



Research Article

Active Case Finding For TB / DR- TB in Health Care Workers

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Abstract

The present study was conducted in NKP SIMS, RC and Lata Mangeshkar Hospital, Nagpur on Health Care Workers with the aim to diagnose and treat Tuberculosis and Drug Resistant Tuberculosis through Active Case Finding Approach. The Active Case Finding sessions were organised by the Department of Respiratory Medicine in co-ordination with TB Department staff and health workers assigned for project work. 425 Health Care Workers actually visited the ACF session and were symptoms screened and subjected to sputum examination for Acid fast bacilli, Chest X-ray, and if needed higher investigations as per the RNTCP and PMDT diagnostic algorithm. 15 Health Care Workers were found to have active tuberculosis. The more health care workers with TB were noticed to be in 25 to 34 yrs age group and the females outnumbered the males (female 8, male 7) and have been diagnosed as the case of active TB disease in less than 2 yrs of employment (13 out of 15 HCWs). This study reflects that the hospital based active case finding is likely to have additional benefits such as contribution to early case finding and detection of patients of tuberculosis from vulnerable group possibly with an extended benefit for reducing secondary cases in the community. The results of the study can constitute and evidence base for future policy formulations on Active Case Finding in Health Care Workers as the evidence shows a high burden of active TB in health care workers, necessity an urgent need to improve existing TB Infection, Prevention and Control measures in Health Care Facilities.

Keywords: Active Case Finding in Health Care Workers, Tuberculosis and Multi Drug Resistant Tuberculosis, Revised National Tuberculosis Control Programme and Programmatic Management of Drug Resistant TB Guidelines.

Introduction

In India work place acquired TB is a significant occupational problem among health care workers. In order to manage the problem effectively it is important to know the burden of TB in health care workers. The increase in rates of TB & MDR-TB among HCWs has lead to great concern about the risk of nosocomial transmission in HCWs and has become a serious occupational hazard world-wide.

Recent increases in Rates of TB and DR-TB among HCWs in major hospitals in Maharashtra has lead to great concern about the risk of nosocomial transmission in health care settings and highlighted the need for periodically screening of health care workers especially working in high risk areas which include TB & Chest clinics, Medicine clinics, Indoor wards, DR-TB centres, ART centres etc.

Donnel MR et al have reported high incidence of hospital admissions with Multi-Drug Resistant

and extensively resistant TB among South African Health Care Workers.⁽¹⁾

In a systemic review of studies from low and middle income countries by R. Joshi et al⁽²⁾, the prevalence of LTBI among Health care workers was on an average 54% (range 33 % to 79%). The attributable risk for TB disease in Health Care Workers compared to risk in general population ranged from 25 to 5361 per 100000 per year.

Naidoo A et al⁽³⁾ conducted study among 62 medical doctors who were diagnosed and treated for Tuberculosis in South Africa, the majority (n= 36) expressed concerned regarding lack of infection control at the work place and delays in TB diagnosis.

Despite of a history of remarkable scientific achievements in microbiology and therapeutics, Tuberculosis continues to pose an extra ordinary threat to human health. Mycobacterium Tuberculosis infection is prevalent throughout the world, case reports are escalating and TB continues to claim about 2 million lives annually.^(4,5,6,7)

Control of TB is currently based on three strategies: Case finding and treatment of active disease, treatment of latent TB infection and vaccinating with BCG. (Bacille Calmette Guerin). The latter two have minimum impact on TB incidence. Hence case finding and treatments of TB disease are currently the principle means of controlling transmission and reducing incidence.

