

Factors associated with occupational exposure to biological material among nursing professionals

Fatores associados à exposição ocupacional com material biológico entre profissionais de enfermagem

Factores asociados a la exposición profesional a material biológico entre profesionales de enfermería

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ABSTRACT

Objective: to identify factors associated with occupational exposure to biological material among nursing professionals.

Method: a cross-sectional study was conducted in a high complexity hospital of a city in the state of São Paulo, Brazil. Nursing professionals were interviewed from March to November 2015. All ethical aspects were observed. **Result:** among the 226 professionals interviewed, 17.3% suffered occupational exposure to potentially contaminated biological material, with 61.5% being percutaneous. Factors such as age ($p=0.003$), professional experience in nursing ($p=0.015$), and experience at the institution ($p=0.032$) were associated with the accidents with biological material. **Conclusion:** most accidents with biological material among nursing professionals were percutaneous. Age, professional experience, and experience at the institution were considered factors associated with occupational exposure.

Descriptors: Nursing, Team; Occupational Risks; Occupational Exposure; Exposure to Biological Agents; Occupational Health.

RESUMO

Objetivo: identificar os fatores associados à exposição ocupacional com material biológico entre profissionais de enfermagem.

Método: estudo transversal, realizado em um hospital, de alta complexidade, do interior do Estado de São Paulo, Brasil. Foram entrevistados profissionais de enfermagem no período de março a novembro de 2015. Todos os aspectos éticos foram contemplados. **Resultado:** dentre 226 profissionais entrevistados, 17,3% sofreram exposição ocupacional com material biológico potencialmente contaminado, sendo 61,5% por via percutânea. Fatores, como a faixa etária ($p=0,003$), a experiência na enfermagem ($p=0,015$) e na instituição, ($p=0,032$) estiveram associados ao acidente. **Conclusão:** a maior parte dos acidentes com material biológico entre os profissionais de enfermagem ocorreu por via percutânea sendo que a idade, experiência profissional e na instituição compreenderam fatores associados à exposição ocupacional.

Descritores: Equipe de Enfermagem; Riscos Ocupacionais; Exposição Ocupacional; Exposição a Agentes Biológicos; Saúde Ocupacional.

RESUMEN

Objetivo: identificar los factores asociados a la exposición profesional a material biológico entre profesionales de enfermería.

Método: estudio transversal, realizado en hospital de alta complejidad del interior del Estado de São Paulo, Brasil. Fueron entrevistados profesionales de enfermería entre marzo y noviembre de 2015. Se contemplaron todos los aspectos éticos.

Resultado: de 226 profesionales entrevistados, el 17,3% sufrió exposición profesional a material biológico potencialmente contaminado, 61,5% por vía percutánea. Factores como la faja etaria ($p=0,003$), experiencia en enfermería ($p=0,015$) y en la institución ($p=0,032$) estuvieron asociados al accidente. **Conclusión:** la mayor parte de los accidentes con material biológico entre profesionales de enfermería sucedió por vía percutánea, debiendo considerarse que la edad, la experiencia profesional y la antigüedad en la institución constituyeron factores asociados a la exposición profesional.

Descripciones: Grupo de Enfermería; Riesgos Laborales; Exposición Profesional; Exposición a Agentes Biológicos; Salud Laboral.

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INTRODUCTION

Healthcare professionals are potentially exposed to several risks present in the work environment while they undertake their work activities, which might cause them illnesses and/or occupational accidents⁽¹⁾.

Hospital environments are considered complex and unhealthy workplaces, with a higher risk of occupational exposure to biological agents, since hospitals admit patients with several infectious and contagious diseases, undertake invasive procedures, and expose people to direct contact with blood and other potentially contaminated body fluids⁽²⁻³⁾.

Occupational accidents caused by exposure to biological materials suffered by healthcare professionals are considered worrying factors, since they lead to losses both for institutions and professionals themselves⁽⁴⁾. These might be percutaneous, after the use of needles, injuries with sharp objects, and/or direct contact with ocular, nasal, and oral mucous membranes, or also by skin contact⁽⁵⁾.

