

## OCCUPATIONAL ACCIDENT INVOLVING BIOLOGICAL MATERIAL AMONG THE FIRE FIGHTERS MILITARY OF MINAS GERAIS

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### ABSTRACT

It aimed to determine the incidence of accidents involving biological material as well as its characteristics and attitudes after exposure among Fire Military Brigade of Minas Gerais' professionals from Belo Horizonte. It carried out a transversal study in the period from January to February 2011. A structured questionnaire with questions about incidence of accidents involving biological material, its characteristics, and attitudes after its occurrence was applied for collection of data. The incidence of accidents involving biological material was 3,7%, from these 53,3% were due to direct contact with body fluids and 33,4% due to piercing cutting material. It was verified incomplete use of personal protective equipment during the accident by 46,7%. As for attitudes, 26,7% rubbed 70% alcohol on the affected site, 46,7% did not do medical examination. It considered necessary the improvement of staff orientation concerning the importance of hepatitis B immunization, correct use of personal protective equipment and appropriate attitudes after accidents involving biological material occurrence.

**Keywords:** Occupational to biological agents. Prehospital care. Universal precautions. Occupational health.

### INTRODUCTION

The Pre-Hospital Care (APH) is the service that aims to meet early to the victim, after a further clinical nature, surgical, psychiatric, and traumatic and that can cause suffering, sequelae, or death. Fixed and mobile units<sup>(1)</sup> can provide this service.

The APH search assistance and/or proper transport the victim to a properly tiered health service and integrated into the health system. It can be primary, when the distress call is performed by a citizen, or secondary, when asked by a health service, in which the patient has already received the first attendance, stabilized the urgency presented, but must be driven to another service of greater complexity for maintenance treatment<sup>(1)</sup>.

In Brazil, the emergency Mobile Service (SAMU) and/or the Military Firefighters Corps<sup>(2)</sup> can perform the APH in mobile units. In Belo Horizonte, both SAMU and the Military fire brigade of Minas Gerais (CBMMG) provide this service. Both have a central call control, free from tariffs.

The difference between them is that the

SAMU is comprised of professionals with training and expertise in the area of health as doctors, nurses and technicians nursing acting both in basic life support units and in the advanced support. The Military Firefighters Corps has only professionals trained in basic life support as first responders, without a technical and scientific training in the area of health<sup>(2-4)</sup>.

Although qualified, rescuers of the CBMMG are not entitled to perform invasive procedures. Factor that does not mean that these professionals do not expose themselves with great frequency to biological materials in the performance of its activities, thus constituting, exposure to biological material, a high occupational risk in this category<sup>(3,5)</sup>.

Occupational contact related accidents with biological material in APH services mobile can occur via direct contact with the blood, secretions, excretions and other body fluids infected or not, or by indirect contact such as transfer of pathogens via contaminated materials and equipment<sup>(4)</sup>.

The chance of an accident at the APH mobile increases due to the following characteristics: limited space inside the vehicles with restricted ventilation that hinders the air recirculation;

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traffic movement with vibration, bumps, propulsion of the bodies by kinetic energy, arising from the accelerations or decelerations of vehicles and sharp curves and high speed<sup>(6)</sup>. In addition, the emergency assistance provided requires dexterity, skill, and agility, triggering factors of a high level of stress, which favors the occurrence of occupational accidents.

In order to minimize contact with the biological material and to protect the professionals exposed to them, in 1996, the *Centers for Disease Control and Prevention* (CDC) in the United States, edited the Guide to Isolation and Precautions with recommendations to be adopted in the attendance of any patient, regardless of their diagnosis, called standard precautions, maintained and reinforced in the review of this guide in 2007. Among the proposed measures include hand hygiene, the use of personal protective equipment (PPE), vaccination against hepatitis B and the appropriate disposal of piercing cutting materials<sup>(4)</sup>.

