

## Occupational Infections among Health Care Workers in a Secondary Care Hospital Saudi Arabia

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### Abstract

**Introduction:** Healthcare workers (HCWs) are frequently exposed to various infectious agents while performing their duties and many accidental exposures to blood borne and air borne pathogens are preventable if health care workers comply with appropriate precautions.

**Objectives:** Assessment of some occupational exposure among health care workers in a secondary care hospital- Najran province- Saudi Arabia during the period (2009-2012).

**Subjects and methods:** Retrospective review of health care workers' (HCWs) records from staff health clinic to determine the distribution of occupational infections among different job categories which was confirmed by clinical manifestations, laboratory investigations and reports of needle stick incidents to which HCWs were exposed during period of data collection.

**Results:** The most common occupational infection among healthcare workers was chicken pox. There was low Tuberculin skin test (TST) conversion rate among different professional categories and nurses were the most affected occupational category during the study period as regard exposure to sharp injuries and air borne infections.

**Conclusions:** Management policy and procedures should be directed and implemented to minimize and prevent occupational infections with emphasis on nurses as being the highly affected risk group.

**Keywords:** Occupational infections; Health care workers; Seroconversion

### Introduction

Health care workers (HCWs) are defined as all paid and unpaid persons working in health-care settings who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. HCWs might include (but are not limited to) physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual staff not employed by the health-care facility, and persons (e.g. clerical, dietary, housekeeping, laundry, security, maintenance, administrative, billing and volunteers) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from HCWs and patients [1,2].

While performing their duties, healthcare workers (HCWs) are frequently exposed to dangerous infectious agents. The risk of transmission of vaccine-preventable infections, both from patients to HCWs and from personnel to patients, other HCWs, and visitors is substantial [3,4]. Measles, rubella, varicella, hepatitis A and hepatitis B (HBV) are all vaccine-preventable diseases that are readily transmitted in healthcare facilities [5-9]. The mortality and morbidity associated with these infections can be significant [5-9]. Additionally, the high cost of controlling transmission and confining nosocomial outbreaks is a significant economic burden [2,3].

At the same time health care workers are at a high risk of exposure to blood and body fluids. Needle stick injuries, cuts and splashes are

common occupational accidents exposing health care providers to different blood borne pathogens. Transmission of hepatitis B virus, human immune deficiency virus (HIV), and hepatitis C virus (HCV) has been related to injuries and frequency of exposure. According to world health organization (WHO), 2.5% of HIV cases, 40% of both HBV and HCV cases worldwide are the result of occupational exposure among health care workers [10]. The first report of HIV transmitted to a HCW as a result of a Needle stick Injury (NSI) was published in 1984 [11]. Adherence to standard precautions, awareness about post exposure prophylaxis (PEP) is poor in developing countries among HCWs and documentation of exposures is suboptimal [12].

Tuberculosis (T.B) is a potential occupational hazard for health care workers (HCWs) [13]. Unfortunately, prevalence rates of T.B among health care workers in Saudi Arabia are not available, even though it is considered one of the most common chronic infectious diseases in the country [14].

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The tuberculin skin test (TST) is one of the few tests developed in the 19th century that still in present use in clinical medicine and it is the recommended tool for T.B screening of health care workers [15]. In several reports, from 4% to 79% of health care workers exposed to mycobacterium tuberculosis develop positive tuberculin skin test [9]. Without known exposure, the yearly conversion rate of tuberculin for health care workers averages 0.1%-5.0% [16].

### Aim of the Study

1. Assessment of some occupational infections among health care workers in a secondary care hospital- Najran province- Saudi Arabia during the period (2009-2012).
2. Study distribution of sharp injury incidents among professional categories during the study period.
3. Review of follow up data of the reported needle stick and sharp incidents for the same study period.

### Materials and Methods

Descriptive study involved health care workers (HCWs) in a secondary care hospital with bed capacity of 300 beds in Najran district located in the Southern province-Saudi Arabia to estimate the incidence of occupational infections and sharp injury exposure during the period (2009-2012).

HCWs included in the study were categorized as: physicians, nurses, technicians and housekeepers with average numbers (254, 452, 85 and 209; respectively), during the study period.

### Methods

Retrospective review of the complete electronic medical records for the working medical staff members in different job categories and all facility departments e.g. ICU, ER, OR, Isolation rooms, Infectious diseases, Pediatrics etc, to determine the following:

1. Occupationally acquired infections (droplet and air borne infection) to which HCWs were exposed during the study period including pulmonary tuberculosis, chicken Pox, measles, mumps, rubella, pertussis, and meningococcal meningitis. Diagnosis of previously mentioned infections was confirmed by history, clinical manifestations, and laboratory investigations including serology and tuberculin skin test (TST) conversion for tuberculosis.
2. Number of tuberculin skin test (TST) converted HCWs during the study period were obtained by reviewing baseline and annual TST using Mantoux skin method.