A literature review showed that 60 different species of microorganisms were associated with the transmission of occupational infection after exposure to biological material. The most important epidemiological viruses are: hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)⁽⁶⁾.

According to the World Health Organization (WHO), the estimated number of healthcare professionals who might suffer occupational percutaneous exposure per year is more than 3,000,000 worldwide. Of these accidents, 2,000,000 are associated with exposure to the HBV, 900,000 to HCV, and 170,000 to HIV. In addition, 66,000 cases of infection with HBV, 16,000 cases of HCV and 1,000 cases of HIV might have occurred with healthcare professionals after percutaneous exposure during their work activities⁽⁷⁾.

Among diverse categories, nursing professionals are those who maintain the highest rates of accidents with biological material and HIV seroconversion rates⁽⁸⁻¹⁰⁾. Nursing teams, while undertaking their work activities in the hospital environment, need permanent contact with patients in different care situations, thus facing a higher risk of exposure to biological material and contamination by HBV, HCV, and HIV⁽¹¹⁾.

The occurrence of occupational accidents with biological material might be associated with some predictors, such as the need for a greater agility in undertaking daily activities, physical and mental fatigue, absence of personal protective equipment (PPE), and little professional experience⁽¹²⁾.

Based on this scenario, the objective of the present study was to identify factors associated with occupational exposure

to potentially contaminated biological material among nursing professionals.

METHOD**Ethical aspects**

The research project was appreciated and approved by the ethics committee of the Ribeirão Preto College of Nursing and the Santa Casa Hospital in the city of Franca. All ethical aspects were observed. An informed consent form and the objectives of the study were presented to the participants. All of them agreed to participate in the study. No reward or remuneration were offered to the study participants, and anonymity of their identities was ensured.

Study design, setting, and period of data collection

A cross-sectional and analytical study was conducted in a medium and high complexity tertiary philanthropic hospital located in a city in the state of São Paulo, from March to November 2015.

Sample, inclusion and exclusion criteria

Initially, the list of all nursing professionals of the abovementioned institution, with their category and working sector was obtained from the personnel department. After calculation of the sample size, the selection of the participants was carried out by drawing, with the use of the stratified sampling method, and later, a new list with the names of the eligible professionals, their category, and their working sector was produced.

The reference population was made up of 551 nursing professionals assigned in outpatient units, hospitalization units, intensive care units, surgical centers, and infant units (hospitalization and intensive care). By means of the sample calculation ($\alpha = 0.05$; relative error (\mathcal{E}) of 10%; prevalence 50%), 226 professionals, being 149 nursing technicians (65.9%), 53 nursing aides (23.5%), and 24 nurses (10.6%) were obtained.

Inclusion criteria were being working for at least six months as a nurse, nursing technician, or nursing aide; being assigned to work at the unit selected for the development of the study; providing direct care to hospitalized patients. Exclusion criteria were being exclusively undertaking administrative activities, or being on sick leave or any kind of leave during data collection.

Study protocol

Data were collected using an instrument containing sociodemographic, professional, and training variables, and on the occurrence of occupational exposure to potentially contaminated

biological material, regardless of the time, which was validated by three experts in the topic, regarding the form and relevance of the questions concerning the objectives of the study.

The eligible participants who agreed to participate in the study were interviewed individually in their own working unit, in a private room, after previous authorization from the nursing coordination. They were approached through direct contact for the presentation of the objectives of the study, emphasizing the importance of the results for the development and knowledge of this topic. In this study, only accidents occurred within the institution itself were considered, and accidents occurred in other institutions were excluded.

Analysis of the results and statistics

All data were catalogued and organized in an Excel sheet and double entered. Statistical analysis was carried out through the SPSS 16.0 software.

The population was characterized by calculating absolute frequencies and percentages. Chi-square test with categorical variables and Fisher's exact test were used to verify the association between the variable main occurrence of accidents with biological material with sociodemographic data and data related to work. The significance level adopted was $\alpha = 0.05$.

RESULTS

The sample of the present study was made up of 226 nursing professionals. Of these, 39 (17.3%) reported having suffered occupational exposure to biological material throughout their professional experience at the institution, and 24 (61.5%) of the cases involved percutaneous contact. Most of these cases, 19 (79.2%), involved visible blood, and hypodermic needles, 22 (91.6%), were the objects most frequently mentioned by professionals who suffered percutaneous occupational accidents.

