

## ORIGINAL ARTICLE

### THE FREQUENCY OF TUBERCULOSIS INFECTION AND TUBERCULIN CONVERSION AMONG HEALTH CARE WORKERS OF KHYBER TEACHING HOSPITAL

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#### **Abstract**

Tuberculosis is a fast growing health problem and health care workers are at the greater risk of acquiring it through their occupational exposure.

**Objective:** To conduct a baseline screening of nursing students in Khyber Teaching Hospital (KTH) Peshawar and follow them prospectively for TB infection and Tuberculin conversion after 1 year.

**Design:** A prospective observational cohort analysis.

**Place and Duration of Study:** Department of Pulmonology and Nursing school Khyber Teaching Hospital Peshawar, between Jan 2000 to Jan 2001.

**Patient and Methods:** Baseline screening of 108 newly recruited nursing students of session year 2000 was performed by administering a questionnaire recording their demographic data, previous contact with TB, BCG vaccine scar and any current TB related symptoms. The screening also consisted of physical examination, blood tests, Tuberculin test, and chest radiograph. The same students were evaluated after 1 year to see any change. They were encouraged to report to the study team if any TB related symptoms develop during the year and they were asked to keep diaries of their clinical duties and rotations.

**Results:** The baseline data reveal mean age of 18.5 years and 51 (47.2%) belonged to low income group (Family income less than Rs. 5000.00). Only four (3.7%) had TB contact. BCG scar was present in 61(56.4%) students. Chest examination revealed abnormal findings in two (1.8%) but these were not TB specific. ESR was normal in all the students. Only two x-rays were showing abnormal findings e.g. scoliosis, left apical and hilar calcification. Tuberculin reaction of >10mm was found in 21(19.4%) students but none of them had active TB.

Follow-up at one year revealed that four nursing students have converted from tuberculin negative status to positive signifying recent infection and one student also revealed radiological changes consistent with Pulmonary TB

**Conclusion:** There were no cases of active TB in the nursing students at base line but 3.7% became infected after one year follow up and 0.9% developed pulmonary TB. Nursing students are at higher risk of contracting TB and regular surveillance is recommended

## **INTRODUCTION:**

According to WHO report more than one-third world population is infected with Mycobacterium Tuberculosis, the bacterium that cause Tuberculosis (TB) .In many people it causes no health problem—remains latent. However, about 10% of infected persons develop active, potentially fatal TB, often in their lungs. The risk of pulmonary TB spread to other people, including Health Care Workers (HCWs) is a recognized fact for many years<sup>1,2</sup>. In United States and other high income countries the risk of TB transmission in healthcare workers was high in pre-chemotherapy era but declined with reduction in incidence of TB in the population.<sup>3</sup> These changes resulted in the relaxation of infection control practices in hospitals but over the past decades the incidence of all types of TB increased in HCWs. In a recent review of TB among HCWs in high income countries, the over all incidence in the general population and HCWs was less than 10 and 25 per 100,000 per year respectively.<sup>4</sup> Two factors had been attributed for increase in risk of nosocomial TB, first is the resurgence of the TB between 1985 and 1991, the incidence of TB increased by 24 to 34% in Denmark, Italy and Switzerland<sup>5</sup> and by 18.4 % in USA<sup>6</sup>. The second factor is the emergence of Multi drug resistance strains of tuberculosis, which has been reported in 40 states of USA<sup>7</sup> and it caused outbreaks in many hospitals ,18 to 35% of exposed HCWs had documented conversion of Tuberculin testing.<sup>8,9,10</sup>

A Higher risk of acquiring TB disease in HCWs is associated with certain work locations (inpatient TB clinics, laboratory, emergency departments) and occupational categories (nurses, ward attendants, paramedics). Positive TST conversion is associated with duration of job and being a nurse<sup>11</sup>. Hospital acquired risk of TB is prominent among young nurses who work in high risk facilities (Emergency department, ICU, infectious Diseases, Internal Medicine).<sup>12</sup>

We conducted this study to find out the frequency of TB in the newly recruited nursing students at baseline and one year after by Tuberculin Skin Testing (TST) and chest radiograph and document any changes.

