



BIOLOGICAL HAZARDS AMONG HOSPITAL JANITORS: A REVIEW ARTICLE

Aya M Fathi^{1*}, Naema El-Laithy², Rehab A. M. Hammam³, Dina S Elrafey⁴

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Abstract

Hospital janitors are not directly responsible for patient care; however, they are at risk of exposure to incidents involving biological material through frequent handling of medical waste during their work. Although about 60 blood-borne infectious pathogens have been identified, most occupation related blood borne infections are due to hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). During COVID-19 pandemic, health care workers were at the front line of the response so they were exposed to the risk of infection. A systematic search was conducted in PubMed, Embase, Cochrane Library and Web of Science databases, and grey literature was searched through Google Scholar included all scientific literature published from 2016 until 2024.

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1 Assistant lecturer of Occupational Medicine and Industrial Health at public health and Community Medicine Department, Faculty of Medicine- Zagazig University – Egypt.

2 Professor of Occupational Medicine and Industrial Health at Public health and Community Medicine Department, Faculty of Medicine- Zagazig University – Egypt.

3 Professor of Occupational Medicine and Industrial Health at Public health and Community Medicine Department, Faculty of Medicine- Zagazig University – Egypt.

4 Assistant professor of Occupational Medicine and Industrial Health at Public health and Community Medicine Department, Faculty of Medicine- Zagazig University – Egypt.

*Corresponding author: Aya Mohamed Fathi

Email: mdraya49@gmail.com

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Introduction

Biological hazards are disease producing agents that can be transmitted to individuals through various routes of exposure and may result in acute or chronic health conditions (1).

Hospital janitors' tasks include cleaning, disinfection and maintenance of fixed surfaces and permanent equipment, in addition to the collection and transport of medical waste. So, they are at risk of exposure incidents involving biological material through frequent handling of medical waste. They also can be exposed to micro-organisms in dust or in aerosols released from waste during the cleaning process. This dust may contain indoor allergens, molds and fungal secretion products, and bacterial endotoxin (2,3).

Biological hazards among hospital janitors include:

1. Bloodborne pathogens:

Blood borne pathogens are microorganisms that are present in blood, tissue, blood products, and other potential infectious materials (OPIM) as semen, vaginal secretions, cerebrospinal fluid, pleural fluid, pericardial fluid, saliva in dental procedures, etc. Workers who have occupational exposure to blood and OPIM are at risk for acquiring blood borne infections. The level of risk depends on the number of infected patients in the facility, the frequency and duration of exposure to contaminated material, and the likelihood that a single exposure will result in infection (4).

Contact of HCWs with blood may be direct, such as needlesticks or splashes of blood containing fluids to the mucous membranes or open wounds, or indirect, such as when surfaces contaminated with blood come in contact with someone's mucous membranes or abraded skin (4).

Needlestick injuries (NSIs) are one of the most serious occupational hazards among healthcare workers (HCWs), with > 2 million occupational exposures occurring among 35 million HCWs annually. NSIs are responsible for the global incidence of HBV (36.7%), HCV (39%) and HIV/AIDS (4.4%) among HCWs. Analysis of World Health Organization (WHO) regions showed that the incidence of NSIs in the African Region was higher than in other regions. The prevalence of HBV and HCV in Egypt is high and unsafe injections transmit most of these infections. Hence, the risk of NSIs and associated infections is higher in Egypt compared with other countries (5,6).

After an injury in workplace situations from a needle contaminated with hepatitis B virus, there is a 6 to 30% chance that an exposed person will be infected. In a similar situation with HIV, there is about a 0.3% chance of infection, and there is about a 1.8% chance of infection for hepatitis C (7).

Housekeeping staff are exposed to contaminated sharps and containers from sharps that are not discarded properly and are left in bedding and accidentally sent to the laundry or during improper handling or disposal of sharps containers (e.g., allowing containers to overfill) (8).

In a study carried out among housekeepers and nurses in Al-Azhar University Hospitals, Egypt, (52.5%) experienced NSI. There were (10.5 %) have positive hepatitis C and (3.5 %) have positive hepatitis B (9).

In a study conducted at tertiary and secondary care hospitals in Menoufia Governorate, the prevalence of needlesticks and sharps injury was (64%); of which more than (65%) had ≥ 2 injuries (10).

Additionally, in a study conducted among HCWs at the Alexandria University Hospitals, (27.3%) of housekeeping/laundry service workers were HCV-PCR positive (11).

In the study conducted among (1036) health care workers in Cairo University Hospitals, (40%) of the participants reported at least one sharps injury (12).

In an Indian study involving workers in a health facility, it was found that (50.0%) of housekeepers and maintenance workers reported at least one incident with exposure to biological material in the year previous to the study, and that these job categories had the highest number of incidents (13).

In another study carried out to detect needlestick and sharps injuries among housekeeping workers in hospitals of Shiraz, Iran, the incidence of NSIs during one year prior to the survey among workers was 22.8 % (14).

In a retrospective epidemiological study using Brazilian records from 1989 to 2012, there were 996 (11.6%) injuries with 57 (6.1%) workers reporting multiple occurrences. These were primarily needlestick injuries (98.5%), caused by hypodermic needles (75.1%), and improper sharps disposal (70.8%) (15).

2. **Methicillin Resistant Staph Aureus (MRSA)**

Staphylococcus aureus is an important cause of skin and soft-tissue infections, endovascular infections, bacteremia, and sepsis in both hospitals and communities (16). Staphylococcus aureus is the most important nosocomial pathogen and can be a problem in hospital infection control because of asymptomatic carriage and cross contamination. MRSA form a major part of nosocomial staph aureus (*S. aureus*) and are typically resistant to multiple antibiotics. These *S. aurei* including MRSA are resident in the nasal and / or skin flora HCWs and are transferred to patients by various diagnostic and / or therapeutic procedures (17).

