Original Article

Study of epidemiological correlates of tuberculosis.

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Introduction: Tuberculosis is a disease of poverty affecting mostly young adults in their most productive years. WHO has suggested that the expected effect of improved diagnostic and treatment services may be negated by an increase in the prevalence of risk factors for the progression of latent TB to active disease in segments of the population. The risk factors broadly described may be biomedical, environmental or socioeconomic. The impact of these other determinants on TB epidemiology in India has yet to be fully understood .

Methodology: Study was undertaken on all patients in the age group of 18 years and above with history of cough for more than 2 weeks attending DOTS Microscopy centre of HIMS with or without other symptoms suggestive of tuberculosis attending DOTS Microscopy centre for a period of six months i.e. from 1st July to 31st December 2010 were included in study group. Total patients attended the centre were 538.

Results: Majority of participants were farmers 159(43.9%) belonging to lower socio-economic status . Out of 362 study subjects maximum i.e. 162 (44.8%) had past history of pulmonary tuberculosis and only 18 (5.0%) subjects had family history of tuberculosis . While majority (45%) had past history of tuberculosis of which 37.1% had sputum positivity. Smoking was found to be most common type of addiction among 207 (57.2%) followed by alcohol i.e. 129 (35.6%) .

Conclusion: Epidemiological factors like literacy status, socioeconomic status, previous history of tuberculosis, smoking & BMI play important role in causation of Tuberculosis.

Keywords: Tubeculosis, literacy, SE status, smoking,Alcohol.

Introduction:

Tuberculosis remains a worldwide public health problem despite the fact that the causative organism was discovered more than 100 years ago. It is a disease of poverty affecting mostly young adults in their most productive years. The vast majority of TB deaths are in the developing world[1].

Besides the disease itself, TB also causes an enormous socioeconomic burden. TB primarily affects people in their most productive years with important socio-economic consequences for the household when an individual falls sick with TB. The disease is even more common among the poor and marginalized sections of the community. If left untreated, each person with active TB disease will infect on an average between 10 and 15 people every year and this continues the transmission of tuberculosis[1].

WHO has suggested that the expected effect of improved diagnostic and treatment services may be negated by an increase in the prevalence of risk factors for the progression of latent TB to active disease in segments of the population. Increase in vulnerability of population may tend to increase incidence despite reduction in transmission achieved under the "Stop TB" strategy. The risk factors broadly described may be biomedical (such as HIV infection, diabetes, tobacco, malnutrition, silicosis, malignancy), environmental (indoor air pollution, poor ventilation) or socioeconomic (crowding, urbanization, migration, poverty). The impact of these other determinants on TB epidemiology in India has yet to be fully understood[2].

Methodology:

Study was undertaken on all patients in the age group of 18 years and above with history of cough for more than 2 weeks attending DOTS Microscopy centre of HIMS with or without other symptoms suggestive of tuberculosis attending DOTS Microscopy centre were included in study group. It comprised of all the patients who attended DOTS Microscopy centre of HIMS for a period of six months i.e. from 1st July to 31st December 2010. Total patients attended the centre were 538.

All information regarding Socio-Demographic profile which included their literacy status, occupation, income, and social class was collected and recorded on a pre-designed and pre-tested questionnaire. Details of past / personal history and presenting complaints were recorded in questionnaire.

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General and systemic examination like weight, height, pulse, respiratory rate, blood pressure, built, pallor and lymphadenopathy was done and findings recorded.

While patient below 18 year of age, very sick patients or person already on anti tuberculosis treatment were not taken as study subjects. The study was approved by the institute's ethics committee. Informed verbal consent was taken from all the patients included in the study.

Data was processed on the software SPSS (version 17) ,Microsoft excel 2007, Graph pad prism 5 and End Note program X5.

Results:

Amongst the literate people maximum i.e. 19.1% had an education level up to Junior high school and few had literacy level of graduate and above i.e. (5.5%). In our study group majority of subjects were literate (55.2%) and among these literate subjects maximum (19.1%) had an education level up to Junior high school followed by 14.1% up to primary and only 5.5% had literacy level of graduate and above. 44.8% subjects were illiterate.

Majority of participants were farmers 159(43.9%) followed by labourers that accounted to 51(14.1%) patients and minimum belonged to professionals i.e. 30(8.3%). On the basis of Social Class , maximum i.e.327 (90.3%) study subjects belonged to lower socio-economic status followed by 33 (9.1%) subjects in middle class and only 2 persons (0.6%) belong to upper class as per modified B.G. Prasad classification.