## **PATIENTS AND METHODS:**

Hundred and eight newly recruited nursing students of the session 2000 from Nursing School Khyber Teaching Hospital Peshawar were selected for this study. Principal of the school and the participants gave a written permission. All the student were interviewed on a structured proforma regarding demographics, contact with active TB patient, past history of TB, family history of TB or TB related symptoms like cough with sputum ,evening fever, night sweats, weight loss for more than 3 weeks duration.

They all underwent physical examination including measurement of weight, height, pulse, BP, temperature, and were investigated by blood complete, ESR, Tuberculin test and chest radiograph. A trained technician did tuberculin test and tuberculin induration was read after 72 hours. More than 10mm induration was reported positive. All the proforma were analyzed and the study team read Chest radiograph.

The study was repeated after 1 year using the same tools in the same group.

## RESULTS:

The mean age of study group is 18.5 years and they belonged to different districts of NWFP (Table1). Fifty one (47.2%) belonged to low socioeconomic group with household monthly income less than Rs. 5000, 13(12.03%) had income between Rs 5001 to Rs10000, 4(3.7%) monthly Rs10001 to Rs25000, only 2(1.8%) has income more than Rs 25000 (fig. 1).

History of TB contact was present in four (3.7%) nursing students and 61(56.4%) participants had BCG scar .None of them had past or family history of TB.

In base line study 47 (43.5%) students weighed less than 50kg weight (Normal mean weight for the group) , but after one year 55(51.8%) students had less than 50kg weight. , Eight percent of the students have lost weight while none has gained from the baseline. (Fig. 2)

Chest clinical examination was found abnormal in two (1.8%) of the student at the baseline, while3 (2.8%) students in the fallow up study.

Blood tests shows 3 (2.7%) participants had hemoglobin less than 10 gm/dl in baseline study, while in fallow up study 81(76.4%) had Hb less10gm/dl thus a significant drop in Hb of 73.4% of students (Fig 3).

Chest x-ray shows abnormal finding in two (1.8%) students, one showing scoliosis of spine, and other had apical and hillar calcification but none suggestive of active TB. In fallow-up study, one x-ray had new changes consistent with tuberculosis.

Tuberculin reactivity at baseline study showed 21(19%) had positive results (>10 mm induration) and 85(78%) students had no TST reactivity. After one year 5(4.6%) out of the 85 who were TST negative converted to a positive TST (>10 mm) suggestive of recent TB infection and one out of 5 had chest x-ray findings confirming the diagnosis of TB disease.

## DISCUSSION

Tuberculosis is a disease of developing countries with low and middle income annually. Forty seven percent of our study population belongs to low socioeconomic group with monthly income of less than Rs5000. It was found in the earlier studies that certain groups with low socio-economic backgrounds such as laundry workers, housekeeping staff, and nursing students are among the higher risk to acquire infection and show TST conversion.<sup>13</sup>. Larsen NM et al documented in their study that TST conversion is associated with increasing age and annual salary of < \$ 20,000 (RR -3.67)<sup>14</sup>.

TB contact history is present in 3.7% of nursing students at the baseline and the exposure in the hospital is un-quantified. TST conversion is strongly associated with TB contact and duration of the job<sup>10</sup>. BCG scar is present in 56.4% of our study participants but only 19% had positive TST. There is significant relation between previous BCG and TST conversion, (RR 11.63)<sup>14</sup> and Molina-Gamboa et al documented in his study that rate of reactivity was higher among persons with BCG scar (75.5%) compared to those with no such history,(50%)<sup>15</sup>.

Forty two (44%) students had bodyweight of less than 50 Kg (normal mean wt. for the study group) at baseline, and further 8 % have lost weight to below 50 Kg. probably

because of poor diet, low stipend and over crowded living. This is further supported by, by drop in Hb of the participants; only 2.7% student had less than 10gm% Hb at baseline but after one year 76.4% had Hb less than 10gm%.

Tuberculin reactivity was negative in 85 (78%) of the students at baseline and 21 (19%) nursing students had positive baseline TST despite a higher percentage had BCG scar. It is comparatively less than the study in Karachi having 43.5% TST positivity<sup>15</sup>.and Mexican study showing 70% of TST reactivity<sup>16</sup>. This may be due to ineffective BCG vaccination or loss of efficacy of the BCG vaccine with age in absence of BCG booster dose.

In the follow-up study, five (4.6%) participants converted from negative to positive pointing to recent TB infection and one had X-ray finding suggestive of TB disease. We had 3.7% tuberculin conversion comparing with a study done in New York (USA) it was 1%<sup>17</sup> and another similar type study by Losen et al shows 1.2% conversion rate<sup>14</sup>.

