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RESEARCH ARTICLE

RISK OF RESPIRATORY DISEASES ASSOCIATED WITH BEEDI WORKERS OF NORTH 24 PARGANAS IN WEST BENGAL, INDIA

[1]Priyanka Mukhopadhyay, [2]Satyajit Sen, [3]Gopal Mondal, [1]Asesh Banerjee and [*,1]Sibani Chakraborty

[1]Department of Microbiology, West Bengal State University, Barasat, Vill-Malikapur, P.O- Berunanpukuria, 24 Parganas (N), Kolkata 700126
[2]AIIH&PH Kolkata, Ministry of Health & Family Welfare, Govt. of India
[3]LWO Kolkata, Ministry of Labour & Employment, Govt. of India

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ABSTRACT

Beedi binding profession occupies a prominent place in rural India. For the beedi industry West Bengal is one of the major hub in India. It has to bealso noted that this profession is an unorganized sector of labour which lacks in access to proper health care. Here we present a study which was carried out with 171 beedi workers from two different locations Hasnabad and Kankra of North 24 parganas in West Bengal. Most of the beedi workers were found to be suffering from tuberculosis (TB) and chronic obstructive pulmonary disease (COPD), which are two important respiratory diseases. A positive association was observed between the respective diseases with beedi making profession. Thereby we recommend greater governmental support for the beedi workers' healthcare and routine check up for prevention and cure of these two afore-mentioned diseases in particular.

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INTRODUCTION

Tuberculosis (TB) is an important cause of human suffering and death. Human immunodeficiency virus (HIV), multi-drug resistant TB (MDR-TB) and extensive drug resistant tuberculosis (XDR-TB) have enhanced the threats to TB control. In recent years aided by recent molecular genetic methods on *Mycobacterium*, mode of action of various TB drugs have been elucidated including cloning and characterization of the primary anti-TB agent, Isoniazid (Brunhuber *et al*., 1994 and Heym, 1994). Tobacco use is responsible for four million deaths in the world every year and 50 per cent of these deaths occur in the middle age (35-69 yr) population. Growing epidemiological and laboratory evidence indicate that tobacco is a risk factor for tuberculosis and for death from tuberculosis (Yach, 2000). Tuberculosis infection, incidence and severity are conventionally known to be related to tobacco use. Other factors are drug abuse, poverty, age, socio-economic condition, adequate health resources etc., (Heym *et al*., 1994).

Corresponding author: Sibani Chakraborty,
Department of Microbiology,West Bengal State University, Barasat, Vill-Malikapur, P.O- Berunanpukuria, 24 Parganas (N), Kolkata 700126

The mortality and morbidity associated with tobacco use is mainly due to respiratory diseases. *Beedi* (0.2-0.3g of tobacco wrapped in a *temburni* leaf and tied with a small string) smoking was reportedas early as 1711 in India (Reddy and Gupta, 2004). The beedi workers of North 24 Parganas in West Bengal, are extensive handlers of tobacco and considered as subjects of study. A large population living in the district of north 24 parganas in West Bengal, earns their living by beedi binding. Beedi binding is a skilled job. The process involves wrapping of processed tobacco in previously soaked tendu (Diospyrus melanoxylon) leaves which is then bound with a string. The processed tobacco enters the respiratory system and causes various respiratory infections among the workers. Nowadays, the greatest concern of TB control programs is the appearance of multidrug-resistant tuberculosis and extensively drug-resistant tuberculosis.

It has been observed that the treatment of tuberculosis tend to be incomplete and irregular, due mainly to poor compliance in taking medicine and in part due to inconsistent supply of medicine especially to poorly educated beedi workers. Recent prediction based on current exposures to risk factors and

disease suggests that COPD may become the third commonest cause of death globally by the year 2050 (van *et al*., 2010). Apart from tuberculosis chronic obstructive pulmonary disease (COPD) is another respiratory disease which has been observed among beedi workers during our study. COPD is the occurrence of chronic bronchitis defined as a cough with sputum production. In the airways of lungs, an increased number and size of goblet cells and mucus glands of the airways result in more mucus than usual contributing to narrowing of the airways and causing cough with sputum.