Active and enhanced case finding (ACF & ECF) require a special effort by the health care system to increase the detection of TB in given population. These strategies identify and bring into treatment people with TB, who have not sought diagnostic services on their own initiative. By detecting and treating TB in patients earlier than would occur otherwise, ACF and ECF can reduce the number of subsequent TB infections and prevent the secondary cases. The primary difference between the ACF & ECF is the level of direct interaction with the target population. ACF is often more labour involving face to face contact and immediate on site evaluation. ECF makes a population aware of TB symptoms (through

publicity and education) and encourage self presentation to medical services. ACF and ECF are of considerable interest for TB control because of the failure of current control strategies to reduce TB incidence particularly in areas with a severe human immunodeficiency virus problems.⁽⁸⁾

The impact of ACF on TB incidence is unknown but several mathematical models suggest that it could have a marked effect on TB case rates.^(9, 10)

The risk of developing TB among HCWs depends upon factors such as occupational category, age and use of infection control measures in the work place. 3

Detection of the most infectious cases of TB, sputum positive cases by case finding in patients attending health facilities is an essential component of control of TB. Its objective is to identify the source of infection in the community i.e. individuals who are discharging large number of Tubercle bacilli. Treatment of these infectious patients rapidly renders them non infectious thereby cutting the chain of transmission. A secondary benefit of case detection is to minimise the delay in initiating treatment, thereby increasing probability of cure.⁽¹¹⁾

Potential of ACF to reduce TB prevalence in contemporary settings with high HIV prevalence has been proven and thus its implementation in other settings is desired. Periodic ACF for Tuberculosis was widely implemented mainly using Chest Radiography in the Northern Hemisphere and some Asian Countries.⁽¹²⁾

The aim is to reduce the transmission of TB by screening high risk populations (i.e. those at an increased risk of exposure to TB infection, most notably contact of infectious cases) and to detect and treat active disease earlier than would otherwise occur.⁽¹³⁾

The success of any TB Control Programme is dependent on health care workers knowledge and application of appropriate policies and practices. TB infection amongst health care workers results in absenteeism and sometimes death or disability of health care workers, further weakening the already overburdened health care system.

Materials and Methods

This was a prospective study carried out from 15/02/2017 to 15/03/2019.

All the staff, medical, non medical including paramedical involved in the research project were given adequate training in carrying out the respective procedures using the copies of study protocol.

The ACF sessions were organized by the Department of Pulmonary Medicine, NKPSIMS, RC & Lata Mangeshkar Hospital Nagpur in coordination with TB Department staff and health workers assigned for the project work.

All the Health Care workers who visited THE ACF sessions were symptoms screened and then subjected to Sputum Examination for Acid Fast Bacilli and Chest X-ray as per the RNTCP diagnostic algorithm and other auxiliary investigations as per the specific individual case. Treatment was initiated as per the RNTCP and PMDT guidelines.

Open ended questions were designed to generate discussion about the disease process of TB & MDR-TB including how TB is transmitted and when a person is infectious, what Infectious Control methods were used and what barriers and motivators existed to use of Infection Control.

Results

In the present study, the Health Care Workers were enrolled between 15 /02 /2017 to 15 /03 / 2019 and the study was carried out in the Department of Respiratory Medicine, NKPSIMS, RC & LMH Nagpur.

Table No.1: HCWs enrolled & participated Gender wise and occupational subgroups.

Professional category	Male	Female	Total	%
1.Interns	49	70	119	
2.Staff Nurses	0	99	99	
3.Pharmacist	2	1	3	
4.P.G.Residents	43	48	91	
5.Other Faculty Members	35	46	81	
6.Lab Technician & class IV employees	20	12	32	
Total	149	276	425	

Table 2: Clinical Characteristics of Health Care Workers with TB

Occupational Subgroup	Pulmonary TB	Extra Pulmonary TB	MDR-TB	TOTAL
1.Intrens	0	0	0	0
2.Staff Nurses	1	5	0	6
3.Pharmacists	0	0	0	0
4.P.G. Residents	1	2	0	3
5.Other Faculty Members	0	2	0	2
6.Lab Technician & class IV employees	2	1	1	4
Total	4	10	1	15

Table 3: Age and Sex Distribution of HCWs with TB

Age Group	Male	Female	Total	%
15—24	0	3	3	
25—34	5	3	8	
35—44	0	2	2	
45—54	1	0	1	
55—64	1	0	1	
65 & Above	0	0	0	