Annual TST was mandatory for all employees, unless there was documentation of a previously positive test. Tuberculin skin testing of HCWs was performed at the hospital via the Mantoux method: a 0.1-mL (5 tuberculin units) solution of purified protein derivative (PPD) was injected intra-dermal on the volar surface of the forearm and the result was read 48-72 hours later by employee health staff (EHS). Self-reporting of results by HCWs was not permitted. Positive TST result was defined as indurations of 10 mm or more. TST conversion was defined as a documented positive TST result after a documented negative TST result performed by EHS.

3. Incidents of needle stick and sharp injuries during the period of study reported by the HCWs to the staff health clinic as stated by the hospital policy.

4. Review of follow up data of the reported needle stick and sharp object incidents during the study period to detect seroconversion.

### Data analysis and interpretation

Collected data of occupational infections and needle stick and sharp object incidents among health care workers during the study period were analyzed using SPSS Program version 13.

### Calculation of TST conversion rate

TST Conversion Rate=No of TST converted staff /total screened staff ×100

### Ethical considerations

To ensure privacy, dignity and integrity, names of the participant health care workers were kept confidential.

Institutional ethics committee clearance for accessing health worker records was taken.

### Results

Total number of air borne infections reported by health care workers during the study period was 48. The most common was chicken pox 32(66.7%), followed by measles 14 (29.2%) and the least prevalent was pulmonary tuberculosis 2(4.2%) (Table 1).

Figure 1 demonstrates that nurses were the most commonly affected category, as about 31 (65%) of all air borne infections during the study period (mainly chicken pox)were reported by nurses (Figure 1).

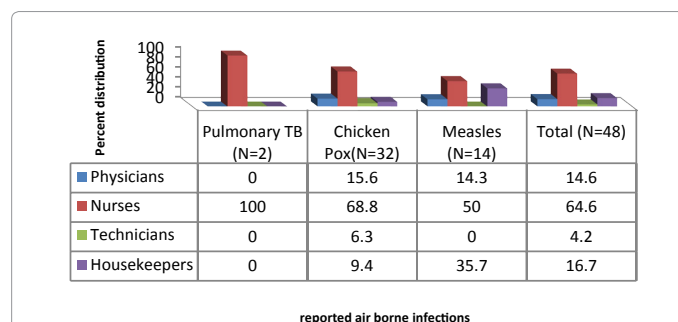
Most reported cases were during the year 2011 which represents 15 / 48(31.3%) infections during the study period (Figure 2).

N.B: Regards exposure of health care workers to droplet infections, there were no reported exposures to droplet infections as mumps, rubella, pertussis, meningococcal meningitis among health care workers during the period from 2009-2012.

There was very low TST conversion rate among HCWs with only 2 reported cases of TST conversion among nurses' group during the

Types of air borne infection	No. (%)
Pulmonary tuberculosis	2 (4.2%)
Chicken Pox	32 (66.7%)
Measles	14 (29.2%)
Total	48 (100%)

**Table 1:** Types of some air borne infections encountered during the study period (2009-2012).



**Figure 1:** Distribution of some air borne infections in relation to health care workers' job categories.

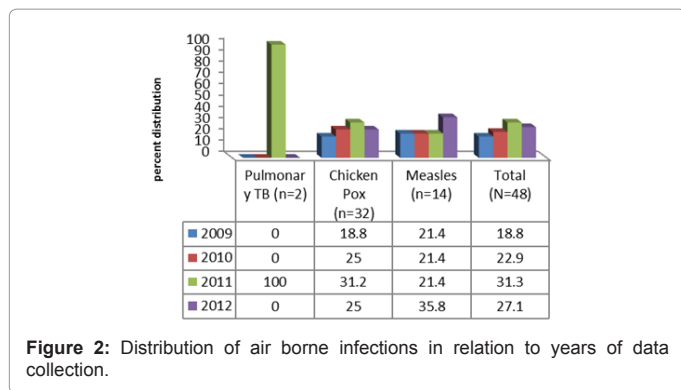


Figure 2: Distribution of air borne infections in relation to years of data collection.

Professional categories	No. of susceptible health care workers for TST conversion	No. of TST conversion	Rate of TST conversion
Physicians	254	0	0
Nurses	452	2	0.44
Technicians	85	0	0
Housekeepers	209	0	0
Total	1000	2	0.2

Table 2: Rate of TST conversion among professional categories during the period of study (2009-2012).

