is against this background that the results of the study should be interpreted. The major findings were that the most common respiratory conditions were a cough (19.9%) and chest tightness (14.5%). Wearing of masks was not significantly associated with respiratory conditions. These results from the current study may be considered as baseline findings for subsequent studies in the monitoring of the effect of cotton dust on the health of the employees in the present population.

The reported prevalence rates of the respiratory conditions might have been underestimated. The selected sample was non-random. It was selected by the management of the cotton spinning mill and might have comprised of "healthy" looking employees. Furthermore, some respiratory conditions might not have been noticeable in the workers because workers were only given one day off duty in a week. Respiratory conditions are more noticeable in workers on the first day at work after being off duty over the weekend or after being off duty for a few days. In addition, because the conditions were self-reported, bias might have been introduced in the results. It is likely that the respondents might have under-reported the conditions in fear of victimization by management.

In a study conducted in Guangzhou in China among workers exposed to cotton dust in factories that processed purely cotton, 18.2% of the employees reported having a cough or phlegm (Jiang *et al*. 1995). The finding in the current study of 19.9% of the workers having reported a cough compares with the above result but is in variance with the finding of Fishwick et al. (1996), who found that 3.5% of their participants reported having had

Table 2. Associations of age, wearing of mask and length of stay in employment with respiratory conditions.

		Wheezing	Chest tightness	Cough	Phlegm	Breathlessness
Age	Total	n (%)	n (%)	n (%)	n (%)	n (%)
<25	54	2 (3.7)	11 (20.4)	10 (18.5)	4 (7.4)	3 (5.6)
25-29	109	3 (2.8)	11 (10.1)	24 (22.0)	16 (14.7)	8 (7.3)
30+	134	8 (6.0)	21 (15.7)	25 (18.7)	14 (10.4)	6 (4.5)
	p-value	.459	.186	.778	.346	.633
Length of stay in employment						
<1	137	3 (2.2)	16 (11.7)	27 (19.7)	13 (9.5)	7 (5.1)
1-4	91	5 (5.5)	15 (16.5)	13 (14.3)	9 (9.9)	4 (4.4)
+5	69	5 (7.2)	12 (17.4)	19 (27.5)	12 (17.4)	6 (8.7)
	p value	0.202	0.441	0.115	0.208	0.467
Wears mask						
Yes or always (222)		10 (4.5)	31 (14.0)	43 (19.4)	21 (9.5)	12 (5.4)
Sometimes or never (75)		3 (4.0)	12 (16.0)	16 (21.3)	13 (17.3)	5 (6.7)
	p value	1.000	0.808	0.841	0.101	0.774

work related persistent cough. The current results also contradict findings from another study by Wang *et al*. (2002) among female cotton textile workers who did not smoke and were followed up at three and twelve months, and showed that by three months, 3.6% of the participants had usual cough with phlegm, and 6.7% had usual dry cough.

Findings from a study by Fishwick et al (1996) that 5.3% of their participants had work related chest tightness is significantly lower than our result of 14.5%. Differences in reported rates of respiratory conditions may be as a result of differences in definition of chest tightness, different climatic conditions prevailing in the study areas as well as differences in dust control measures in the mills. Meanwhile, the result of Fishwick *et al* (1996) that 5.3% of their respondents had work related wheeze compares favourably with our finding of 4.4%.

Although the lower rates of respiratory conditions in the current study may be attributed to the shorter period of exposure to cotton dust of less than one year, findings from a study on new employees in a cotton textile mill found that at their early exposure to cotton dust, workers complained more cough and other respiratory irritation symptoms, and the frequency of chest tightness reached the peak one year after exposure and remained at higher level later (Ma *et al*., 1997).

Because no significant associations were observed of age, wearing of mask and length of stay in employment with respiratory conditions, interventions for reduction of prevalence rates for respiratory conditions should be applied to all workers. The impact of wearing of mask on the reduction of the prevalence rates of respiratory conditions was not significant. This finding supports the importance of having workplace dust control measures than personal dust protective equipment.

Only one worker was seen with a respirator in a waste room but was not wearing it. Although workplace dust controls are better than personal protective equipment, workers carrying out maintenance work on the ventilation system must wear respirator. Other workers who must wear respirators are those working in the dusty areas such as the waste room. However workers must be taught how to use, clean and maintain respirators because improper use of them can be dangerous.

In hot climate, respirators become too uncomfortable to be worn. There is a need to develop a respirator which is suitable to be worn in hot conditions.

Prevalence rates of respiratory conditions among workers in cotton mills can be reduced by reducing the amount of dust in the air. The mill had in place engineering dust control (ventilation control) equipment. However, during clean-up more dust was released into the air by dry sweeping. Wet sweeping is recommended for reducing further releasing of dust in the sir. Dust levels must be frequently monitored in the mill so that interventions to further control dust levels in working areas with high dust levels can be put in place. Workers, working in high dust level areas, who develop severe respiratory conditions could be transferred to work areas with less dust.

About one in five (16.8%) of the workforce smoked cigarettes. Smoking can cause lung cancer and other respiratory problems. It may worsen respiratory conditions caused by cotton dust. Stopping smoking will reduce the risk of developing respiratory conditions.

In conclusion, the low prevalence rates of respiratory conditions we found in the current study might have been under-reported. It is recommended that workers must undergo annual medical check-up.

Ethical consideration

The project was approved by the Ethical Committee of the University of Zambia. Further approval was granted by the factory managers and employees. The employees might not have freely participated in the study as they were selected by the management.

Acknowledgements

We sincerely acknowledge the contributions of the technicians from the departments of Community Medicine, Mining Engineering and Physiology into the study. Our thanks go to the Research Assistants for the wonderful work. Dr S.H.Nzala is thanked for his input into the development of the proposal. We are grateful to the management of the cotton spinning mills for allowing us to conduct the study and the VLIR UNZA IUC Programme for the financial support.

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