Regarding the use of procedure gloves at the time of the percutaneous accident with biological material, in 18 (75.0%)

occurrences, professionals reported the use of gloves and, in 6 (25.0%) situations, they did not use them.

Of the professionals who participated in the study, 203 (89.8%) were women (Table 1). Among the 39 (100.0%) injured participants, women (97.4%) were more exposed to biological material than men (2.6%).

Ages ranged from 20 to 68 years, with median of 34.3 years (SD = 10.3). The age group with the highest concentration of professionals was between 30 and 39 years (35.0%). Regarding the age group of professionals who reported having suffered exposure to biological material, the majority was also concentrated between 30 and 39 years (46.1%).

With regard to professional category, most, 149 (65.9%), were nursing technicians. The highest frequency of occupational accidents occurred with them, 25 (64.1%).

Regarding the length of experience as nursing professionals, 41.6% of the participants had five years or less of professional practice, which ranged from eight months to 38 years, with median of seven years (SD = 8.4). The length of experience at the institution ranged from seven months to 38 years, with median of five years (SD = 7.7); however, 54.0% of the professionals reported being working at the institution for a period lower than five years. Of the total participants injured, most had professional experience in nursing (61.5%) and experience at the institution (74.3%) lower than five years.

No statistical significance was found between the variables gender ($p = 0.140$) and professional category ($p = 0.658$) with the occurrence of exposure to biological material.

When associating the occurrence of exposure to biological material with age group ($p = 0.03$), professional experience in nursing ($p = 0.015$), and experience at the institution ($p = 0.0320$), significant associations between these variables were found, that is, professionals aged between 30 and 39 years, with less than five years of professional experience and experience at the institution, had a higher occurrence of occupational accident (Table 1).

Table 1 – Association between occupational exposure to biological material and sociodemographic, professional, and training variables of nursing professionals. Franca, São Paulo, 2015.

Variables	Exposure to biological material						P
	Yes (n = 39)		No (n = 187)		Total (N = 226)		
	n	%	n	%	n	%	
Gender							0.140*
Female	38	18.7	165	81.3	203	89.8	
Male	01	4.3	22	95.7	23	10.2	
Age group (years)							0.003*
19 to 29	16	23.2	53	76.8	69	30.5	
30 to 39	18	22.8	61	77.2	79	35.0	
40 to 49	05	10.4	43	89.6	48	21.2	
≥ 50	-	-	30	100.0	30	13.3	

To be continued

Table 1 (concluded)

Variables	Exposure to biological material						P
	Yes (n = 39)		No (n = 187)		Total (N = 226)		
	n	%	n	%	n	%	
Position							0.658*
Nursing aide	11	20.8	42	79.2	53	23.5	
Nursing technician	25	16.8	124	83.2	149	65.9	
Nurse	03	12.5	21	87.5	24	10.6	
Experience in nursing (years)							0.015*
≤05	24	25.5	70	74.5	94	41.6	
>05 - 10	07	11.3	55	88.7	62	27.4	
>10 - 20	07	17.5	33	82.5	40	17.7	
>20	01	3.3	29	96.7	30	13.3	
Experience at the institution (years)							0.032*
≤05	29	23.8	93	76.2	122	54.0	
>05 - 10	04	7.8	47	92.2	51	22.6	
>10 - 20	05	14.7	29	85.3	34	15.0	
>20	01	5.3	18	94.7	19	8.4	
Working unit							0.095*
Hospitalization units	19	25.0	57	75.0	76	33.6	
Surgical centers	03	7.1	39	92.9	42	18.6	
Infant units	05	12.2	36	87.8	41	18.1	
Outpatient units	08	22.2	28	77.8	36	15.9	
Intensive care units	04	12.9	27	87.1	31	13.7	
Training							0.919**
Yes	33	17.4	157	82.6	190	84.1	
No	06	16.7	30	83.3	36	15.9	

Note: *Fisher's exact test; **Chi-square test

Exposure occurred in all units selected for the study, and the highest number of professionals injured was found in hospitalization units (48.7%). However, a statistically significant association with the exposure to biological material was not found ($p=0.095$) (Table 1).

