



## ACCIDENTS WITH BIOLOGICAL MATERIAL IN WORKERS

*ACIDENTES COM MATERIAL BIOLÓGICO EM TRABALHADORES*

*ACCIDENTES CON MATERIAL BIOLÓGICO EN TRABAJADORES*

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The objective was to describe the accidents with biological material occurred among workers of Rio Grande do Norte, Brazil, between 2007 and 2009. Secondary data were collected in the National Notifiable Diseases Surveillance System by exporting data to Excel using Tabwin. Among the types of occupational accidents reported in the state, the biological accidents (no. = 1,170) accounted for 58.3% with a predominance of cases among nurses (48.6%). The percutaneous exposure was the most frequent occurrence and the circumstances of the accidents were related to the handling of sharps and the most common organic material was blood (63.5%). More than 50% of the workers were vaccinated against hepatitis B, but without information regarding the evaluation of vaccine response. The study revealed the need of improvement in the quality of the information, once the sub-entries and inconsistencies make the National Notifiable Diseases Surveillance System less trustworthy in the characterization of the affected workers.

**Descriptors:** Accidents, Occupational; Occupational Risks; Epidemiology.

Objetivou-se descrever os acidentes com materiais biológicos ocorridos entre trabalhadores do Rio Grande do Norte entre 2007 e 2009. Coletados dados secundários do Sistema Nacional de Agravos Notificáveis exportados para o Excel utilizando o Tabwin. Dentre os acidentes ocupacionais, destacaram os biológicos (n=1.170) que corresponderam a 58,3% com predomínio de casos entre os profissionais de enfermagem (48,6%). A exposição percutânea foi a mais frequente e as circunstâncias de ocorrência dos acidentes relacionadas à manipulação de perfurocortantes, o material orgânico mais comum foi o sangue (63,5%). Mais de 50% dos trabalhadores acidentados eram vacinados contra hepatite B, porém sem informação quanto à avaliação da resposta vacinal. O estudo revelou a necessidade de melhoria na qualidade das informações, pois os sub-registros e inconsistências tornam o Sistema Nacional de Agravos Notificáveis menos fidedigno na caracterização dos trabalhadores acometidos.

**Descritores:** Acidentes de Trabalho; Riscos Ocupacionais; Epidemiologia.

El objetivo de describir los accidentes con material biológico se produjo entre los trabajadores de Rio Grande do Norte entre 2007 y 2009. Datos secundarios fueron Enfermedades de Declaración Obligatoria Nacional por exportación de datos a Excel utilizando TABWIN. Entre los tipos de accidentes laborales reportados, los biológicos (n = 1.170) representaron 58,3%, predominio de casos entre los profesionales de enfermería (48,6%). La exposición percutánea fue más frecuente y las circunstancias de los accidentes con el manejo de objetos punzantes y el material orgánico era la sangre (63,5%). Más de 50% de los trabajadores vacunados contra la hepatitis B, pero no hay información en cuanto a la respuesta la vacunación. Demostró la necesidad de mejora en la calidad de la información, es sub entradas e inconsistencias haciendo menos confía en el sistema de enfermedades de declaración en la caracterización de los trabajadores.

**Descritores:** Acidentes de Trabajo; Riesgos Laborales; Epidemiología.

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## INTRODUCTION

The exposure of the health professionals to biological material constitutes an occupational problem in the services of health, once it causes damage to the mental and physical integrity of the worker, making him vulnerable to the risk of acquiring infectious diseases<sup>(1)</sup>.

The biological risk is the probability of occupational exposure to biological agents, such as: genetically modified, or not, microorganisms; cultures of cells; parasites; toxins and prions found in blood, body fluids, means of cultures and clinical specimen<sup>(2)</sup>.

A biological accident is the one which involves occupational exposure to potentially contaminated biological material. A study developed in this area shows that the accidents involving blood and other organic fluids correspond to the most frequently related exposures<sup>(3)</sup>.

The exposure to biological material, blood or other potentially contaminated organic liquids can result in infection caused by pathogens such as the human immunodeficiency virus (HIV) and the hepatitis B virus (HBV) and C (HCV). This risk varies according to the type of exposure, which may occur through percutaneous injuries provoked by sharps; accidents with mucosa, which occur when there is sprinkling involving eyes, nose and mouth; cutaneous accidents, when there is contact of the biological material with non intact skin; and by human bites, considered as exposure of risk when involving the presence of blood<sup>(4)</sup>.

The following must be considered biological fluids of risk: blood, organic liquids with blood and potentially infected organic liquids (semen, vaginal discharges, liquor and synovial, peritoneal, pericardial and amniotic liquids). Sweat, tear, feces, urine, vomit, nasal and saliva secretion (except in odontological environment) are biological liquids without risk of occupational transmission of HIV. In these cases, the chemoprophylaxis and the serological assistance are not

recommended. However, the presence of blood in those liquids makes them infectant<sup>(4)</sup>.