Non-adherence to standard precautions measures by the professionals can configure in exposure to biological materials, increasing the chance of contamination by microorganisms potentially causing infections which, consequently, can result in absenteeism to work, temporary or permanent, as medical licenses, cases of disability and even death<sup>(6)</sup>.

Considering the characteristics of the CBMMG rescue worker and the scarcity of scientific papers related to exposure to biological material involving professionals from the Fire Department in APH, becomes of extreme importance the knowledge about accidents involving biological material, in order to enhance employee health and reduce occupational hazards of these workers<sup>(7)</sup>. Thus, the objective of this study was to determine the incidence of accidents with biological material, as well as their characteristics and behaviors after the event, between professionals of the CBMMG of Belo Horizonte.

## METHODOLOGY

A cross-sectional survey and quantitative approach in eleven units of CBMMG in the municipality of Belo Horizonte.

Data collection occurred in the period of January and February 2011. A researcher visited every unit of the municipality for three consecutive days because the working range was of twenty-four hours to forty-eight hours off, accounting for three separate teams of workers.

The subject of this survey were all working professionals CBMMG of that municipality, previously invited and clarified about the study's objectives, and who have agreed to participate by reading and signing the informed consent. Only those professionals who were working on the day of the interview were addressed. It was excluded those who were on vacation, sick or with medical license during the period of data collection.

It was used for the study, an anonymous questionnaire auto applicable structured and validated by experts in the field of health care-related infections. The pilot test was conducted on similar sampling to this final group, in a unit of a town in the metropolitan region of Minas Gerais in the Southeast region consisted of 33 military. Consecutively to the pilot, it was not required substantial changes in the questionnaire content, and the same one was applied in the study. Questions addressed the demographics, incidence of accidents with biological material as well as its features and conduct after the fact.

After the presentation of the data collection's instrument by one of the researchers, participants in the presence of the same answered the questionnaire individually.

It was delimited as accidents only those arising from the rescue with involvement of body fluids, since almost all of the professionals have reported suffering often accidents by contamination in polluted waters.

The data collection during hours of work aimed to ensure the greater participation of employees, however, uninterrupted work was a limitation to the study, as some professionals had to leave to attend an emergency call during the application of the instrument. The ones who were called, did not have any prevision to return to the base, so for these the questionnaire remained incomplete.

After this step, data was entered and analyzed, in descriptive form, with the aid of statistical software *Statistical Package for the Social Sciences* (SPSS) Version 13.0.

The project was approved by the Research Ethics Committee at the Federal University of Minas Gerais ETIC 458/05 and accepted by the operational command of firefighters (COB) paragraph 7262/09, responsible for all operational units of the State of Minas Gerais.

## RESULTS AND DISCUSSION

A total of 700 professionals registered in CBMMG of Belo Horizonte, 488 were approached, of which 409 (83.8%) agreed to participate, 67 (13.7%) refused and 12 (2.5%) did not finish filling out the questionnaire, due to the call of emergence at the time of its application, without their return to the base. The discrepancy between the number of registered professionals and discussed is due to an outdated survey of human resources of the battalions, once the workers often change their sectors and are dismissed for various reasons.

Most of the professionals who participated in the study were men (381/93.2%). The median age was 30.8 years, standard deviation of 8.14. The predominance of males found in the present study corroborates with other studies involving pre-hospital care throughout Brazil<sup>(8-10)</sup>. Historically, this occurrence among the military firefighters can be explained by the fact that the newly admitted in military career should be healthy men to better meet the demands of the service, which represented considerable risks and required physical effort. Thus, the admission of women after 1981 corresponded to 20% of effective recruited and currently consists of 30 %<sup>(11)</sup>.

For training these professionals, the institution offers courses composed of disciplines that address, among other topics, the techniques of first aid and safety. The average length of time devoted to these training courses was 6.6 months, standard deviation of 10.2.

