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HEALTH CARE WORKERS AND RISK OF HOSPITAL-RELATED TUBERCULOSIS

AK Salami, PO Oluboyo
Department of Medicine, College of Medicine, University of Ilorin, Nigeria

ABSTRACT

Objective: To determine the incidence and risk of hospital-related TB amongst the health care workers and trainee students of this institution.

Design: Retrospective study.

Method: Chart review of PTB and EPTB diagnosed by AAFB in sputum, suggestive chest X-ray features of TB and aspiration cytology or tissue histology.

Results: Thirty-two (1.5%) of the 2,173 total staff strength developed occupation-related TB in a 15 year period, 15 (47.0%) of which presented as HIV/TB co-infection. Junior HCWs were mostly affected and the male:female ratio was about 1:2. PTB occurred in 25 staffs (78.1%), EPTB occurred in 5 (15.6%) and 2 (6.3%) had disseminated TB. HCWs directly caring for patients; 24 (75.0%) were mostly affected. They were HCWs from nursing, 15 (47.0%) and clinical services, 9 (28.0%). Duration of employment of the affected HCWs varied from half a year to 11.5 years and the rate of diagnosis of cases varied from nil to 3 per year. Identified risks for acquiring and developing active TB in the hospital were; HIV infection 47.%, diabetes mellitus 9.4%, "alcoholic" liver cirrhosis; 6.3% and chronic obstructive pulmonary disease 3.1%.

CONCLUSION: Incidence of hospital-related TB is low amongst the staffs of UITH; however, all the HCWs of the hospital were at risk of exposure. Staffs at the clinical sections had the highest frequency of developing occupation-related TB, and HIV infection was the commonest risk factor.

Keywords: Hospital-related TB, Health care workers and Risk factors. **(***Accepted 14 March 2007)*

INTRODUCTION

Health care workers (HCWs) are at risk of acquiring occupational diseases some of which could cause serious illness and even death[1]. These risks are sometimes unavoidable while caring for patients with infectious respiratory conditions such as tuberculosis (TB)[1]. TB is often acquired by airborne transmission of *Mycobacterial tuberculosis*, its causative organism and smear positive patients are the main source of bacilli transmission, however, smear negative patients including extra pulmonary TB could also transmit the bacilli[2] when cough is being induced in patients[3,4] or large abscesses are being irrigated[5] or wound dressings are being changed[6]. The risk of HCWs exposure to *Mycobacterial tuberculosis* is dependent on the number of TB patients been cared for[7], the duration of exposure to an index case of open PTB and the efficacy of the infection control measures in such facility[8]. These risks have been extensively studied inthe advanced world[9,10] and the reports showed that personnel in the laboratories, especially those in the postmortem and microbiology rooms had higher incidences of the disease than other personnel because of their direct contact with mycobacterial laden tissue and sputum specimens[10,11]. However, with the adoption of a number of preventive measures such as; patients' isolation, negative pressure ventilation and earlier case diagnosis and treatment[12,13], frequencies of hospital-related TB has greatly reduced. The same could not be said of Africa, a continent that is heavily burdened by TB and HIV infection. The incidence rates of both conditions are quite high across the region and records of TB in most countries are poorly kept, including data on hospital-related TB[14]. Nigeria is not exempt, national report on TB is far from being up-to-date save for scattered institutional reports on the disease[15]. Also pre-employment screening for tuberculous infection by

Correspondence: Dr AK Salami
E-mail: Salkaz2000@yahoo.com

chest radiograph and tuberculin testing is often not enforced partly because of the general believe that TB is endemic in the country and partly because of the diagnostic problem of tuberculin test in differentiating present from past mycobacterial infection and even from BCG vaccination, considering the fact that Nigeria has a high rate of BCG vaccination at birth[16]. We have reported hospital prevalence rate of 9.2% for PTB[15] and an annual incidence rate of 37% has been documented for smear positive TB[17]. We care for a large number of TB patients and thus, HCWs are at increased risk of occupational exposure in our clinics, wards, laboratories and adjoining premises within the hospital environment. It was on this background coupled with the few cases of HIV/TB that have been observed in recent times amongst the hospital staffs[18] that informed this study of the incidence and risk of occupation-related TB amongst the employees and trainee students of this institution.

MATERIALS AND METHODS

A retrospective analysis of all diagnosed cases of TB among the staff of UITH from 1990 to 2004 was conducted by charts review. Records of HCWs diagnosed to have TB were obtained from the chest unit TB register and their charts were retrieved fromthe hospital's records library. Charts with at least 2 positive sputum smears results of acid and alcohol fast bacilli (AAFB) or a positive smear result and a suggestive x-ray report of active PTB were considered along with cases of extra pulmonary TB (EPTB) diagnosed by aspiration cytology or tissue histology save for skeletal TB that was diagnosed by clinical and radiological assessment. Evaluation of treatment outcome was based on evidence of the patient having received 6 or 9-month regimen of short course anti-TB therapy comprising isoniazid 5-10mg/kg, rifampicin 10-20mg/kg and ethambutol 15- 25mg/kg with or without pyrazinamide 35mg/kg. The total staff strength of the hospital, affected personnel grade, department and duration of employment were all obtained from the establishment unit of the hospital.