Out of 362 study subjects maximum i.e. 162 (44.8%) had past history of pulmonary tuberculosis and only 18 (5.0%) subjects had family history of tuberculosis, but half (50%) of them were sputum positive.

It was observed that majority (45%) had past history of tuberculosis of which 37.1% had sputum positivity.

Smoking was found to be most common type of addiction among 207 (57.2%) followed by alcohol i.e. 129 (35.6%) and addiction to both (alcohol and smoking) in 121(33.4%) subjects. It was also observed that sputum positivity was more (45.6%) in subjects addicted to both smoking & alcohol followed by 44.3% and 42.9% in subjects addicted to alcohol and smoking alone. A statistically significant difference was found between type of addiction & sputum positivity for pulmonary tuberculosis.

It was observed that sputum positivity was maximum i.e. 43.4% in undernourished subjects followed by 32% and 22.2% in well nourished and over nourished respectively meaning thereby that undernourished people were more prone to pulmonary tuberculosis as compared to well nourished. A statistically significant association was found between sputum results and B.M.I.

Table1: Association of sputum sample results with educational status, occupation and social class

S.N I.	Educational status	(N=134) Positive	(N=228) Negative	(N=362) Total	'p' value
1	Illiterate	50(33.7%)	98(66.3%)	148(40.8%)	0.26
2	Just literate	2(14.3%)	12(85.7%)	14(3.8%)	
3	Primary	21(41.7%)	30(58.3%)	51(14%)	
4	Junior High School	24(34.8%)	45(65.2%)	69(19.2%)	
5	High School	12(41.3%)	17(58.7%)	29(8.2%)	χ^2=7.69,
6	Intermediate	15(48.4%)	16(51.6%)	31(8.5%)	df= 6
7	Graduate & above	10(50%)	10(50%)	20(5.5%)	
II	**Occupation**			**Total (%)**	
1	Farmer	63(39.6%)	96(60.4%)	159(44%)	0.52
2	Labourer	20(39.3%)	31(60.7%)	51(14%)	χ^2=4.14,
3	Shopkeeper	14(35.8%)	25(64.2%)	39(10.7%)	df=5
4	Professional	11(36.7%)	19(63.3%)	30(8.3%)	
5	Government service	14(41.1%)	20(58.9%)	34(9.4%)	
6	Others (Housewives & students)	12(24.5%)	37(75.5%)	49(13.6%)	
III	**Social Class (BG Prasad)**				
1	Upper Class	0(0%)	2(100%)	2(0.5%)	0.58
2	Upper middle	2(20%)	8(80%)	10(2.7%)	χ^2=2.87,
3	lower middle	10(43.4%)	13(56.6%)	23(6.3%)	df=4
4	Upper Lower	35(38.1%)	57(61.9%)	92(25.5%)	
5	lower	87(37%)	148(63%)	235(65%)	

(Parenthesis given in bracket is proportion)

Table 2: Association of sputum result with History of tuberculosis

S.No	History of Tuberculosis		Positive (N=134)	Negative (N=228)	Total (percentage) N=362	'p' value
1	Family history of TB	Yes	9(50%)	9(50%)	18(5%)	0.24
		No	125(36.3%)	219(63.7%)	344(95%)	
2	Past history of Pulmonary TB	Yes	60(37.1%)	102(62.9%)	162(45%)	0.99
		No	74(37%)	126(63%)	200(55%)	

(Parenthesis given in bracket is proportion)
χ^2= 1.37, df=1
χ^2=5.26, df= 1

Table 3 : Association of sputum results with History of addiction

S. No	History of Addiction	Positive (N=134)		Negative (N=228)	Total (percentage) N=362	'p' value
1	History of smoking	Yes	90(42.9%)	120(57.1%)	210(58.0%)	0.007*
		No	44(28.9%)	108(71.1%)	152(42.0%)	
2	History of alcohol intake	Yes	61(44.3%)	77(55.7%)	138(38.0%)	0.02*
		No	73(32.5%)	151(67.5%)	224(62.0%)	
3	History of smoking & alcohol	Yes	60(45.6%)	68(54.4%)	125(34.5%)	0.001*
		No	70(29.5%)	160(70.5%)	237(65.5%)	

(Parenthesis given in bracket is proportion)
χ^2=7.31, df=1
χ^2=4.94,df=1
χ^2=9.61, df=1

Table 4: Association of sputum sample results with Body Mass Index (B.M.I)

