



## OCCUPATIONAL ACCIDENTS WITH BIOLOGICAL MATERIAL EXPOSURE: INTEGRATIVE REVIEW

### ACIDENTES OCUPACIONAIS COM EXPOSIÇÃO A MATERIAL BIOLÓGICO: REVISÃO INTEGRATIVA

### ACCIDENTES OCUPACIONALES CON EXPOSICIÓN A MATERIAL BIOLÓGICO: REVISIÓN INTEGRADORA

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#### ABSTRACT

**Objective:** to identify the main characteristics of occupational accidents with exposure to biological material among health professionals. **Method:** integrative review to answer the question << What are the occupational accidents that most affect health professionals? >> searching the database LILACS and CAPES Journal Portal. There were 15 articles selected, read in detail, analyzed the contents, shown in figure with the main information gathered. **Results:** it was revealed that most of the accidents happened between technicians and nursing assistants, involving needles with lumen and exposing the professional to the patient's blood. The Emergency Unit was the place with the highest percentage of accidents and most professionals did not use personal protective equipment. **Conclusion:** there is the importance of identifying the causes of occupational accidents, in order to build strategies for prevention of future incidents. **Descriptors:** Occupational Accidents; Worker's Health; Nursing Work.

#### RESUMO

**Objetivo:** identificar as principais características dos acidentes ocupacionais com exposição à material biológico entre os profissionais da saúde. **Método:** revisão integrativa, com vistas a responder à questão << Quais são os acidentes ocupacionais que mais acometem os profissionais da saúde? >>, a partir de buscas na base de dados LILACS e no Portal de Periódicos CAPES. Foram selecionados 15 artigos, lidos detalhadamente, analisados os conteúdos e demonstrados numa figura com as principais informações colhidas. **Resultados:** evidenciou-se que a maioria dos acidentes aconteceu entre os técnicos e auxiliares de enfermagem, envolvendo agulhas com lúmen e expondo o profissional ao sangue do paciente. A unidade de Emergência foi o local com maior percentual de acidentes e a maioria dos profissionais não utilizava Equipamento de Proteção Individual. **Conclusão:** destaca-se a importância de identificar as causas dos acidentes ocupacionais, no intuito de construir estratégias voltadas para prevenção de futuros incidentes. **Descritores:** Acidentes de Trabalho; Saúde do Trabalhador; Enfermagem do Trabalho.

#### RESUMEN

**Objetivo:** identificar las principales características de los accidentes ocupacionales con exposición a material biológico entre los profesionales de la salud. **Método:** revisión integradora, para responder la pregunta << ¿Cuáles son los accidentes ocupacionales que más cometen los profesionales de la salud? >>, a partir de búsquedas en la base de datos LILACS y en el Portal de Periódicos CAPES. Fueron seleccionados 15 artículos, leídos detalladamente, analizados sus contenidos, demostrados en una figura con las principales informaciones recogidas. **Resultados:** se evidenció que la mayoría de los accidentes acontecieron entre los técnicos y auxiliares de enfermería, envolviendo agujas con lumen y exponiendo al profesional a la sangre del paciente. La unidad de Emergencia fue el local con mayor porcentaje de accidentes y la mayoría de los profesionales no utilizaban Equipamiento de Protección Individual. **Conclusión:** se destaca la importancia de identificar las causas de los accidentes ocupacionales, con el intuito de construir estrategias dirigidas para prevención de futuros incidentes. **Palabras clave:** Accidentes de Trabajo; Salud del Trabajador; Enfermería del Trabajo.

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## INTRODUCTION

Work accidents record the health problems of individuals work-related and represent a serious problem to be faced not only by the damage to the institutions, but also to the employees. It appears that the quantity of accidents related to labor in Brazil are alarming, since in a period of four years, there were 491,711 occupational accident recorded, and of them 2,708 deaths. Besides causing damages to workers and the employing institutions, these accidents are responsible for significant costs to public safe.<sup>2</sup>

Occupational accidents are a major health problem of workers, especially in health since they are exposed to various risks related to work, such as physical, chemical, biological and ergonomic. In addition, the mental suffering experienced by some professionals is highlighted due to the pace, the intensity of work, emergencies, living with illness and death, which can lead to psychosocial stresses.<sup>1</sup>