Professional categories	No. of susceptible health care workers for needle-stick injuries	No. of sharp injury incidents	Needle stick injury rate
Physicians	254	45	17.7
Nurses	452	143	31.5
Technicians	85	6	7.1
Housekeepers	209	18	8.6
Total	1000	212	21.2

Table 3: Frequency and percentage distribution of sharp injury incidents among professional categories during the period from 2009-2012.

study period (2009-2012) (Table 2).

Among the listed professional categories, nurse group was the most common likely to report sharp incidents during the study period as they reported 143 / 212 incidents (67.5%) (Table 3).

N.B: The number of seroconverted cases of blood borne pathogens was zero after 6 months of follow up according to hospital policy.

## Discussion

Surveillance data on occupational health risks is a cornerstone in occupational safety and health (OSH) management. Reporting the data on occupational infectious diseases not only highlights the important time trends in work-related health risks, but also stresses on the importance of workplace prevention and hygiene [17].

In this study, chicken pox was the most frequently reported air-borne acquired infection among health care workers accounted for 66.7% of all infections. This is consistent with the studies conducted in Saudi Arabia which demonstrated through serological screening higher susceptibility to varicella among health care workers (11.3% and 14%; respectively) in comparison to susceptibility to other infectious diseases as measles (13%) and rubella (10%) [4,18]. This may be explained by low response rate for chicken pox vaccination among health care workers as although a vaccine to prevent the disease was approved for health care workers in 2003, the acceptance rates are as low as 15% (which may

be due to worries about side effects, suspicions about vaccines, and a general perception that the natural infection is mild, all contribute to staff ambivalence towards these optional program) [19].

Measles patients potentially expose large number of individuals in the emergency department and health care facility before being placed under air borne precautions. These potential hospital exposures had important employee health and public health implications.

Based on the average number of nurses, 7 cases of measles were reported during the study period represented an annual incidence of 30 cases per 1000 nurses. This represents a much higher attack rate of measles among HCWs who had not been vaccinated against measles or who had received only one dose of measles vaccine [20]. This indicates a high risk of measles transmission in healthcare settings among non-immune persons.

Tuberculosis (TB) is a public health problem estimated as 17/100000 population in 2011 according to WHO [21]. Also, (TB) considered as an occupational infectious disease, occurring in healthcare professionals that could lead to work absenteeism and a negative professional impact. Accurate monitoring of employee tuberculin conversion rates is the cornerstone for revision and reinforcement of tuberculosis control measures [22].

In the current study, pulmonary tuberculosis was the least frequent occupationally acquired infections as it constituted 4.0% (of all reported infections during the period of study with TST conversion rate) 0.2% (consistent with the other studies that demonstrated TST conversion rate (0.38%, 0.1%) respectively) [16,22]. This low TST conversion rate in the current study can be explained by the regular yearly follow up, continuous professional education, and on site job training conducted by the staff clinic in the studied facility and the commitment of the health care workers to the standard precautions of employee health in their health care facility.

On the other hand, other studies based on data of compensated occupational diseases revealed much higher frequency of TB among health care workers with reported frequency, 71.3% and 83.9% of all reported occupational infections respectively [23-25].

In the present study, nurses' group was the most commonly affected professional category (65%) for all reported air borne infections and this is consistent with other studies that reported similar percentages of nurses' affection ranging from 62.5-72% [24,25].

Accidental sharp injuries (SIs) are an occupational hazard for healthcare workers (HCWs) posing a significant risk of occupational transmission of blood borne pathogens such as human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) to healthcare workers [23].

In this study, the majority of HCWs who had NSIs was nurses (67.5%), physicians (21.2%), followed by housekeepers and technicians staff (8.5 & 2.8%) respectively. Nurses were the most commonly affected job category, a finding comparable to most reported data published both locally and internationally, this is owing to the fact that nurses are the persons in direct contact and responsible for most of blood sampling and other I.V access procedures carried out during patient care in hospitals [23,26,27].

Hepatitis viruses (B and C) and HIV laboratory testing did not show any positive seroconversion with similar reported zero seroconversion for HIV following needle stick injury among 296 HCWs reporting NSIs in a tertiary care hospital in India and another low but not negligible seroconversion rate with HCV seroconversion rate (1.2%) after 6 months follow up of needle stick injuries [28]. These data addresses the success

of hepatitis B vaccination implemented for all newly hired employees in the studied health care facility in KSA ensuring high antibodies titer indicating individual immunity; in addition to maintaining high level standard of infection control practices [29].

## Conclusion

The most common occupational infection among studied healthcare workers was chicken pox. Nurses' group was the most affected occupational category during the study period as regards exposure to sharp injuries and air borne infections so, management policy to prevent occupational infectious diseases must focus on nurses.

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