S.No	Nutritional status (B.M.I)	Positive (N=134)	Negative (N=206)	Total (percentage) (N=362)	'p' value
1	Under nourished	76(44%)	99(57%)	175(48.3%)	
2	Normal	54(32%)	115(68%)	169(47%)	0.03*
3	Over nourished	4(22.2%)	14(77.8%)	18(5%)	

(Parenthesis given in bracket is proportion)
χ^2=6.63, df=2

Discussion:

The present study revealed that sputum positivity was maximum (41%) in literates and low (32.1%) in illiterate subjects comparable to study by N Shetty et al who also reported maximum cases of tuberculosis in subjects with higher education level (52.4%) as compared to illiterates (18%)[3]. Among literate subjects sputum positivity was found more in Graduates and above (50%) and minimum in subjects studied up to Junior High School (34.8%). This implies that with increasing level of literacy the sputum positivity has increased. On the contrary study done by Q H Khan reported more proportion of illiterate subjects (75%) among confirmed cases out of screened symptomatic[4]. The observation in present study was also contradictory to the study of Schoemen J H et al & N Shetty et al [3] both reporting that higher level of education was protective against tuberculosis. The contradiction might be because our study was a hospital based and here patients come to seek specialized health care advice or treatment. Although educated persons were more aware to seek early health care advice, but this association was not found to be significant.

In the index study majority of subjects were farmers (43.9%) followed by labourers (14.1%) and it was similar to subject distribution in study by Q H Khan[4]. Soham Gupta et al also reported majority (44%) of study subjects to be labourers by occupation followed by 27.1% professionals, 12.1% household workers, 10.6% students and 6.3% were retired or unemployed[5]. The findings by various authors can be co-related as the majority of population in India still belongs to farmers and labourers group.

In this study sputum positivity was found to be maximum i.e. 41.1% in subject with Government job while sputum positivity in farmers and labourers was 40% & 39.3%. The higher sputum positivity in subjects with govt job could be because in present study majority were literate ie.55.2% & AFB positivity in literate subjects was also reported high i.e. 52%. Contrary to our findings, S.Gupta et al observed a significantly higher prevalence ($p<0.0001$) of PTB in labourers (43.96%), followed by white collar workers (27.05%), retired & unemployed (6.28%), household (12%) & students (11%)[6]. Similarly Jha et al observed that prevalence of Pulmonary Tuberculosis was highest among the farmers (15.83/1000) followed by laborers, where as it was least (1.66/1000) in Professionals[6]. Q H Khan in his study at rural Aligarh observed that the prevalence rate was highest (19.48/1000) in Agriculture workers and labourers and lowest (7.11/1000) in business and professional groups. Their difference in prevalence with varying occupation was statistically significant[4].

The difference of result between index study and that of Jha et al and Q H Khan might be because their study was based on rural community while our study was based on hospital setting.

One study from Wardha, Maharashtra, India showed that the percentage was greater in white collar workers closely followed by cultivators, agricultural labourers, students & professional(Chakraborty 2004)[7]. The reason behind highest positivity rate among the government employees could be stated as area of the study setting which was entirely different from the studies quoted and as government officials are highly educated so they are aware of the various health modalities. Though farmers and labourers also showed quite large number of positivity, it may be ascribed to poor living conditions including sanitation and lower level of health consciousness in this group. Housewives and students were having least positivity that could be because of burden and dominancy from the rest of the members of the family and low level of exposure to the environment as they are confined to their homes only whereas in case of students it could be the awareness of the disease and its prevention as the study subjects were 18 years and above, although the results were not statistically significant.

As per modified B G Prasad classification in present study maximum i.e. 90.3% subjects were from low socioeconomic status and it was observed that Sputum positivity was high in subjects belonging to lower socioeconomic class i.e. (37.3%), which was comparable to study by Q H Khan who reported high prevalence rate of tuberculosis (21.88/1000) in lower socioeconomic class[4]. Shetty et al (2006) and Q H Khan (2006) also attributed lower education level and poverty as the reason for increased incidence of PTB among lower socio-economical group.

In the present study 9.1% subjects were from middle class and only 0.6% was from upper class and no sputum positive case was recorded in upper class category.

The prevalence might be more in low-socio-economic class due to ignorance, poverty and closed proximity of positive cases in vicinity as well as within the family. Moreover the organism causing tuberculosis has better chance to thrive in squalor which is very common amongst low social classes.