Professionals who deal directly or indirectly with the health of patients worry too much about the assistance offered, prioritizing their comfort and well-being, and little about the risks inherent in the execution of their activities, which may be extended according to the diversification of processes and work organization and specialty care.<sup>3</sup> It is evident that nurses are the largest contingent of workers in health care, and provide direct and uninterrupted patient care on a daily basis, being more exposed to biological and sharps, which contributes to higher accident rates.<sup>4</sup>

Thus, among the most prevalent work-related accidents in health, there are the biological occupational risks highlighted, which arises from the possibility of pathogen transmission through direct contact with blood and other potentially contaminated fluids. The main concern is the contamination with the hepatitis B, C, or human immunodeficiency virus (HIV), which can lead to disastrous consequences in the lives of workers, both in the physical, psychological and social, reflecting the family and social relationships.<sup>5</sup>

It is estimated that the risk of HIV transmission after needle injuries with patients known as positive for the virus is 0.3 to 0.5% and, after exposure of mucous membrane is 0.09%. Concerning to Hepatitis B, it appears that after percutaneous exposure, the risk can reach 62% in situations where the display source patient serological HBeAg reagent. The estimate of the risk of

infection for hepatitis C after occupational accident is 1-10%, requiring professional due care to perform procedures with sharps, since activities that require dexterity and accuracy of health professionals leaves them more vulnerable to injured upper limb, especially fingers and hands.<sup>2-4</sup>

In this case, considering the high number of professionals involved in occupational accidents, it is necessary that the health service institute based on what is recommended by the Ministry of Health, effective biosecurity measures aimed at the reduction of occupational risks. The standards should include postures that allow greater security in day-to-day workers, by reducing the physical, chemical, psychological, ergonomic and biological risks they are exposed.<sup>6</sup>

In Brazil, the Work Accident Communication (CAT) must report occupational accidents immediately. In addition, regarding the notification of information of the cases are taken from the National Disease Notification and Information System (SINAN) and the Information System on Occupational Health (SIST/RS). These tools are important as they help identify why the Worker fall ill or die, in addition to providing information necessary to develop action strategies in the area of promotion and disease prevention.<sup>3</sup>

Based on the above, it is identified the importance of knowing the main types of occupational accidents that affect workers health. The results are expected to contribute to the development of assistance activities in safe conditions for workers and for the patient. Thus, the objective of this study is to identify the main features of occupational accidents with exposure to biological material among health professionals.

## METHOD

Retrospective, descriptive and documentary study. It was opted for the integrative review, descriptive and exploratory method that enables to summarize the previously published research and get conclusions from a subject of interest to provide subsidies for the implementation of the practice changes.<sup>7</sup> To develop this study, five stages were used: problem identification, literature search, data evaluation and presentation of the integrative review.<sup>7-8</sup>

To identify the problem, the following question has listed: What are the occupational accidents that most affect health professionals? The inclusion criteria used to

determine the sample were as follows: Research articles in Portuguese that addressed the problems exposed, those published from January 2004 to November 2014, with free online access to full text.

Regarding the literature search, the databases Latin American and Caribbean Literature on Health Sciences (LILACS) and Coordination Journals Portal of Higher Education Personnel (CAPES) were used. The research took place in December 2014 and the following key words of Descriptors of Health Science (MeSH) were used: “occupational risks”, “Occupational exposure”, “care team to the patient” and “Nursing”. With the goal to restrict bias, the descriptors were added uncontrolled as “occupational accidents”, performing all the possible combinations among the descriptors for each database. Initially, there were 194 articles found, 85 in LILACS and 109 in CAPES Journal Portal. After application of the inclusion and detailed reading of the articles criteria, 15 articles were selected.

For assessment of the studies, an instrument validated by Ursi 9 was used for categorization of data to be discussed. Thus, the analysis of the articles was based on the concepts of quantitative research with experimental design, almost experimental, descriptive studies and literature on the researched topic. The construction of this study used a classification system consisted of seven levels, as follows: Level I evidence derived from systematic reviews or meta-analysis of relevant clinical trials; Level II

evidence derived from at least one randomized clinical trial controlled and well defined; Level III Well-designed clinical trials without randomization; Level IV cohort studies and case-control; Level V systematic review of descriptive and qualitative studies; Level VI evidence derived from a single descriptive or qualitative study and level VII opinion of authorities or report of expert committees.<sup>10</sup>

Data analysis was carried out through close reading of the literature and analysis of the contents, which were demonstrated through a table that summarizes the main information gathered.

