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Research Article

Association Between Smoking and Lung Abnormalities in Ex-Mineworkers of the Transkei Region of South Africa: An X-Ray-Based Study

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Abstract

Background: Inhalation of dust in mining job is a serious health problem all over the world. It has a more deleterious effect on lungs when it is associated with smoking. It is not easy to estimate the combined effect on the health of mineworkers.

Objective: The objective of this study is to establish the association between smoking and lung abnormalities among ex-mineworkers in the Transkei region of South Africa.

Patients and Methods: During a two-year period (May 1997 to May 1999) 2080 former mineworkers were examined at the Benefit Examination Clinic at Nelson Mandela Academic Hospital, Mthatha. Radiological examinations were carried out on ex-mineworkers, in the age group ranging from 30 years to 70-plus years.

Results: There 466 X-ray plates were studied. They were categories on the basis of history of smoking into three categories: Ex-smokers 137 (29%), smokers, 107 (23%) and non-smokers 48 (10%). The lung abnormality was detected, the highest (29%) among ex-smokers, followed by smokers (23%) and non-smokers (10%). Majority 181 (39%) of ex-mineworkers between age group of 40 and 59 were suffering from lung pathology in this study. The finding are statistically significant (p value < 0.05, X2 8.3 and OR = 2).

Conclusion: There is significant association between smoking and lung abnormality among ex-mineworkers of Transkei region of South Africa.

Keywords: *Smoking; Lung Abnormality; Ex-Mineworker(S); Dust; Lung Cancer*

Introduction

The complex of dust inhalation with smoking in the causation of lung diseases is certainly health-degenerating, as a large number of ex-mineworkers have experienced when they developed lung abnormalities. About 500 million people alive today will eventually be killed by tobacco use. By 2030 tobacco use is expected to be the single biggest cause of death worldwide [1]. These mineworkers have also been exposed to silica dust, which, together with tobacco smoking that is a common practice among the black mineworkers, has a devastating effect on their health. With current smoking patterns, smoking-related deaths are projected to rise to 10 million a year by the 2020s, with 70% of these mortalities assumed to occur in poorer countries [2]. The mining industry has also underestimated the crippling effects of tobacco smoking among its employees. The two commonly used legal drugs, alcohol and tobacco, are more frequently consumed among miners than all illegal drugs combined [3].

Lung cancer, one of the few malignancies of which the main cause is definitely known and that can be prevented, is on the increase especially in developing countries that have been targeted by tobacco companies [4]. No estimate of tobacco smoking in South Africa is

available, but it seems to be a more serious and widespread problem than is readily acknowledged, especially among ex-mineworkers of Transkei region of South Africa. The purpose of this preliminary report is to correlate the smoking with lung abnormalities among ex-mineworkers of the Transkei region of South Africa.

Patients and Method

During a five-year period from May 1997 to May 2002, about 3 000 ex-mineworkers were examined at the Benefit Examination Clinic, a clinic located at Nelson Mandela Academic Hospital (NMAH) a tertiary hospital attached to the Walter Sisulu University in the Eastern Cape Province. The benefit examination of ex-mineworkers is done once a week. The ex-mineworkers present themselves on this day for a comprehensive checkup to enable them to claim compensation from their former employers. A record of their history of mining and ID documentation, a chest X-ray and a report of a physical examination are then documented and forwarded to the Medical Bureau of Occupational Diseases in Johannesburg to process the compensation claims.

This study was a descriptive one, carried out by random sampling of data collected from X-ray photographs taken from X-ray plates of the chests of 466 ex-mineworkers. These photographs were interpreted by an independent radiologist. The interpretations of the photographs by the radiologist were then compiled with smoking, non-smoking and ex-smoking histories in relation to lung abnormalities. The word "abnormalities" is defined in Longman's English dictionary as being different from what is expected, usual or average, especially in a bad or undesirable way. It has been used instead of disease throughout this study. Photographs of X-ray plates of ex-mineworkers were studied in an attempt to ascertain unusual states, different from normal ones, exhibiting gross morphological changes. This examination sought to establish the presence of opacities in the lung fields, gross tracheal deviations, and structural abnormalities of the lungs and pleurae. In the majority of cases a mixed picture was observed and this was taken into account in the final diagnoses, with the help of an independent radiologist. This method in fact leads to underestimation of lung pathologies, as many of the smaller opacities are not obviously visible on the X-ray photographs. Since it is a comparative study of lung abnormalities in three categories of mineworkers, i.e. non-smokers, smokers and ex-smokers, gross errors in judgment are neutralized. All the data were collected and analyzed by Epi6 Info computer program. The result was displayed in the form of tables.