In present study, smoking was found to be commonest addiction i.e. in 57.2% of subjects. In present study, a statistically significant association was determined between sputum positivity and smoking i.e. 42.9% of smokers were sputum positive. Jha et al and Q H Khan also reported a strong statistically significant association between smoking and pulmonary tuberculosis. Susan et al in their study conducted at King County, Washington also reported a 30-50% more risk in current and former smokers as compared to non smokers[4,6]. G. Harvir et al at HIHT, Dehradun also reported 57.8% positive tuberculosis cases in smokers[4]. These observations support the present study in regard to smoking as a risk factor for pulmonary tuberculosis. G. Harvir et al also concluded in his study that more numbers of pulmonary tuberculosis cases were found in smokers[9].

In present study, addiction to alcohol was found in 35.6% subjects. The present study also establishes statistically significant association between sputum positivity and alcohol addiction meaning thereby that 44.3% of subjects among alcoholics were sputum positive and it was comparable to study by Q H Khan who observed higher number of tuberculosis cases in alcoholics (24.41/1000) as compared to non alcoholics (13.79/1000)[4]. Similar correlation was also noted by Susan et al and they established that heavy drinkers were twice at risk for TB in comparison to non regular alcohol consumers[4]. S Gupta et al in a study at Southern India observed 16.9% & 12.6% prevalence of smoking & alcoholism respectively in diagnosed cases of PTB[5].

In our study, 33.4% subjects were addicted to both alcohol and smoking. The present study also revealed strong statistical association between sputum positivity and combined addiction with alcohol and smoking meaning that 45.6% of subjects among them were found to be sputum positive. On the contrary, Shetty et al (2006) in their study from South India have shown insignificant risk of pulmonary TB in subjects with history of smoking & alcohol consumption[3].

In present study, 44.8% subjects had positive history of tuberculosis while Q H Khan reported 16.45% subjects with history of tuberculosis. In our study a substantially high percent of subjects had past history of tuberculosis and among them 37.1% had sputum positive result although it was statistically insignificant. Q H Khan observed a much less percent of confirmed cases (16.45%) in subjects with past history of pulmonary tuberculosis. The reason cited by them was better health awareness and availability of better health services under the jurisdiction of Jawan, Aligarh[4].

In present study, positive family history of tuberculosis was observed in 45% subjects while Jha et al reported it to be 36.99% in their study[6]. In present study, among 18 subjects with positive family history of tuberculosis, 50% were found to be sputum positive. On the contrary, Jha et al and Q H Khan in their studies found a lower incidence of pulmonary tuberculosis in subjects with positive family history of tuberculosis. The results were statistically insignificant in all the above studies including the present one.

In the present study, 44.2% subjects had history of anti TB treatment in the past. The explanation for higher past history of TB in these subjects could be inadequate treatment / treatment failure or re-emergence of infection or drug resistance.

In the index study, 48.3% subjects were found to be undernourished whereas 46.7% had normal BMI. In present study, sputum positivity was maximum i.e. 43.4% in undernourished subjects followed by 32% in well nourished and 22.2% in over nourished subjects meaning thereby that undernourished people were more prone to pulmonary tuberculosis as compared to well nourished. A statistically highly significant association was found between sputum result and BMI ($p=0.003$) and the results were comparable to study results of Jha et al that reveals high prevalence among the 'undernourished' persons i.e. 6.63/1000 followed by a lower prevalence of 1.35/1000 among 'well-nourished' subjects. These results were statistically highly significant[6].

Tverdal A in their study "Body mass index & incidence of tuberculosis" during 1985 at Norway found a distinct association between an increasing risk of pulmonary TB with a decreasing body mass index for both sexes and all age groups[10]. Similarly Cegielsky & McMurray at John Hopkins Institute, Baltimore in an evidence based study found that malnutrition appeared to increase the risk of developing tuberculosis. They concluded that prevalence of malnutrition based on BMI<18.5kg/m^2 and Mid upper arm Circumference (MUAC) <22.0cm are likely predictors of tuberculosis[11]. Hopewell P C in their study at San Francisco (1994) concluded that the poor nutritional status of patients with pulmonary TB may be due to anorexia, impaired absorption of nutrients or increased catabolism[12]. Shetty et al also concluded that TB is a disease of the poor & malnourished people are always at risk for developing TB.

It can thus be perceived that there is a strong association of tuberculosis with anthropometric indices of nutritional status. Malnutrition has traditionally been regarded as a causal link in between body composition and tuberculosis and it might be due to anorexia, impaired absorption of nutrients or increased catabolism.

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