Microscopically there is an infiltration of the airway walls with inflammatory cells. Inflammation is followed by scarring and remodeling that thickens the walls and also results in narrowing of the airways which results in a limitation of airflow and emphysema. The destruction of air space reduces the surface area available for the exchange of oxygen and carbon-dioxide during breathing which causes limitations to airflow. Lack of hygienic environment and protective health care devices and due to scarcity of alternative employment the workers thrive on beedi binding most of the time. Beedi binding provides a guaranteed wage, secured employment and some degree of economic independence of rural woman (Dharmalingam *et al*., 1993). A significant association exists between beedi smoke and tuberculosis (Glorian Sorensen, 2013). Various studies indicate that education and occupation are simultaneously and independently related with tobacco use (Yasmin *et al*., 2010; Nakkeeran Senthilkumar *et al*., 2010). Therefore a study is needed to evaluate the prevalence of various respiratory diseases associated with beedi binding profession. The study aims at betterment of healthcare for the beedi workers of North 24 Parganas in West Bengal.

MATERIALS AND METHODS

Data Collection

A study has been carried out with 171 respondents from two different localities of Kankra and Hasnabad in the district of 24parganas (north) in West Bengal. The data collection was done from the Government health care service providers for the beedi workers of Kankra and Hasnabad village. Most of the respondents were suffering from Tuberculosis and COPD (chronic obstructive pulmonary disease). COPD includes both chronic bronchitis and asthma. A major portion of the workers were engaged with this profession from their childhood (i.e. 5-10 years). Tuberculosis patients were diagnosed by acid- fast bacilli (AFB) staining protocol. COPD patients were diagnosed by clinical features and chest X-ray. The total strength of our population was 171 among which 131 were beedi workers and 40 non beedi workers (Table1a). They belong to same socio economic status, mainly from Muslim community and from poor educational and economic background.

Among these 131 workers, 70 were suffering from various respiratory diseases and 61 workers were not suffering from any disease which is taken as control. On the other hand, among those 40 non beedi binding respondents, 12 were suffering from various respiratory diseases and 28 were neither engaged with this profession nor suffering from any respiratory disease.

Table 1a.Comparison of respiratory diseases between beedi and non-beedi workers from Kankra and Hasnabad in North24 Parganas, West Bengal

	With respiratory diseases (A)	With no respiratory disease (α)	Total
Beedi workers (B)	70	61	131
Non beedi workers (β)	12	28	40

Comparative data presentation from Kankra and Hasnabad centres

Comparing Kankra and Hasnabad centres' data individually helps to find the degree of association of a particular respiratory disease with the beedi binding profession. From village Kankra, we obtained 96 respondents. Among them 72 were beedi workers and 24 were non beedi workers from same locality. Among 72 beedi workers 37 were suffering from several respiratory diseases and 35 were not. On other hand, among 24 non beedi workers 7 were suffering from respiratory diseases and 17 were not (Table1b).

Table 1b. Comparison of respiratory diseases between beedi and non-beedi workers from Kankra

	With respiratory diseases (A)	With no respiratory disease (α)	Total
Beedi workers (B)	37	35	72
Non beedi workers (β)	7	17	24

From the village Hasnabad, we obtained total 75 respondents. Among 59 beedi workers, 33 were beedi workers with respiratory disease and 26 were beedi workers with no respiratory disease (control). Among 16 non beedi workers, 5 were suffering from various respiratory disease and 11 were neither beedi worker, nor suffering from any respiratory disease (Table1c).