In addition to the participant's accreditation by the institution in the cited courses, 81 (19.8%) reported attending or have completed some undergraduate degree, being cited about 30 different courses, of which the most common were: Law (10/12.2%), Administration (9/11.0%), Engineering (8/9.8%), Nursing, and Physical Education (7/8.5%), Psychology (6/7.3%).

Although the courses offered had dealt with worker safety and the prevention of accidents at work, it was observed the occurrence of accident with biological material exposure between 15 participants (3.7%), 380 (89.4%) did not suffer any accident and 14 (3.3%) did not respond.

This result demonstrates that, although they do not perform invasive procedures, these professionals are not exempt from the risk of exposure to biological material, being susceptible to acquiring diseases transmitted by body fluids/secretions in the performance of its activities<sup>(5, 9, 12)</sup>.

In addition, the study found that accidents can happen more than once, as for 40.0% (6) of participants that suffered an accident two and even three times, thereby contributing to the increased risk of acquiring a disease conveyed by biological material for these workers.

The involvement of a piercing cutting material occurred in five (33.3%) of the cases of accidents. Direct contact with body fluids and secretions of the victim took place on eight (53.3%) cases, and for four (50.0%) exposure was in the mucous oral/ocular and the other four (50.0%) not discriminated in his account the form of exposure (mucous membrane, skin or not).

This finding resembles the result verified in APH services public of Belo Horizonte and Minas Gerais in which the majority of accidents were by contact with body fluids, followed by accidents caused by piercing cutting materials among multiprofessionals from basic and advanced rescue units<sup>(7-8)</sup>.

Not performing invasive procedures justifies the main reason of the accident be through direct/indirect contact of the biological material with mucous membranes. However, accidents with piercing cutting materials are not discarded between these professionals, since they have available in cars scalpels for cutting umbilical cords in case of delivery service, and are exposed to the risk of cuts on hardware and glassware of vehicles that may have been previously contaminated by secretions of the victim. Emphasizing the importance of proper use of PPE (gloves, goggles, closed shoes) for prevention of these accidents.

In relation to the procedure that produced the exposure, five (33.3%) professionals reported

the contact of secretions expelled by the victim during sneezing, coughing or vomiting. Hands and fingers were involved in seven (46.7%) of accidents. Most of the rescuers (8/53.3%) did not know precise the depth of injury and six (40.0%) reported involvement of small volume of secretion.

The knowledge of the type of accident, their severity, size of the lesion, presence and volume of secretion involved, in addition to the clinical conditions of the source patient and correct use of post-exposure prophylaxis contributes to occupational risk assessment and preventive measures<sup>(13)</sup>.

In relation to working conditions at the time of the accident, seven (46.7%) suffered professional accident when they were working at night, between 19:00 and 05:59 and most of the accidents (11/73.3%) occurred in the rescue units, where there is a higher possibility of contact with the victim.

It is possible to infer that fatigue, sleep, impacts of mobile units, attendance in places little illuminated and difficult to reach sometimes favor the occurrence of a large number of accidents at night and in rescue units<sup>(6)</sup>.

At the time of the accident, 12 (80.0%) professionals reported using some type of PPE. Of these, all reported use of glove and being variable the adherence to other PPE. It is observed frequently in literature reports of glove use during all services provided by health care workers. However, for other PPE it was found usually low compliance, being the professional exposed in the other regions<sup>(5, 9, 12, 14-15)</sup>.

Some barriers interfere in personal protection and safety as communication, work overload, the physical structure, the accessibility to protective equipment and organizational and managerial aspects<sup>(16)</sup>. Thus, in order to increase compliance with use of PPE it is essential that these be provided and employees receive information about the importance of its use, training, and supervision to the proper use of the equipment.

With regard to post exposure conduct it was observed that care performed by four individuals was considered wrong, as they rubbed 70% alcohol in the region. However, this practice

may be due to ignorance of the proper conduct after accidental exposure to biological material recommended by the Ministry of Health, with the local wash thoroughly with soap and water or the lack of internal structure in the ambulances – not providing sinks and taps with water<sup>(13-14, 17)</sup>.