Results

There total 466 mineworkers x-ray plates studied, and categories into ex-smokers 226 (48%), smokers 143 (31%), and non-smokers 97 (21%) on the basis of history of smoking (Table 1 and Figure 1). The lung abnormality was detected in 137(29%) ex-smokers, 107 (23%) smokers and 48 (10%) non-smokers (Figure 2). Most 181 (39%) of abnormality on X-ray chest were detected in between 50 and 59 age group, and least 15 20 (3%) in the age of 70 and above (Table 2).

History of smoking	Lung abnormality detected	Lung abnormality not detected	Total
Ex-smokers	137 (29%)	89 (19%)	226 (48%)
Smokers	107 (23%)	36 (8%)	143 (31%)
Non-smokers	48 (10%)	49 (11%)	97 (21%)
Total	292 (63%)	174 (37%)	466 (100%)
Chi square = 16.64	p value 0.0002	(Statistically highly significant)	

Table 1: *Association between history of smoking and lung abnormality un ex-mineworkers of the Transkei region of South Africa (n = 466).*

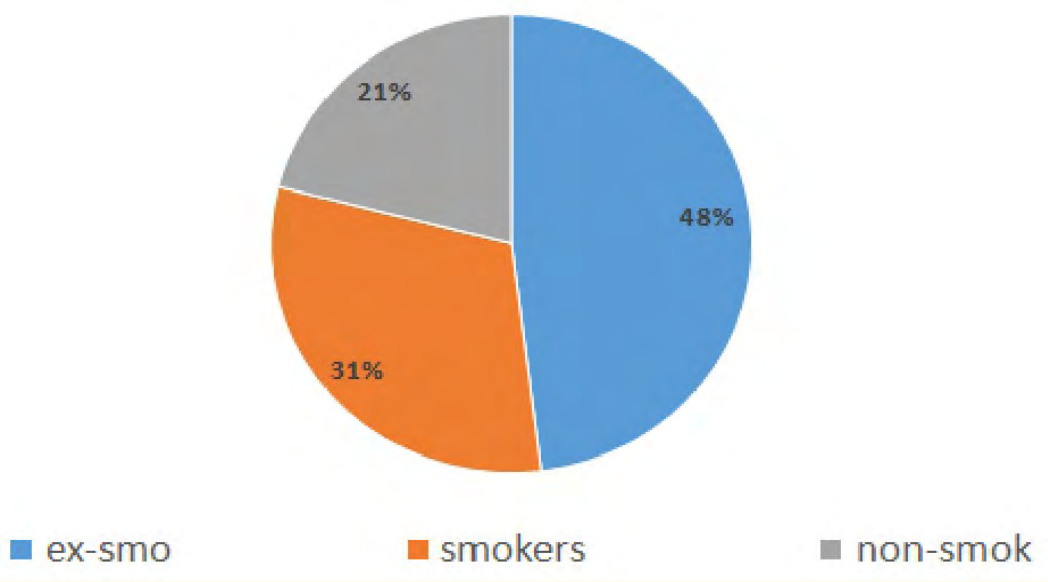

Figure 1: *Percentage of Ex-smokers, smokers and non-smokers in the Transkei region of South Africa (n = 466).*

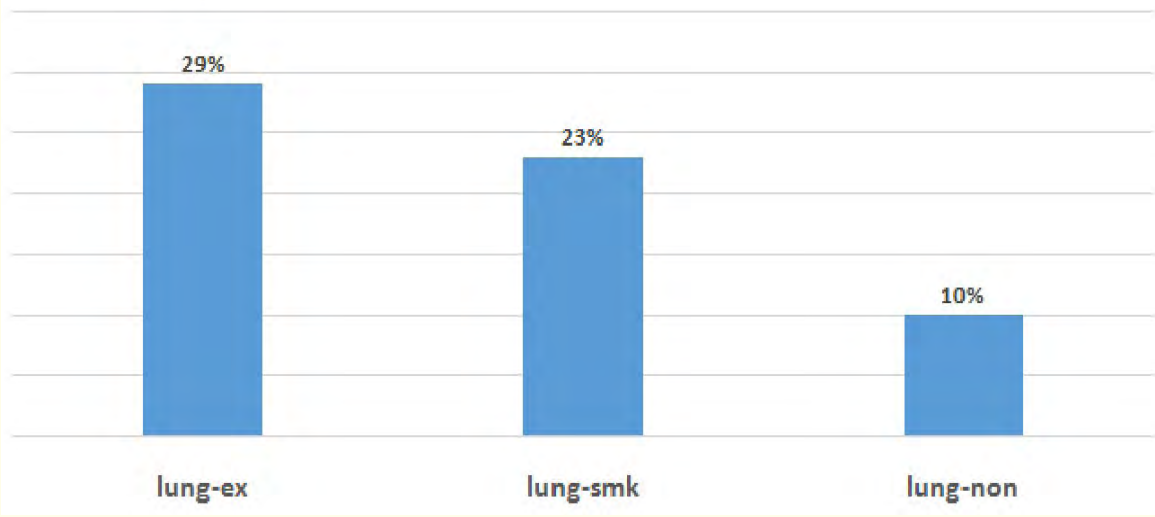

Figure 2: *Percentage of lung abnormalities in ex-smokers, smokers and non-smokers among ex-mineworkers in the Transkei region of South Africa (n = 466).*