One of the Nursing students had clinical pulmonary TB with TST conversion and x-ray changes. TB incidence in nurses is 3 times higher than general female population<sup>18</sup>. It was established in a study that 80% of nurses have been infected by nosocomial TB infection<sup>19</sup>. Pulmonary TB is the most frequent type of TB 62% among health care workers followed by Pleural Effusion 28%<sup>20</sup>.

## **CONCLUSIONS:**

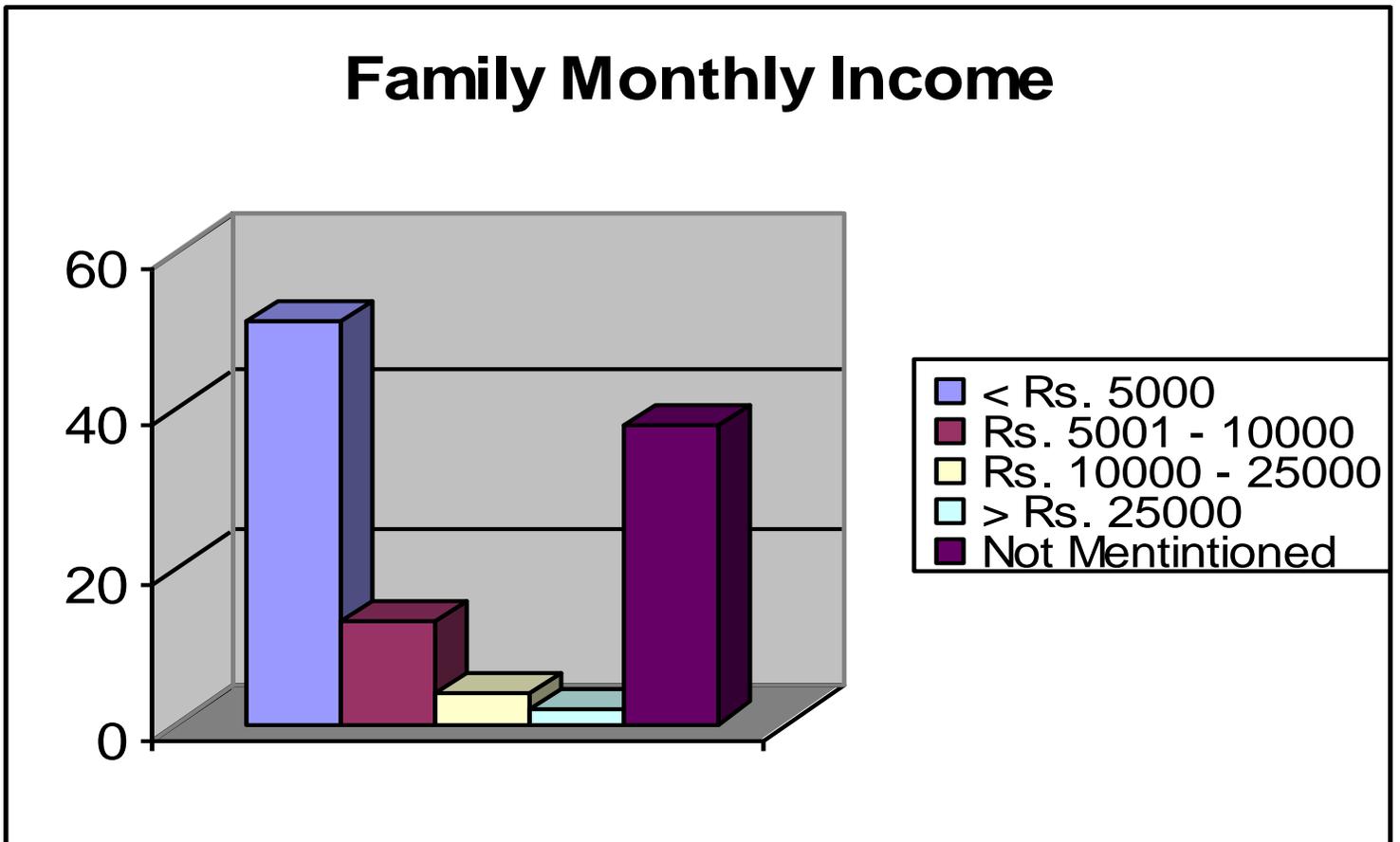
There were no active TB cases in student nurses at baseline but 3.7% had TST conversion after one-year follow-up and 0.9% developed pulmonary TB. Nursing students are at higher risk of tuberculosis infection and there is need for active and continued surveillance of health care workers.