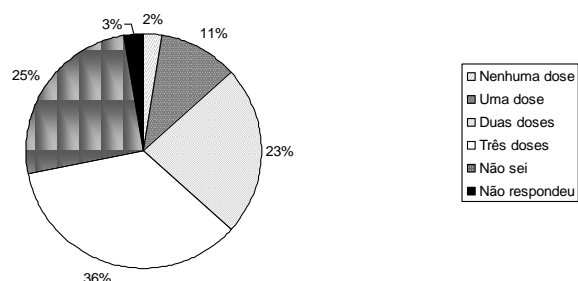
Still in relation to post exposure conduct, 7 (46.7%) professionals did not go through medical examination after the accident and only 3 (20.0%) emitted the notice of accident at work (CAT), indicating possible lack of awareness of the risks to which they are exposed or negligence of accidents, considering unnecessary notification, for example, of a cut occurred in the bodywork or hardware of a vehicle<sup>(7, 18)</sup>.

Rapid test for HIV on the victim was only accomplished in two (13.3%) of cases of accident. The request of examinations of the victim and the source patient, as well as the notification should be attitudes of the responsible for post-exposure conduction<sup>(13, 17)</sup>.

Is evidenced a need of periodic training courses that address general conduct post exposure, flows of notification and the importance of these steps to preventing disease and possible new accidents.

Concerning the immunization status, CBMMG workers were questioned about the number of doses for hepatitis B. Accordingly, 103 (25.2%) did not know answer that question, 12 (2.8%) did not answer it, as shown in Figure 1.

Note that they were not asked about realization of serology for hepatitis B.



**Figure 1** – Distribution of the number of vaccine doses received for hepatitis B among working professionals in the Military fire brigade of Minas Gerais. Belo Horizonte, 2011.

The ignorance of the status for hepatitis B vaccine by 103 (25.2%) of participants deserves more attention, considering that the contact with the HBV has a high power of infectivity after exposure to biological material: risk estimated in 6% to 30%, reaching 40%, even when there is adoption of prophylactic measures<sup>(13, 17)</sup>.

Therefore, when compared to hepatitis C and the acquired immunodeficiency syndrome (AIDS), hepatitis B has more chance to be acquired and is the only preventable by immunization<sup>(13,17,19)</sup>.

Hepatitis B transmission occurs through blood and other organic fluids, being one of the most common infectious diseases among professionals who expose themselves to biological material, than between individuals from general population, and its immunization should be a requirement for practicing these professions<sup>(13,17,19)</sup>.

Guaranteed access to immunobiologicals is disposed in Regulatory Standard (NR) 32, by offering free vaccinations against hepatitis B, tetanus and diphtheria to all workers exposed to biological agents. This regulation also mention the need to take control of the effectiveness of vaccination as recommended by the Ministry of Health, and if necessary, arrange your reinforcement<sup>(13)</sup>.

Although the vaccine for hepatitis B is provided since the 1990 in Brazil, it is estimated that less than 50% of health care workers in some regions of the country have completed the scheme of three doses<sup>(17)</sup>. In order to extend the coverage, the Ministry of Health released in July 2013 free vaccination for the population of 0 to 49 years<sup>(20)</sup>.

It is necessary, beside training professionals, keep in mind that the success of prevention of infections from contact with biological material consists mainly on immunization for hepatitis B, correct use of PPE, and proper management of exposed<sup>(17)</sup>.

## CONCLUSION

The study showed low occurrence of accidents with biological material, compared to health care professionals in general, obtaining an incidence of 3.7%. This result

proves that these military professionals are exposed to biological materials and hence are subject to the same kind of accidents.

Although the exposure to biological material by these professionals is smaller, over time it can bring consequences as the acquisition of occupational infectious diseases, similarly the consequences evidenced in health care professionals in pre-hospital care or hospital activities.