Age groups	Lung abnormality detected	No Lung abnormality detected	Total
30 to 39	23 (5%)	33 (7%)	56 (12%)
40 to 49	84 (18%)	57 (12%)	141 (30%)
50 to 59	97 (21%)	40 (9%)	137 (30%)
60 to 69	68 (15%)	29 (6%)	97 (21%)
70+	20 (4%)	15 (3%)	35 (7%)
Total	292 (63%)	174 (37%)	466 (100%)
Chi square = 18.36	p value 0.001	(Statistically highly significant)	

Table 2: *Lung abnormality detected in different age groups in ex-mineworkers of Transkei (n = 466).*

The 75% of changes in the X-ray plates of smokers, while 50% in non-smokers (Table 3, 4 and Figure 3). The readings taken indicated an odd ratio (OR) of 2.0 with a p value of < 0.05, and Chi-square 8.3, indicative of statistically significant association between smoking and lung abnormality in the ex-mineworkers (i.e. ex-smokers, smokers, and non-smokers).

Age groups (Years)	Gross Lung abnormality detected	No Lung abnormality detected	Total
30 to 39	4 (4%)	11 (11%)	15 (15%)
40 to 49	11 (11%)	13 (14%)	24 (25%)
50 to 59	13 (14%)	10 (10%)	23 (24%)
60 to 69	13 (14%)	9 (9%)	22 (23%)
70+	7 (7%)	6 (6%)	13 (13%)
Total	48 (50%)	49 (50%)	97 (100%)
Chi square = 4.62	p value 0.32	(Statistically not significant)	

Table 3: *Lung abnormality detected in non-smokers in age groups among ex-mineworkers of Transkei region of South Africa (n = 97).*

Age groups	Lung abnormality detected	No Lung abnormality detected	Total
30 to 39	12 (8%)	7 (5%)	19 (13%)
40 to 49	33 (23%)	15 (10%)	48 (33%)
50 to 59	33 (23%)	8 (5%)	41 (28%)
60 to 69	24 (17%)	5 (4%)	29 (21%)
70+	5 (4%)	1 (1%)	6 (5%)
Total	107 (75%)	36 (25%)	143 (100%)
Chi square = 4.21	p value 0.378	(Not Significant)	

Table 4: *Lung abnormality detected in smokers in different age groups of ex-mineworkers in the Transkei region of South Africa (n = 143).*

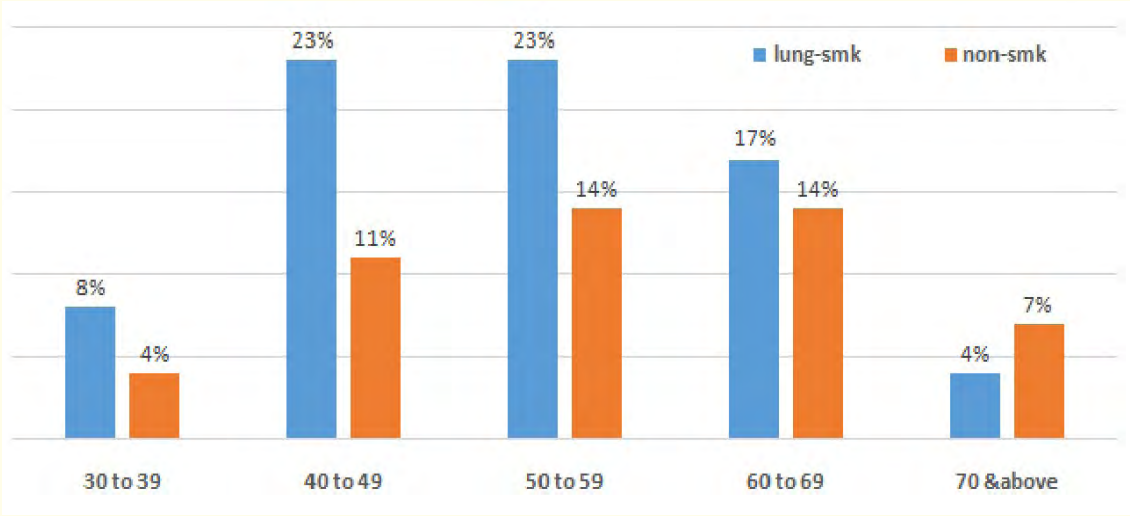

Figure 3: *Percentage of lung abnormalities among different age groups in ex-mineworkers of the Transkei region of South Africa (n = 466).*