Table 1c. Comparison of respiratory diseases between beedi and non-beedi workers from Hasnabad

	With respiratory diseases (A)	With no respiratory disease (α)	Total
Beedi workers (B)	33	26	59
Non beedi workers (β)	5	11	16

Here, the correlation between causation of tuberculosis with beedi binding profession is of particular importance since it has been previously reported that beedi workers are exposed to unburnt tobacco dust through cutaneous and pharyngeal route (Sabale et al., 2012)

RESULTS

Two way contingency tables for each disease were prepared. The association between diseases and the profession was determined by calculating the Yule's Q value (association co-efficient). Two by two tables provide with various statistics and measures of association. Yule's Q is based on the odds ratio and a symmetric measure taking on values between -1 and +1. There are two directions of association: positive association and negative association**.** Two variables have a positive

association when the values of one variable tend to increase as the values of the other variable increase. A perfect positive association means that a relationship appears to exist between two variables, and that relationship is positive 100% of the time. A perfect positive association is represented by the value +1.00, while a 0.00 indicates no association.

Analysis of samples from Kankra

Here, we present Table2a which describes the correlation between about the beedi workers and their respiratory diseases of village Kankra.

Table. 2a. Two-way contingency table for all respiratory diseases of village Kankra

	With respiratory diseases (A)	With no respiratory disease (α)	Total
Beedi workers (B)	37 f_{AB}	35 $f_{\alpha B}$	$f_{B=}$ 72
Non beedi workers (β)	7 $f_{A\beta}$	17 $f_{\alpha\beta}$	f_{β}= 24
Total	f_A =44	f_{α} = 52	n= 96

$$Q_{AB}= \frac{f_{AB}f_{\alpha\beta}-f_{A\beta}f_{\alpha B}}{f_{AB}\,f_{\alpha\beta}\,+f_{A\beta}\,f_{\alpha B}}$$

$$= 0.43$$

Since the Q value is 0.43, a significantly positive association between the occurance of respiratory diseases with the profession of beedi binding can be predicted.

Table2b. Two- way contingency table for tuberculosis of village Kankra

	Tuberculosis (A)	Non Tuberculosis (α)	Total
Beedi workers (B)	11f_{AB}	61$f_{\alpha B}$	$f_{B=}$ 72
Non beedi workers(β)	2$f_{A\beta}$	22$f_{\alpha\beta}$	f_{β}=24
Total	f_A=13	f_{α} = 83	n= 96

$$Q_{AB}= \frac{f_{AB}f_{\alpha\beta}-f_{A\beta}f_{\alpha B}}{f_{AB}\,f_{\alpha\beta}\,+f_{A\beta}\,f_{\alpha B}}$$

$$=0.329$$

The two-way contingency table has the Q value of 0.329, it also can be predicted that a positive association between Tuberculosis and the beedi workers would occur in general. The correlation value of 0.329 again suggests that the association would be significant.

Table2c. Two-way contingency table for COPD of village Kankra

	COPD(A)	Non COPD(α)	Total
Beedi workers (B)	31f_{AB}	41$f_{\alpha B}$	f_B =72
Non beedi workers(β)	5$f_{A\beta}$	19$f_{\alpha\beta}$	f_{β}= 24
Total	f_A= 36	f_{α}= 60	n= 96

$$Q_{AB}= \frac{f_{AB}f_{\alpha\beta}-f_{A\beta}f_{\alpha B}}{f_{AB}\,f_{\alpha\beta}\,+f_{A\beta}\,f_{\alpha B}}$$

$$= 0.48$$

This two-way contingency table the Q value is 0.48 for COPD. Hence it ensures an association between COPD and beedi workers which is again significant.

Analysis of samples from Hasnabad

The following two- way contingency Table3a represent the relation between various respiratory diseases and beedi workers of the village Hasnabad.