Table 4 : Weight band of HCWs with TB

Band	Male	Female	Total
<16 Kg	0	0	0
16—25 kg	0	0	0
26—45 Kg	3	4	7
46—70Kg	3	4	7
>70 Kg	1	0	1

Table 5: Body Mass Index

BMI	Male	Female	Total
<18.5	4	4	8
18.5—24.9	4	2	6
>25	1	0	1

Table 6 : Symptomatology

Symptoms	No. Of Patients
Cough with/ without expectoration	10
Breathlessness	8
Haemoptysis	3
Fever	14
Loss of Weight	10

Table 7: Duration of Symptoms

Duration of Symptoms	No. Of Cases
< 1 Year	13
1—3 Years	2
3—5 Years	0
>5	0

Table 8 : Previous history of TB

Male	Female	Total
2	0	2

Table 9 : Addictions

Addiction	No. Of Patients
Smoking	5
Alcohol	3
Tobacco Chewing	3
Non Addict	9

Table 10 : Associated Comorbid Conditions

Diseases	No. Of Patients
Diabetes	2
Renal Disease	0
Hypertension	2
Retroviral Disease	0
Pott,s Spine	1

Table 11: HCWs with TB and Tools of Investigation

HCWs	Sputum positive	CBNAAT positive for Resistance	CXR/CT-MRI	Visceral Fluid Analysis & Histopathology
Interns	0	0	0	0
Staff Nurses	1		1	4
Pharmacist	0	0	0	0
P.G. Residents	0	0	1	2
Other Faculty Members	0	0	1	1
Lab Technician & class iv employees	3	1	0	0
Total	4	1	3	7

Table 12: The duration of work in health care

Duration	Total No. Positive for TB	%
< 2 years	6	40
2—5 Years	3	20
5.1—10Years	2	13.33
>10 Years	4	26.66

Table No. 13: Infection prevention and control training

Occupational Sub group	Received Training	Not Received	%
1.Interns	50	69	
2.Staff Nurses	41	58	
3.Pharmacists	2	1	
4.P.G.Residents	20	71	
5.Other Faculty Members	24	57	
6.Lab.Technicians & class IV employees	6	26	

Enrolment and disposition of study participants is shown in table no. 1. Of the 450 HCWs who consented to participate, 425 were available for evaluation. (95 %) Of these 15 (4.25 %) HCWs were classified as having active TB disease. The rest were TB negative. The HCWs with active TB disease were registered and referred for further management as per RNTCP protocol.

The 15 HCWs with active TB, 6 were staff nurses, of these 1 was sputum smear positive for Acid Fast Bacilli, 1 sputum negative for AFB but Chest X-ray positive for TB , 2 were having Pleural Effusion, 1 Tubercular Lymphadenopathy and 1 having TB meningitis. Thus 2 staff nurses were of Pulmonary TB and 4 with Extra pulmonary TB.

Among 3 Post Graduate Junior Residents with TB, 1 Junior Resident III (3rd Year) of Surgery Department was found to be suffering with Chest X-ray positive TB, 1 Junior Resident II (2nd Year) of Gynaecology Department and 1 Junior Resident II (2nd Year) of Radiology Department were diagnosed as the case of Tubercular Pleural Effusion.

Two faculty members were detected as the case of Extra Pulmonary TB (1 with TB Lymphadenopathy and 1 with TB spine).

One Laboratory Technician was found to be the case of Tubercular Pleural Effusion , 2 class 4 employees were diagnosed as Sputum Positive for AFB Tuberculosis and 1 with MDR—TB.(Table 2)

Most of the HCWs were between 25 years to 34 years age group and the least was in 55 years to 64 years age group. (Table no.3)

Gender wise 8 were male and 7 were female. 3 male HCWs and 4 female HCWs belonged to 26 Kg to 45 Kg Weight Band, 3 males and 4 females belonged to 46 Kg to 70 Kg Weight Band and One had more than 70 Kg weight. (Table no.4)

Present analysis indicated that 8 HCWs had BMI less than 18.5, 6 between 18.5 to 24.9 and 1 HCW had BMI more than 25. (Table no.5)

On the basis of symptoms 10 patients had cough with or without expectoration, 10 HCWs had breathlessness, 3 HCWs had haemoptysis, 14 HCWS had fever and 14 HCWs had patients had weight loss. (Table no. 6).