Discussion

This preliminary study is a first of its kind and aims to estimate the deleterious effects of smoking among ex-mineworkers of Transkei region of South Africa. The mortality and morbidity rate as a result of tobacco smoking among ex-mineworkers is difficult to estimate, but there are a number of indicators suggesting that the incidence of lung diseases is very high, and therefore mortality is probably high as well. About four-fifth (79%) of mineworkers have a smoking habit (Table1 and Figure 1). It is difficult to determine whether this habit of smoking is a cause or effect of mining job. Majority of mineworkers who left their home and started living alone and acquire all bad habits at the mines. A little less than half (29%) of the total lung pathology, were found among ex-smokers (Table 1 and Figure 1). It is not clear, what makes them to give up this habit of smoking. It may possible that their health is no more permitting them to continue smoking or the health professional could have given them advice to stop smoking.

Most (52%) of these lung abnormality were detected in mineworkers who smokes or smoked in the past (Table 1 and Figure 2). This high percentage of lung abnormalities could be associated with exposure to unlimited amounts of pollutants in the dusty environment plus smoking could cause heavier damage than without smoking. Dust could be minimize in underground mining but could not be eliminated out fully. The tobacco smoke inhalation could only possible when someone is smoking and could be prevented. The combined effect of dust and smoking along with other supper added infection could lead to extensive damage to the lungs. An earlier study carried by the author showed that the high prevalence of infectious diseases such as tuberculosis, with or without silicosis (71.2%), proved that abundant lung abnormality occurs among the ex-mineworkers [5]. It is surprising that 48% smokers has left the habit of smoking in this study (Table 1 and Figure 1). It is not clear, what makes them to give up this habit of smoking. It may possible that their health is no more permitting them to continue smoking or the health professional could have given them advice to stop smoking. The highest (29%) of lung pathology was detected on X-ray among ex-smokers, followed by 107 (23%) in smokers (Figure 2). In the case of COPD among young people, giving up smoking leads to the improvement of their lung function. However, in older people, such as many ex-mineworkers, such an improvement is not possible, although after cessation of smoking further deterioration will run parallel to that of non-smokers. Krishna., *et al*. on the other hand, found that the FEV1 was significantly lower in smokers than in non-smokers and ex-smokers [6].

There is high percentages of lung pathology among smokers (75%) than non-smokers (48%) mineworkers in all age groups (Table 3 and 4). It means every second non-smoker mineworkers is suffering from lung disease. It prove that there is a heavy burden of dust related lung disease among mineworkers. A study carried out in Transkei (2002) has shown that there is a heavy burden of lung pathology among ex-mineworkers of Transkei (meel, 2002). The post card size X-ray photograph were used visually by an independent radiologist in this study, probably underestimated the real picture of lung pathology among mineworkers. The three quarter of (75%) of smokers has shown the lung abnormality in this study, while non-smoker were just half of them (Table 3). It indicate that tobacco smoking has contributed at least 10 to 20 percent in the progression of lung disease.

The highest percentage (46%) of lung abnormality was detected among smoker mineworkers between 40 and 59 age groups (Table 3 and Figure 3). This indicate that an excessive mortality among smoker mineworkers than non-smokers as a result of chronic respiratory diseases is not surprising. Both cigarette smoking and exposure to dust in mines are causal factors of chronic respiratory diseases [7,8]. This also indicates that non-smokers are much healthier than smokers and ex-smokers. It also indicates that ex-smokers are healthier than smokers. One can easily conclude that quitting smoking is advantageous. Tobacco smoking ex-mineworkers live with a much more deteriorated state of health than non-smokers. It seems that the role of dust and smoking is an additive in the causation of lung abnormalities. The mining owners have obligations to their employees, enshrined in the Occupational Safety and Health Act, 1993, regarding the health care of mineworkers. The provisions of this Act should be extended to ex-mineworkers as well. Most of the time, the measures taken by the mining health care advisers are either protective or curative in nature, but not preventive. Education regarding the bad effects of tobacco consumption and the rights of non-smokers should be incorporated in the practice at the workplace under this Act.

Conclusion

There is an association with smoking and lung pathology among mineworkers of Transkei region of South Africa. The mineworkers who had smoked exhibited two to three times the number of gross lung abnormalities on radiological examination than those who had had no experience of smoking in their life. This is a preliminary study with a limited sample size, and therefore, there is need of advance research in this field.

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