RESULTS AND DISCUSSION

Of the 15 selected articles, 26.6% were published between 2004 and 2008. From 2009, there was an increase in publications, so 73.4% of the studies were published between 2009 and 2013. It appears that the publication concerning the accidents with the biological material exposure is something present, which can be explained by the high number of accidents that occur in the country, deserving much attention from researchers as health professionals inserted in practice.<sup>1</sup>

As for the level of evidence of the sample, it was observed that all studies had level VI, considered weak.<sup>10</sup> Of the sixteen articles, 93.3% have a quantitative approach, and 6.7% have quantitative and qualitative approach, all non-experimental. In Table 1, it is possible to check the articles included in this research, according to authors, journal, year and a summary of the main results.

| Authors                                                                              | Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chiodi MB et al. <sup>2</sup> Rev Gaúcha Enferm. 2010                                | There was a prevalence of female workers, with ages between 20 and 61 years old. The most affected category was nursing assistants, followed by nursing technicians. As for the object that caused the accident, the needles were responsible for most of them, with the biological material blood as the more involved. As for the activities carried out at the time of the accident, the majority of cases occurred while performing venipuncture, drug administration and blood glucose tests. As the cause of the accident, improper disposal of sharps were predominant.     |
| Lima LM, Oliveira CC, Rodrigues KMR. <sup>6</sup> Esc Anna Nery. 2011.               | The nurses were the categories with most work accidents with biological material. Professional being female, aged 21-30 years old and accidents involving skin lesions caused by sharps used during the performance of procedures, followed by recapping needles prevailed in the study. The largest number of exposures to biological material occurred within the Surgical Center and had the blood body fluid involved.                                                                                                                                                         |
| Diehl DT et al. <sup>3</sup> Rev Epidemiol Control Infect. 2012.                     | It was observed that the professional category most affected was the nursing technicians, followed by dentists and nurses surgeons. There was a higher prevalence in female workers, aged between 30 and 39 years old.                                                                                                                                                                                                                                                                                                                                                             |
| Chiodi MB, Marziale MHP, Robazzi MLCC. <sup>11</sup> Rev Latino-am Enfermagem. 2007. | The category of nursing assistants and technicians was the most victimized, with a predominance of female professionals, aged between 40 and 61 years old. Needles were responsible for most of the injuries and the blood was the biological material involved in most occupational exposures. The fingers were the part of the body most affected. Most accidents occurred during the venipuncture procedure. From the reasons informed, most of the workers indicated the patient as responsible for the accident due to his movements during implementation of the assistance. |
| Oliveira AC, Gonçalves JÁ. <sup>12</sup> Rev Esc Enferm USP. 2010                    | The accidents were more prevalent in the medical staff, with the needle as the material involved. Contributing factors to the accident were: lack of attention, followed by poor working conditions, carelessness. Only 15.4% of the accidents were recorded, observing underreporting.                                                                                                                                                                                                                                                                                            |