Table3a. Two-way contingency table for all respiratory diseases of village Hasnabad

	With respiratory diseases (A)	With no respiratory disease (α)	total
Beedi workers (B)	33 f_{AB}	26 $f_{\alpha B}$	f_B =59
Non beedi workers (β)	5 $f_{A\beta}$	11 $f_{\alpha\beta}$	f_{β}= 16
Total	f_A =38	f_{α}= 37	n= 75

$$Q_{AB}= \frac{f_{AB}f_{\alpha\beta}-f_{A\beta}f_{\alpha B}}{f_{AB}\,f_{\alpha\beta}\,+f_{A\beta}\,f_{\alpha B}}$$

$$=0.47$$

The two-way contingency table has a Q value of 0.47 which indicates a positive association between the occurance of respiratory diseases and the process of beedi making.

Table3b. Two-way contingency table for Tuberculosis of village Hasnabad

	Tuberculosis(A)	Non Tuberculosis (α)	total
Beedi workers (B)	21f_{AB}	38$f_{\alpha B}$	f_B = 59
Non beedi workers(β)	1$f_{A\beta}$	15$f_{\alpha\beta}$	$f_{\beta=}$ 16
Total	f_A =22	f_{α}= 53	n= 75

$$Q_{AB}= \frac{f_{AB}f_{\alpha\beta}-f_{A\beta}f_{\alpha B}}{f_{AB}\,f_{\alpha\beta}\,+f_{A\beta}\,f_{\alpha B}}$$

$$= 0.78$$

The two-way contingency table has the Q value of 0.78 for TB which indicates a highly positive association of tuberculosis with beedi binding profession.

Table 3c. Two-way contingency table for COPD of village Hasnabad

	COPD (A)	Non COPD (α)	Total
Beedi workers (B)	21f_{AB}	38$f_{\alpha B}$	f_B = 59
Non beedi workers(β)	1$f_{A\beta}$	15$f_{\alpha\beta}$	f_{β}= 16
Total	f_A =22	f_{α}= 53	n= 75

$$Q_{AB}= \frac{f_{AB}f_{\alpha\beta}-f_{A\beta}f_{\alpha B}}{f_{AB}\,f_{\alpha\beta}\,+f_{A\beta}\,f_{\alpha B}}$$

$$= 0.78$$

The two-way contingency table has a Q value of 0.78 which denotes a more significant positive association between beedi binding and COPD.

DISCUSSION

The present study reveals that a significant positive association exists between the two important respiratory diseases, namely TB and COPD, with beedi binding profession. The level of significance when compared using statistical analyses of Yule's Q value can be categorized as 'mild' to 'severe'. Comparison of data from the two different localities of Kankra and Hasnabad show that the risk of all respiratory diseases (COPD & tuberculosis together) associated with beedi binding is same for both (Q value of 0.4 each) the area. However when compared individually for the two diseases TB and COPD, Kankra revealed a moderate level of significance for both the diseases (Q value of 0.329 for TB and 0.48 for COPD) and Hasnabad showed a severe level of significance for the occurrence of TB and COPD among the beedi workers (Q value 0.78 each). Further it is to be noted that all values of data obtained from both Kankra and Hasnabad suggest a complete positive association of TB and COPD with the profession of beedi making. Thus it can be concluded that the beedi workers of Hasnabad and Kankra are prone to tuberculosis and COPD because of their profession.

Overall a greater percentage of beedi workers suffer from both TB and COPD. However, TB is a greater public health threat out of these conditions. Now-a-days TB-therapy is administered in form of multi-drug regimen. Due to treatment for long period of time, the patients tend to go off the treatment regimen once they feel a little better. These patients invariably come back with full-blown and multi-drug resistant TB another few years down the road. Thus Directly Observed Therapy (DOT) has been mandated for all patients. In spite of supervised anti tubercular therapies undertaken by the Government, patient compliance still tends to be low mainly due to drug side effects, migration, poverty and under education associated with this profession. This leads to the rise of incomplete treatment cases and possibility of emergence of multi-drug resistant tuberculosis cases among this profession obviating the need for further research towards this direction.

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