On the basis of duration of illness 13 HCWS had less than 1 year duration, 2 HCWs had 1 to 3 years duration, while 0 HCWs had 3 to 5 years duration and 0 had more than 5 years duration. (Table no. 7).

On the basis of past history and addiction 2 HCWs had previous history of TB. (Table no. 8). 3 HCWs were found to have addicted to Tobacco Chewing, 5 HCWs to smoking, 3 HCWs to alcohol and 9 had no addiction. (Table no. 9). 1 HCWs had associated DM, 2 had Hypertension and 1 had Pott's Spine. (Table 10)

On the basis of investigation tools, 1 HCW was diagnosed as having MDR-TB. 4 HCWs were found to be Smear Positive for AFB by microscopy, 1 HCW was diagnosed as a case of MDR-TB by CBNAAT, 3 HCWs were diagnosed by radiological investigation like Chest X-ray, CT- Scan, MRI and 7 HCWs were diagnosed as the case of TB on the basis of Pleural/Spinal Fluid analysis and histopathological examination of the Enlarged Lymph Nodes. (Table no 11). 6 HCWs with TB were working in the NKPSIMS & LMH since 2 years, 3 HCWs with TB had duration of 2-5 years and 2 HCWs with TB had duration of work of 5-10 years and 4 HCWs had worked in Health Care since more than 10 years. (Table no. 12).

Discussion

In the present study we determined the occupational risk of TB in the work force of a private tertiary hospital in Nagpur, a region with an intermediate burden of TB. This is the first study to investigate the incidence of TB among HCWs. One of the objectives of this study was to assess the acquisition of active TB disease among HCWs. In this study, TB therefore refers to TB disease and not latent TB infection and was diagnosed by Sputum Smear Microscopy, Chest X-ray, histological evidence of TB granuloma, Molecular test CBNAAT, Pleural / CSF fluid analysis, CT Scan, MRI if needed and concomitant clinical findings.

Prevalence of active TB disease in health care workers: In our study, fifteen Health Care Workers were found to be the case of active TB. (15 out of 425, 4.25 %). Active TB disease was less prevalent in health care workers working in health care facilities (1.4 %) ⁽¹⁴⁾ Compared to those working in the community (5 %) ⁽²¹⁾ in South African Health Care Workers.

Two studies provide data on the prevalence of active TB disease in South African health care workers. Active TB disease was less prevalent in health care workers working in health care facilities (1.4 %) ⁽¹⁴⁾ compared to those working in

the community (5 %) ⁽²¹⁾. The reported rates of TB in different groups of HCWs in TB-endemic countries have varied widely, with a higher risk of TB in HCWs reported by some studies and a lower risk by others. For example, Kruuer et al. showed that the TB risk among HCWs in Estonia was higher than in the general population.⁹

Similar results have been obtained in studies in Serbia and Japan, 15 while opposite results were obtained in two other studies.^(15,16)

Age of health care worker: - The more health care workers with TB in our study was found to be in 25-34 years age group (8, 53.33 %). and females exceeded over males. (8 females, 7 males). Ayuk et al⁽¹⁶⁾ reported that health care workers 40 years or older had a significantly higher incidence of active TB disease compared to health care workers younger than 40 years.

In Naidoo et al⁽¹⁷⁾, health care workers aged 25–29 years had a significantly higher incidence of active TB disease compared to all other age groups.

This finding is consistent with previous reports showing that TB risk among medical nurses employed in specialised lung disease institutions is higher than among those in non-exposed institutions.^(24,25,26)

We observed higher odds of among female participants in the study. Whether this increased odds of TB among women is related to differences in genetic, physiological or structural constitution of the sexes or even differences in TB exposure risk behaviour remains to be elucidated. However, this finding clearly does not correspond to the widely established higher rates of TB disease among men. Incidence of active TB disease, however, specific work locations (TB ward, paediatric ward and the outpatient department) were significantly associated with increased risk of acquiring active TB disease.⁽¹⁹⁾

In our study most of the HCWs with active TB were detected in the less than 18.5 BMI category indicating that low body mass is the risk factor for acquiring TB.