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|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Almeida CAF, Benatti MCC. <sup>13</sup><br>Rev Esc Enferm USP. 2007                      | Most accidents happen with female workers. The most affected category was the nursing staff, the main shift of occurrence of the accident was the day. The type of exposure was mostly percutaneous, the main causative agent was needles with lumen. The blood was the organic material of most of the exposures.                                                                                                                                                                                                                                                                                                                                                                                                 |
| Noronha DD et al. <sup>14</sup><br>Motricidade. 2012.                                    | Most of the time, accidents with biological risks happened with the nursing technicians and assistants, with drilling in the upper limbs and needle involvement. Furthermore, it was noticed that the predominant organic material was blood.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Araújo LM, Lima KS, Santos SP. <sup>15</sup><br>Motricidade. 2012.                       | The results show that there was a predominance of females and nursing technician category in the occurrence of accidents, with more occurring in the morning and afternoon shifts. Most of the accidents were caused by needles and rushed upper limbs. Most workers reported the accident.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Silva TR et al. <sup>16</sup><br>Rev Gaúcha Enferm. 2010.                                | Most accidents affects female workers, aged between 21-40 years old in the nursing assistant professional category. It occurred prevalence of percutaneous injury, blood involved as organic material and needles with lumen as causative agent of accidents.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Paiva MHRs, Oliveira AC. <sup>17</sup><br>Rev Bras Enferm. 2011.                         | There was a predominance of accidents involving doctors in contact with body fluids, followed by sharps. In 91.3% occurred underreporting. The people associated with the accident were: age over 31 years old, and working in Advanced Support Unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Pimenta FR et al. <sup>4</sup><br>Rev Esc Enferm USP. 2013.                              | Among the professionals who claim to have suffered occupational exposure to biological material, there were nursing assistants category, female, aged 30-39 years old predominated, and percutaneous and bodily fluid involving blood as a kind of exposure.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Kon, NM et al. <sup>5</sup><br>Rev Bras Med Trab.2011.                                   | The recorded accidents occurred predominantly with nursing assistants, female and young age. With the type of exposure, most involved sharp objects, and the blood was the most common organic fluid. About the circumstances in which the accident occurred, the highest prevalence was during medication administration, followed by improper disposal of sharps material. The needles with lumen were the main responsible for the accident and most of the employees were using personal protective equipment (PPE).                                                                                                                                                                                           |
| Bonini AM et al. <sup>18</sup><br>Rev Eletr Enf. 2009.                                   | There was a predominance of accidents involving nursing technicians, mostly female, aged 21-30 years old. Most of the exposures were percutaneous, and the blood ws more involved body fluid and much of the professionals did not wear PPE when the accident occurred. The main causes attributed by workers for the occurrence of exposure were: inattention, speeding and excessive tasks.                                                                                                                                                                                                                                                                                                                      |
| Nishide VM, Benatti MCC, Alexandre NMC. <sup>19</sup><br>Rev Latino-am Enfermagem. 2004. | Among the professional categories, the nursing assistant was who suffered most accidents. The occurrence through injury by sharps was the most prevalent, with the main cause needles and during medication preparation. At the time of the accident, most of the workers did not use PPE. Accidents involving nurses occurred in the early hours of work. For nursing technicians and assistants, accidents occurred throughout the workday. There was a high percentage of cases of non-notified work-related injuries. The lack of attention was the most mentioned reason among nursing workers of the event of accidents, followed by not using the correct PPE/carelessness and rush due to the duty/stress. |
| Balsamo AC, Felli VEA. <sup>20</sup><br>Rev Latino-am Enfermagem. 2006.                  | There is a predominance of injuries to female workers, and nursing assistants' category. There was a predominance of sharps injuries, the scalp and the injection needle being the main cause. Blood was the most involved body fluid and the majority of workers reported that they were using PPE. The Emergency Unit was the place with the highest percentage of accidents, followed by Medical Clinic and Intensive Care Unit. The reasons most often mentioned by the employee in charge of the exposure were "it just happened", inattention and rush.                                                                                                                                                      |

Figure 1. Distribution of articles, according to authors, journals, year of publication and main results, João Pessoa, PB, 2014.

Among the journals where the studies were published, the *Revista de Enfermagem da USP* was highlighted with three articles (20%), followed by *Revista Latino-Americana de Enfermagem*, the *Revista Gaúcha de Enfermagem* and *Revista Motricidade*, with two publications each (13.3%). The other journals had only one publication. It was found that 11 (73.3%) studies were published in Nursing. In Brazil, the Brazilian nursing has been increasing its production of knowledge from the scientific research, given the need to be increasingly recognized and affirmed as a science, technology and innovation, and to improve their practice performance.<sup>21</sup>

Based on the analysis of the selected material, it is possible to identify a frequency

of factors involved in accidents with biological material. As for the professionals involved in the accident, there is a prevalence of the nursing staff, especially assistants and technicians. These categories are the most providing direct patient care, often handling sharps, and performing procedures that expose them to risks, in addition to be a great quantity of them within institutions. It is noteworthy also that professionals who have a lower level of education are more likely to work accidents, in addition, low wages in that category make these workers have more than one job, resulting in physical and psychological pressures.<sup>2,6,15-16</sup>

Two articles show an incidence of accidents with biological material in the

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medical team.<sup>12,17</sup> The risk exposure varies by job category and the place of work. These studies were carried out in the operating room and emergency unit, sectors in which the medical team is closer to patients and performs more invasive procedures. Moreover, they are places that require fast and effective action developed, most often under stress, which favors the occurrence of accidents.<sup>6,17</sup>

As for gender and age, most studies showed prevalence of female and younger age group (21-30 years old). This can be attributed to lack of experience and lack of ability to use the techniques and the fact that the nursing staff is predominantly female.<sup>2,6</sup> However, four articles stated that most victimized were more than 31 years old, which is justified by the fact that with the increase of age, professionals permeate for cognitive changes, such as changes in attention and state alert, which together psychosocial dimension leads to impairment of health and worker performance.<sup>3</sup>