A person can get MRSA by contact with their own nasal bacteria -because Staphylococcus is a natural commensal-, by contact with an infected person's sore, or by contact with a carrier who is colonized, but has no symptoms. Hands are the most important means of transmitting infection. Objects such as clothing, equipment, and furniture can be involved in transmission. Airborne spread is possible, but rare. Workers with openings in their skin, with chronic illness, with compromised immunity or who live in crowded or unhygienic conditions are more likely to get Staph or MRSA (18).

In direct contact with biological hazards, *S. aureus* may pose a potential threat to the health issue of the janitors themselves and individuals related with them. A study carried out among janitors working in hospitals in Northern Taiwan, the nasal carriage rate of *S. aureus* was 15.3% and the carriage rate of MRSA was 3.6%. Janitors working in hospital more than 6 years and cleaning microbiologic laboratories were significantly associated with nasal *S. aureus* colonization (16).

3. Airborne Disease

o Tuberculosis (TB):

Mycobacterium tuberculosis (*M. tuberculosis*) is a bacterium that infects humans, causing tuberculosis (TB). It flourishes in high oxygen-containing tissues such as lungs. It replicates slowly and can remain in a latent state for a long time (18).

M. tuberculosis is transmitted through airborne particles called droplet nuclei which are formed when individuals with pulmonary or laryngeal TB cough, sneeze, shout or sing. The droplets are sized 1-5 μm and remain airborne for prolonged periods of time spreading throughout the health facility (19).

Active tuberculosis may be asymptomatic (nearly 25% newly diagnosed cases) or may have clinical signs such as: cough persisting for more than two to three weeks, low-grade evening rise in temperature, weight loss, and night sweats. Tuberculosis causes pulmonary tuberculosis most commonly, but it can infect almost any organ, and hence signs and symptoms may vary according to the organ affected (18).

For healthcare personnel (HCP), latent tuberculosis infection (LTBI) can vary from 20% in the developed world to 40% in Russia to about 70% in the developing world. In low- to middle-income countries, the annual risk of TB infection was found to vary between 0.5% to 14.3% in HCWs (18,20).

In a study carried out to determine the risk of TB infection among healthcare workers in a tertiary-care hospital in Ankara, Turkey. Two-step Tuberculin Skin Test (TST) was positive for (83%) HCWs. the TST positivity was (93%) for male housekeepers and (70%) for female housekeepers (21).

o COVID 19:

Coronaviruses are a large group of viruses that are rather common throughout the community. Historically, evidence has shown that the virus is transmitted through birds and mammals, with humans being particularly vulnerable to infection and transmission of the virus (22).

The previous outbreaks of coronaviruses such as Severe Acute Respiratory Syndrome-Coronavirus (SARS-CoV) and Middle East Respiratory Syndrome-Coronavirus (MERS-CoV) in 2003 and 2015, show similarities to the novel coronavirus, which was first reported in December 2019, and is currently the disease in questions resulting in the worldwide Coronavirus disease-2019 outbreak, COVID-

19. WHO declared that COVID-19 infection was a Public Health Emergency of International Concern on 30 January 2020 (23).

As CDC recommends, coronavirus spreads mainly from person-to-person by close contact (within about 6 feet) with infected people via respiratory (coughs or sneezes) or transmitted by touching a surface or object that the virus on it. In terms of symptoms, the WHO reported that more than 80% of COVID-19 patients showed mild symptoms and recovered without any medical intervention, approximately 20% of infected cases had a severe illness such as shortness of breath, septic shock and multi-organ failure, and it has been reported that an estimated 2% of cases can be fatal (23).

It is well recognized that regular disinfection, housekeeping and cleaning are essential for the daily operations of any healthcare facility. Janitors are the unsung heroes who perform these arduous tasks, despite often long hours and limited remuneration (24).

Although there is extant literature examining the impact of the COVID-19 pandemic on healthcare workers, less emphasis has been placed on environmental services workers, who play an equally important front-line role (Ng et al., 2022). In a study conducted in the wake of a COVID-19 outbreak in a university cardiothoracic hospital in Cairo, Egypt, housekeeping staff were the most affected out of all hospital staff, with 7.6% contracting COVID-19; these workers had the highest risk of reverse transcription polymerase chain reaction positivity (25).

Among health care workers in a tertiary care hospital of a Metropolitan City from India, the seroprevalence rate was highest among housekeeping staffs (26.11%) followed by dieticians/food and beverage staff (18.37%) (26).

o Other airborne infections:

Influenza, measles, rhinovirus and varicella are among many other microorganisms which can be transmitted in healthcare settings by the airborne route. Most of the above viruses will present with fever, coryza, headache, sneezing, and, if the illness worsens, shortness of breath, and rapid onset of respiratory failure. Unlike tuberculosis, these infections are not latent and do present with signs and symptoms on acquiring them. They are very contagious and infected individuals can transmit disease in the few hours before becoming symptomatic (18).

Conclusion

The study highlighted that the hospital janitors are at a real risk of occupational biological hazards. The findings highlight the importance of implementing safe work practices and control measures for protection of hospital janitors. For example, proper hand hygiene and wearing PPE. Regulatory guidelines in respect of medical waste management should be strictly enforced.

Further research prospective

Future research studies using a prospective cohort design. Also, further studies should be conducted to highlight appropriate preventive measures and policies are recommended. Furthermore, regular educational programs and training should be organized to ensure compliance of janitors with infection and control principles.

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