Statistics

Descriptive statistics of all the variables were generated on epiinfo statistical packages version 6.3

RESULTS

The total staff strength of the hospital was 2,173; comprising 316 doctors, 696 nurses and 1,161 allied and support staffs. Thirty-two of them; 12 (38.0%).males and 20 (62.0%) females developed TB in a Fifteen year period giving an incidence rate of 1.5%, table 1.

Table 1: **Characteristics of UITH Staff Diagnosed to have TB.**

Variable	Frequency
Age	
Mean	38-25years
Range	25-64years
Sex	
M	12(38.0)
F	20(62.0)
Job status	
Senior	11(34.4)
Junior staff	21(65.6)
Location of disease	
Pulmonary	25(78.1)
Extra pulmonary	5(15.6)
Mixed PTB &EPTB	2(6.3)
Co-Morbidity	
HIV positive	15(47.0)
Diabetes mellitus	3(9.4)
Liver cirrhosis	2(6.3)
COPD	1(3.1)
Chest x-rays	
Opacities in both lungs	21(67.7)
Cavitary lesions	17(54.8)
Smear status	
Sputum smear positive	27(84.4)
Sputum smear negative	5(15.6)

Table 2: **Age By Sex Distribution of HCWS With TB**

Year	M	F	Total
≤24	-	-	-
25-34	5	9	14
35-44	4	6	10
45-54	2	4	6
55-64	1	1	2
≥65	-	-	-
Total	12	20	32

Patients' age range was 25-64years with a mean of 38.25years. About 75% of the affected HCWs were below 45years of age, table 2. Affected HCWs' duration of employment varied from half a year to 11.5 years with an average of 5.8 years,table 3. Yearly diagnosis of cases varied from nil to three, more than halve, 20 (62.5%) of them were diagnosed in the last six years mostly as HIV/TB co-infection. The male to female ratio was 1:1.6 while that of junior to senior staff was 2:1. Twenty-five cases; 78.1% had PTB, all were AAFB positive, 21 of these (84%) had suggestive TB features on chest X-ray. There were 5 (15.6.8%) EPTB; one pott's disease and four TB lymphadenitis. Two others (6.3%) had combined

PTB and EPTB. Identified risks of acquiring and Developing active TB were HIV infection; 15 cases (47.0%), diabetes mellitus;three cases (9.4%), "alcoholic" liver cirrhosis; two cases (6.3%) and chronic obstructive pulmonary disease (COPD); 1 case (3.1%).

Nursing services had the highest number of cases; 15(47.0%) comprising nurses, nursing students, porters and ward attendants, tables 4 and 5; followed by the Clinical departments with 9 cases (28.1%) comprising doctors, interns and medical students. All the affected HCWs except 2 HIV co-infected and 2 cirrhotic patients were managed as outpatients. In terms of treatment outcome; 26 cases (81.3%) were cured, 4 (12.5%) defaulted, all were HIV positive and two (6.3%) died, also HIV co-infected.

Table 3. **Duration of Employment by HCWs Profession**

Discipline	**Duration of employment (year)**					
	?1	**1-3**	**4-6**	**7-9**	**10-12**	**Total**
Doctor	-	1	-	1	-	2
Staff nurse	-	1	-	1	-	2
Ward attendant	-	3	1	1	-	5
Porter	-	2	2	1	-	5
*Nursing student	-	3	-	-	-	3
Medical intern	2	1	-	-	-	3
?Medical student	-	1	3	-	-	4
Revenue clerk	-	-	1	-	-	1
Messenger	-	-	1	-	-	1
Radiographer	-	-	-	1	1	2
Records clerk.	-	-	-	1	-	1
Laboratory technician	-	1	-	-	-	1
Security officer	-	-	-	-	1	1
Laundry staff	-	-	-	-	1	**1**
Total	**2**	**13**	**8**	**6**	**3**	**32**

*And ♠ = possibly exposed during clinical postings

Table 4: **TB by HCWs' Department**

Department	**Frequency(%)**
Nursing services	15(47.0)
Administration	1(3.1)
Medical records	1(3.1)
Account	1(3.1)
Radiology	2(6.3)
Haematology	1(3.1)
Security	1(3.1)
Laundry	1(3.1)
Medicine	2(6.3)
Obstetrics &Gynecology	1(3.1)
Surgery	1(3.1)
Pathology	1(3.1)
Others	4(12.5)
Total	**32(100)**