With regard to the type of accident, the skin lesions were more prevalent, caused by sharps, especially the needles, with blood as the more involved biological material. This material is the most present during complex procedures, and it is the most serious type of exposure by allowing increased risk of seroconversion to pathogens that can cause diseases such as AIDS and hepatitis. It is noteworthy that the hollow needles have a greater potential for contamination than the compact needles.<sup>4-6</sup>

Regarding the part of the body involved, most reached the fingers, which is the main working tool of the nursing team.<sup>15</sup> The last Statistical Yearbook of Social Security stated that 75,359 of the ICDs (International Classification of Diseases) present in more workers in 2012, refer to problems into their hands, cuff injury and hands.<sup>22</sup> With regard to the time that accidents happened, studies show that the daytime is the most frequent, associated with the fact that this is the period in which more procedures are performed, thus having a more intense pace of activity compared to the night.<sup>15,18</sup>

About the circumstances in which the accident occurred, the studies highlighted as most prevalent the improper disposal of the material, the retreat needle, performing venipuncture and administration of medications. The exposures can be avoided as the professionals use standard precautions, such as: Careful handling of sharps, not retreat needles, properly disposal, and renovation of the containers before being full.<sup>14</sup>

Some authors discussed also the reasons given by employees for exposure occurred, highlighting: inattention, rush, poor working conditions, carelessness, non-use of PPE, excess tasks and patient movement during service. It is necessary the knowledge of such aspects to better understand the mechanisms that underlie accidents with biological material and from it, take measures to promote a safe environment.<sup>11-12,18-20</sup>

Regarding PPE, most of the analyzed sample indicated the use as proposed by the Regulatory Standard 32 (NR), which provides the basic guidelines for the implementation of security protection measures and health of workers in health services.<sup>23</sup> However, only four studies evaluated the use of PPE at the time of the accident.<sup>5,18,20</sup> The most common reasons attributed to the non-use of these equipment are: emergency situation, believe that the use is not necessary in certain procedures and even confidence of the professional in his skill and dexterity.<sup>17-18</sup>

According to NR 32, the employer must provide to workers appropriate personal protective equipment to the location of the risks, and must ensure the use of sharp materials with safety device. In addition, the PPE should be evaluated daily for the condition and safety and should be stored in easily accessible locations and in sufficient quantity for immediate replacement, as required by the procedure or in the event of contamination or damage.<sup>23</sup>

In this context, it is stated that it is of great importance to use the PPE for accident prevention, since the increased risk of accidents involving exposure to biological material is inversely proportional to the use of preventative practices. Moreover, it is appropriate to emphasize that the greater the number of training preventive health professionals participate, the lower the number of exposures.<sup>4,6,18</sup>

Another aspect discussed in the analyzed studies is the high rate of sub notification of accidents, which refers to a position by the professionals, neglect with himself, also linked to fear, stigma, punishments and even the danger to be fired.<sup>12,15</sup> Underreporting is the greatest hindrance to the understanding of the risks and factors related to occupational exposure, since it is by means of notifications that can measure the extent of the problem and develop specific prevention measures for the various work environments.<sup>3</sup>

According to NR 32, workers must immediately report all accidents or incidents with potential exposure to biological agents.<sup>23</sup> This notification must occur to endorse the

professional, and ranges from medical care, the request of the source patient's laboratory tests and the worker, to the entry in the CAT<sup>24</sup>. Finally, it highlights the need to formulate institutional proposals that stimulate the worker to self-care, to reflect on their professional practice and, especially, to the knowledge of the legal aspects involving occupational exposure.<sup>12</sup>

## CONCLUSION

From the analysis of the articles, it became clear that the most affected professional category was nursing assistants and technicians due to greater contact with the patients. Regarding the accident, they occurred with a prevalence of percutaneous injuries caused by needles with lumen, and the blood was the biological material involved in most of the exposures. About the circumstances in which the accident occurred, there was a higher prevalence during medication administration, followed by improper disposal of sharps. The Emergency Unit was the place with the highest percentage of accidents, followed by the Medical Clinic and Intensive Care Unit, emphasizing that most professionals did not use PPE at the time of the accident.

It is emphasized that it is important to identify the most prevalent injuries among health teams and, from the information gathered, build strategies for improving conditions that influence the growing incidence of work-related accidents. The offer and encouraging the use of personal protective equipment as well as the implementation of educational programs can assist in changing employees' behavior and minimize occupational incidents. Nurses should work to encourage the team of workers to behavior change and self-promoting health, contributing to the enhancement of security during professional practice.

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