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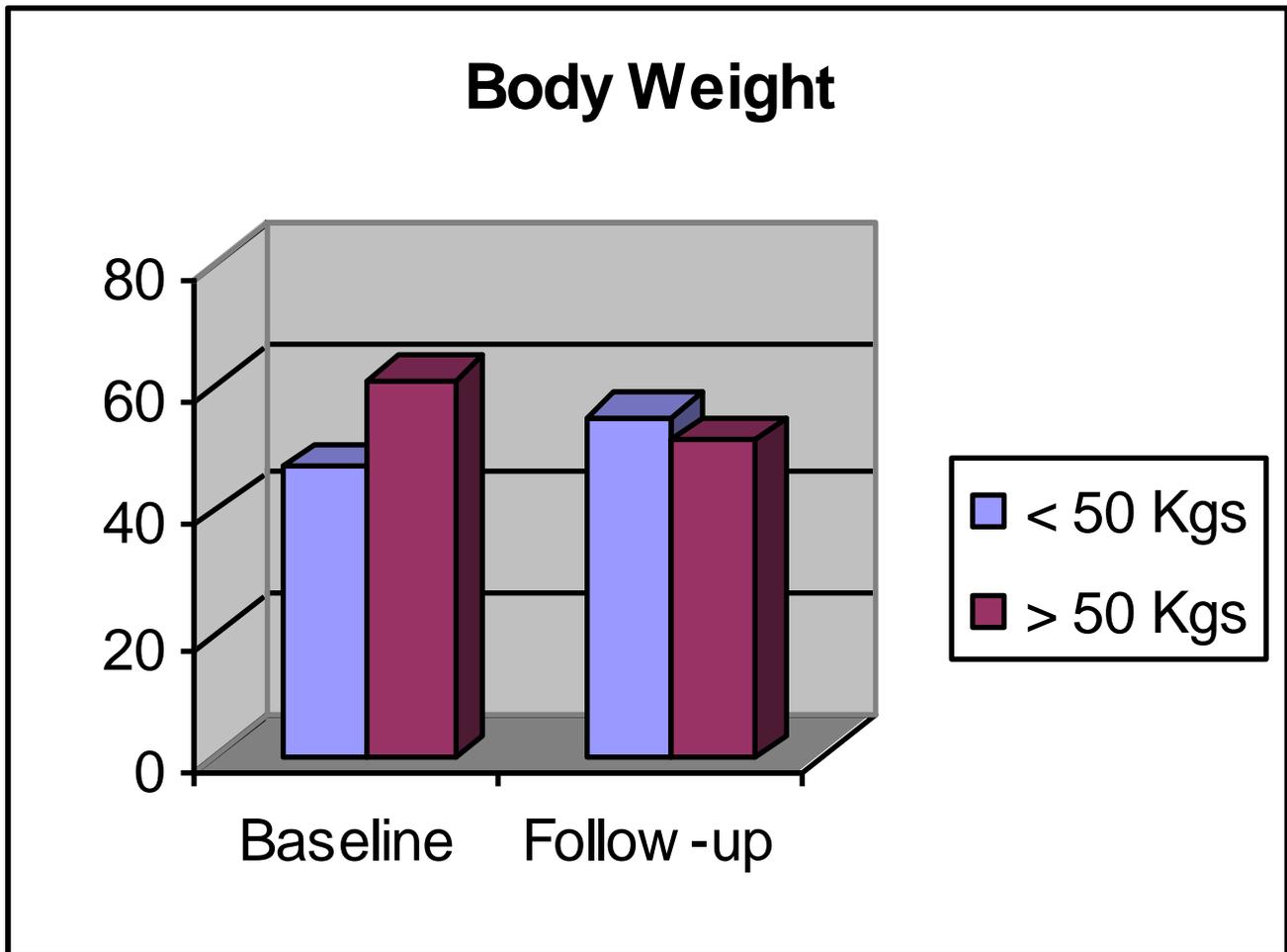
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**Figure 1**



**Fig 2**



**Figure 3**