Accidents reported occurred mostly at night, in rescue units, once only, through direct contact with secretions of the victims, involving small volume of secretion, having been low adherence to use of full PPE at the time of the crash. In addition, a considerable amount of professionals did not inform the completion of vaccination schedule for hepatitis B, one of the most common diseases in occupational accidents with biological material, which can be prevented.

The post exposure conducts have fallen short, few were those who washed the site with soap and water, underwent medical examination, emitted the CAT and succeeded to perform tests on the source patient.

It is considered the need for better orientation of employees about the importance of proper use of PPE, general conduct required after the occurrence of accidents with biological materials, as well as to encourage and facilitate, through partnerships with the municipal health secretariats, refreshing the schema of vaccination against hepatitis B, tetanus and diphtheria as NR32 recommendation, in order to ensure greater safety to the worker by promoting health and preventing possible diseases.

The knowledge of the flow of attendance and notification has been also noted as a priority measure to improve the management of cases.

Monitoring occupational accidents and their characteristics contribute to the knowledge of everyday reality, providing key information to guide the preparation / review of protocols and programs for the theme, performed by professionals involved in the prevention of disease and injury and promotion of workers' health.

## ACIDENTE OCUPACIONAL ENVOLVENDO MATERIAL BIOLÓGICO ENTRE BOMBEIROS MILITARES DE MINAS GERAIS

### RESUMO

Objetivou-se determinar a incidência dos acidentes com material biológico bem como suas características e condutas pós-exposição, entre profissionais do Corpo de Bombeiros Militar de Minas Gerais de Belo Horizonte. Realizou-se um estudo transversal no período de janeiro e fevereiro de 2011. Utilizou-se para coleta de dados um questionário estruturado composto de questões sobre a ocorrência de acidentes com material biológico, suas características e condutas. A incidência de acidentes envolvendo material biológico foi de 3,7%, destes 53,3% decorreram de contato direto com fluidos corporais e 33,4% de materiais perfuro cortantes. Constatou-se a utilização incompleta de equipamentos de proteção individual durante o acidente por 46,7%. Diante das condutas pós exposição, 46,7% não realizaram exame médico. Considera-se necessário uma melhor orientação dos profissionais quanto à relevância da imunização para hepatite B, utilização correta dos equipamentos de proteção individual e condutas adequadas após a ocorrência dos acidentes com materiais biológicos.

**Palavras-chave:** Exposição a agentes biológico. Assistência pré-hospitalar. Precauções universais. Saúde do trabalhador.

## ACCIDENTES OCUPACIONALES CON MATERIAL BIOLÓGICO ENTRE LOS BOMBEROS MILITAR DE MINAS GERAIS

### RESUMEN

Tuvo como objetivo de determinar la incidencia de los accidentes con material biológico, así como sus características y conductas tras la exposición, entre los profesionales del Cuerpo de Bomberos Militares de Minas Gerais de Belo Horizonte. Se realizó un estudio transversal en el período de enero a febrero de 2011. Se utilizó para recolección de los datos un cuestionario estructurado compuesto de preguntas sobre la ocurrencia de accidentes con material biológico, sus características y conductas. La incidencia de los accidentes con material biológico fue de 3,7%, de estos 53,3% fueron en consecuencia del contacto directo con fluidos corporales y 33,4% de materiales punzo cortantes. Se constató la utilización incompleta de los equipamientos de protección individual durante el accidente en 46,7%. Delante de las conductas tras la exposición, el 46,7% no se sometió a un examen médico. Se considera necesaria una mejor orientación de los profesionales en cuanto a la importancia de la inmunización contra la hepatitis B, utilización correcta de los equipos de protección individual y conductas adecuadas después de la ocurrencia de los accidentes con materiales biológicos.

**Palabras clave:** Exposición a agentes biológicos. Atención pre hospitalaria. Precauciones universales. Salud laboral.

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