DISCUSSION

The data of the present study show that the occurrence of occupational exposure to potentially contaminated biological material is still a worrying factor among nursing professionals in the hospital environment. Similar data were found in another study⁽¹³⁾, in which 18.6% of nursing professionals of an oncology hospital in the state of São Paulo suffered accident with biological material. However, in a study conducted in a reference support center for people exposed to situations of risk with biological material located in a city in the state of São Paulo, an accident rate of 47.3% was found⁽¹⁴⁾.

Most cases of occupational accidents with biological material evaluated in this study occurred by percutaneous exposure involving visible blood; hypodermic needles stood out as objects that caused accidents. The same result was described

by other researchers who found that, of the accidents occurred among healthcare professionals from health institutions in the city of São João da Boa Vista, 78% were percutaneous, and blood was the most involved body fluid among cases of exposures (76.0%)⁽¹⁵⁾.

Of the total cases of percutaneous exposure involving hypodermic needles, it is worth noting that 25.0% of the injured professionals were not using procedure gloves. Similar data were found in a study conducted in a large-sized teaching hospital of a city in the state São Paulo⁽¹⁶⁾. The frequent use of PPE is extremely important for the prevention of exposure to biological material and safety of professionals and patients⁽¹⁷⁾.

Regarding the characterization of nursing professionals who suffered percutaneous exposure to biological material, prevalence of female gender was found. Studies have shown that female professionals are more often affected by accidents with biological material⁽¹⁸⁻¹⁹⁾. Although the data of this study also show that occupational exposure is more frequent among women, no significant association was found between gender and occupational accident with biological material.

Among the factors associated with the higher number of occupational accidents, age group and length of experience in nursing

and length of experience at the institution stand out. Most accidents occurred among young adult professionals. Similar data were found in a study conducted in healthcare institutions of two Brazilian cities, with an age group of 31 to 40 years (41.3%)⁽²⁰⁾.

According to the distribution by professional category, nursing technicians stood out for reporting the highest number of accidents with exposure to biological material. Such finding supports the results found by other researchers who showed that 50.0% of the workers who were injured with biological material were nursing technicians⁽²¹⁾.

Most professionals injured reported being working both in nursing and at the institution, for five years or less. A study carried out by means of documentary analysis in a large-sized teaching hospital of a city in the state of São Paulo, found that considering the length of professional experience and occupational accidents with biological material, 24 (42.9%) professionals worked for five years or less⁽²²⁾. However, other researchers found divergent data in which most accidents occurred with nursing professionals who had more than 10 years of professional experience⁽¹⁸⁾.

Hospitalization units had the highest number of professionals who reported occupational exposure to biological material. This finding might be corroborated by a study conducted in two hospitals of the city of Montes Claros, in the state of Minas Gerais, which show that these places have the highest predominance of accidents with biological material⁽²³⁾, being 52.6% with nurses.

Some studies have reported factors associated with the higher occurrence of occupational accidents among female nursing professionals with little professional experience and absence of PPE⁽²⁴⁻²⁵⁾.

Study limitations

It is important to point out as a limitation of the present study that, at the time of the individual interviews, the participants were asked to mention their exposure to biological material, being possible that some events of lesser importance have not been reported due to forgetfulness.

Contributions of the study to the nursing, healthcare or public policy areas

The result of this study is considered of extreme importance for nursing professionals, since no study was conducted on the reality of the institution studied. Knowledge regarding the epidemiology of accidents with biological material, circumstances in which they occurred, professional categories exposed, and key factors are relevant, since it might contribute to the implementation of preventive strategies, adoption of safe policies, and development of training programs. Although the results of the present study show only a part of nursing professionals' reality, they provide an approach regarding the topic and strengthen the need to follow up the evaluation undertaken.

CONCLUSION

The present study found that the overall occurrence of occupational exposure to biological material was 17.3%. Of these, 61.5% were percutaneous, and their occurrence among nursing technicians stood out. Factors such as age, professional experience in nursing, and experience at the institution were associated with the occurrence of occupational exposure to potentially contaminated biological material.

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