The most common symptoms noticed in the present study were low grade fever, loss of weight and appetite. (14 /15, 93.33 %). Most of HCWs had the duration of the symptoms of the less than a year.

Two male HCWs had reported the previous history of TB. Five male HCWs were addicted to smoking, 3 to alcohol, 3 to tobacco chewing and 9 HCWs were non addict.

Diabetes: In our study two health workers were detected to have active TB disease and Diabetes Mellitus type 2.

There is limited data from the studies in this review on the association between diabetes and risk of TB disease or infection. Both of the nurses diagnosed with TB in Balt et al. had non-insulin dependent diabetes.⁽¹⁸⁾ However, no significant association between diabetes and risk of TB disease or infection was noted in the two studies reporting on this relationship⁽¹⁶⁾.

HIV status

No Health Care Worker with TB was found to have suffered from HIV infection.

In Kwa Zulu-Natal, Wilkinson et al.⁽²³⁾ reported that 12 out of the 14 TB cases in health care workers tested for HIV were positive.

Duration of employment : In our study more health care workers were found to have been diagnosed as active TB disease in less than 2 years of employment (13 out of 15, 86.66 %) Both of the studies that assessed the relationship between duration of employment and incidence of active TB disease found no significant association⁽¹⁵⁾

Drug-resistant TB in health care workers: One health care worker was diagnosed as a case of Drug-resistant TB.

TB infection prevention and control (IPC) training: 282 HCWs out of 425 (66.35%) HCWs did not receive Infection Prevention and Control training in Tuberculosis.

One study assessed the association between training in TB IPC and risk of active TB disease and found that health care workers who reported having had no previous TB IPC training were significantly more likely to acquire active TB

disease.⁽¹⁶⁾ Two studies reported on the association between TB IPC knowledge, training and practice and the risk of incident latent TB infection.^(14,16)

Adams et al.⁽¹⁴⁾ found that having “some training in infection control procedures aimed at self-protection” significantly reduced the odds of latent TB infection (TST positivity) in health care workers at secondary level health care facilities. In four studies, training in TB infection prevention and control was significantly associated with decreased odds of acquiring active TB disease⁽²⁰⁾ and latent TB infection^(14, 16, 20)

Conclusion

The most important finding was that TB developed much more frequently in nurses working in TB-related departments compared to the HCWs in other departments, suggesting occupational acquisition of TB rather than reactivation of latent TB. Because employees did not undergo TSTs to detect TB infection when they were hired, we do not know whether HCWs with TB disease are already infected before starting work at this hospital or whether they were newly infected with *M. tuberculosis* afterwards.

However among occupational subgroups, the TB risk for nurses was higher than that of doctors and employees in other departments (including office workers), and was notably higher among nurses working in TB-related departments (medical intensive care unit, respiratory department ward and emergency room). This finding is consistent with previous reports showing that TB risk among medical nurses employed in specialised lung disease institutions is higher than among those in non-exposed institutions.^(21,22)

To stop the spread of TB in hospitals, several preventive strategies should be implemented: administrative, engineering and personal respiratory protection.⁽²¹⁾ and that stricter preventive strategies, such as contact investigations of active TB disease, the installation of an isolation room in the emergency room, and latent TB infection screening by TST at

the time of hiring should be implemented for all HCWs.

To determine the true extent of the TB epidemic in health care workers, screening for active TB disease should be conducted in all health care facility employees, on a regular basis.

Finally, the evidence base shows a high burden of both active and latent TB in health care workers, necessitating an urgent need to improve existing TB infection, prevention and control measures in health care facilities. Further to this training in TB infection, prevention and control be provided to all health care facility employees, including non-clinical staff. Implementation of WHO recommended TB infection control measures is regularly needed in health facilities to protect Health Care Workers.

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