Table 5: **TB By HCWs Profession And HIV Status**

Discipline	**HIV status**		**frequency(%)**
	positive	**negative**	
Doctor	2	-	2(6.3)
Staff nurse	≠1	1	2(6.3)
Ward attendant	≠!3	2	5(15.6)
Porter	4	1	5(15.6)
Nursing student	≠1	2	3(9.4)
Medical intern	-	3	3(9.4)
Medical student	-	4	4(12.5)
Revenue clerk	1	-	1(3.1)
Messenger	*1	-	1(3.3)
Radiographer	-	2	2(6.3)
Records clerk.	*1	-	1(3.1)
Laboratory technician	≠1	-	1(3.1)
Security officer	-	1	1(3.1)
Laundry staff	-	1	1(3.1)
Total	15(46.9)	17(53.1)	32(100)

DISCUSSION

Pulmonary and extra pulmonary TB are seen daily in this hospital and are managed as either inpatients or outpatients. HCWs of various cadres and disciplines come in contact with them at some points during the course of their hospital care. This was reflected in the categories of the HCWs that developed hospital-related TB; it ranged from the security officer at the hospital gate to the clinician at the patients' bedside. The incidence of hospital-related TB amongst these HCWs was 1.5 % and majority of the cases occurred amongst the junior staffs who were mostly females. This is similar to epidemiology of TB in the general population[19]. Half of all the cases were seen in the last six years as HIV/TB co-infection, this made HIV infection the commonest risk factor for the acquisition and development of active TB in them. Other risk factors were diabetes mellitus, "alcoholic" liver cirrhosis and COPD. PTB and EPTB developed within 3 and 6years of employment of HIV infected HCWs that had direct patients care responsibilities while HIV seronegative HCWs developed TB much later. Nursing department had the highest rate of hospital-related TB amongst her members perhaps because of the large number of staffs here that have prolong and direct contact with patients while within the hospital environment. Most of the affected HCWs from this department worked in the accident and emergency unit of the hospital where a wide variety of patients present daily for consultations, some of whom could have been unsuspected TB patients[13,20]. Three departments; medicine, radiology and laboratory medicine especially morbid anatomy and microbiology recorded few cases of occupation-related TB amongst their staffs. These may not be unconnected with the fact that cough induction, a procedure that generates high frequencies of aerosolized infectious particles is not a common practice in our patients likewise non-excretion of bacilli during a patient's brief stay in the X-ray room for chest radiograph may explain the lower number of cases from these departments despite the technicians' high frequency of patients' exposures[13]. Cultural as well as religious rejection of postmortem as a clinical procedure on corpses by the followers of one of the major religions (Muslims) in the state could also partly explain why only one case of occupation-related TB was seen amongst the pathologist, while provision of special pathogen laboratory equipped with exhaust facilities will account for the rarity of cases amongst the microbiologist. Community transmission of bacilli outside the hospital environment would be difficult to rule out in HCWs without direct patients care responsibilities like the clerical, security and laundry staffs. However, because they work in the same closed hospital environment that does not have any particular air-flow patterns they could have acquired the bacilli from highly infectious patients within the hospital premises and this might have not required prolonged contact[21]. This suspected chain of bacilli transmission from patients to HCWs could only be established by either mixed linked polymerase chain reaction[13] or DNA finger printing[22] of isolates of Mycobacterium bacilli showing similar DNA pattern from both the patient and the exposed HCW. These techniques are not currently available in this centre and most of TB in our HCWs are assumed to be work place related. Overall, 4 (12.5%) of the cases were managed in the hospital while others were managed as ambulant outpatients and their response to anti-TB drugs was encouraging, 81.3% of them were cured, 12.5% defaulted claiming to have received divine healing while 6.3% mortality was recorded.

In conclusion, incidence of hospital-related TB is low in this hospital, but every member of staff is at risk if sufficiently exposed to an infectious patient. HCWs that routinely care for patients have the greatest risk because of their direct and constant contact with TB patients. The resulting illness could be stigmatizing and sometimes cause death. We are recommending the following control measures to completely eradicate the risk of TB amongst the HCWs: 1. Periodic health education for HCWs about signs and symptoms of PTB so as to suspect cases early and isolate them. 2. HCWs should be taught and enjoined to observe the rules of universal self precaution, when attending to suspected TB cases. 3. Isolation room should be provided and designated so in the emergency department where suspected cases could be admitted pending confirmation of the diagnosis. 4. Early diagnosis of cases should be encouraged so as to reduce the risk of bacilli transmission from infectious patients to the HCWs, which is more likely when the diagnosis is delayed[23]. 5. Microbiology laboratory plays a critical role in this respect, therefore, the time consuming Ziehl-Neelsen staining method with light microscopy currently in use for case diagnosis in our hospital should be upgraded to the modern and much faster processing technique of auramine-rhodamine staining with fluorescence microscope.

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