The risk of infection by HIV, after percutaneous occupational exposition with contaminated blood is approximately 0.3% and, after the exposure of the mucosa, approximately 0.09%. In the case of occupational exposure to HBV, the risk of infection varies from 6 to 30%, and it can reach 60%, depending on the condition of the source-patient, among other factors. As to HCV, the risk of occupational transmission after a percutaneous accident with HCV positive source-patient is approximately 1.8%, ranging from 0 to 7%<sup>(3)</sup>.

The work accident is the one that happens when doing the work and which brings as consequence body injury or functional disorder, with loss or reduction of capacity for work, permanently or temporary or even death. Therefore, the accident with biological material is within this category of loss of health of the worker<sup>(3)</sup>.

The accidents of work with the exposure to risk biological material must be treated as cases of medical emergency, once the interventions for the prophylaxis of the infection by HIV and hepatitis B must begin right after the occurrence of the accident, in order to be more efficient. The post exposure measures are not completely effective, so it is necessary to keep permanent educational actions<sup>(4)</sup>.

The findings in this study will contribute to enhance knowledge on the epidemiological situation regarding the biological accidents in Rio Grande do Norte, Brazil, subsidizing the development of strategies of acting in the Surveillance in Health of the worker in this state, thus contributing for the control and prevention of that problem.

Based on the above considerations, the researcher aimed at describing those findings, analyzing the biological accidents occurred with workers in the state of Rio Grande do Norte, Brazil, from 2007 to 2009.

## METHOD

This is an epidemiological descriptive study, developed with the Centro de Referência em Saúde do Trabalhador (Center of Reference in Health of the Worker) (CEREST), of the Sub-Coordenadoria de Vigilância Epidemiológica da Secretaria de Estado da Saúde Pública do Rio Grande do Norte (RN) (SUVIGE/SESAP/RN/BRASIL) (State organ of epidemiological surveillance) made with the authorization of the managers of SESAP/RN from the collection of all the notified and closed cases of accidents with biological material (no.=1,170), present in the data bank of the National Notifiable Diseases Surveillance System (SINAN), from 2007 to 2009.

The data collection was in September 2010, at CEREST/RN, including all notified cases of work accidents with biological material in the state of Rio Grande do Norte, Brazil and registered after the 37<sup>th</sup> epidemiological week. Secondary data registered at SINAN were collected, through the exportation of data to Excel (2007) sheets, using the *Tabwin* linked to SINAN. Data of identification of the worker were not exported, only the data of the variables presented in this study were aggregated. So, the ethical principals were respected in order to guarantee secrecy and the anonymity of the workers involved in the accidents. For the analysis of the data, the descriptive statistic was made through measures of relative and absolute frequencies.

## RESULTS

2,180 cases of injuries and diseases regarding the work were notified at SINAN, in Rio Grande do Norte, from 2007 to 2009. The injuries configured as accidents represented 94.6% of the accidents (no. = 2,008) from these, 1,170 cases were biological accidents (58.3%).

Natal and Mossoró were the cities which presented the highest number of notifications with accidents with biological material in the period. In these counties there are hospital institutions of reference for the assistance to accidents with biological material, and they are the main notifying sources of the state.

Regarding the occupation, the accidents with biological material occurred predominantly with nursing professionals, corresponding to 48.6% of the cases.

**Table 1** - Distribution of the number of accidents with exposition to biological material, according to the Classificação Brasileira de Ocupações (CBO) (Brazilian Classification of Occupation), by year of notification. Rio Grande do Norte, RN, Brazil, 2007-2009

Occupation	2007		2008		2009	
	n	%	n	%	n	%
Nursing technician	65	25.0	132	31.4	227	46.3
Nursing assistant	36	13.9	36	8.6	19	4.0
Student	16	6.2	20	4.8	28	5.7
Garbage collector	10	3.9	19	4.5	3	0.6
Nurse	7	2.7	20	4.8	27	5.5
Dental surgeon	7	2.7	11	2.6	11	2.2
General practitioner	4	1.5	8	1.9	8	1.6
Assistant of laboratory of clinical analysis	3	1.2	6	1.4	8	1.6
Technician of physicochemical laboratory	3	1.2	7	1.7	6	1.2
Attendant of dental office	6	2.3	4	1.0	8	1.6
Assistant of laundry	2	0.8	4	1.0	5	1.0
Janitor	---	---	3	0.7	5	1.0
Pharmacist	---	---	5	1.2	2	0.4
General surgeon	---	---	4	1.0	11	2.2
Health communitarian agent	---	---	4	1.0	1	0.2
Others	14	5.4	24	5.7	48	9.9
Ignored	86	33.2	111	26.4	73	14.9
Total	259	100.0	421	100.0	490	100.0

Source: SINAN/SUVIGE/CEREST/SESAP

The most frequent form of exposure to the biological material was percutaneous (Table 2). SINAN accepts more than one possibility of exposure during the accident.

**Table 2** - Distribution of the number of accidents by exposure to the biological material, according to the type of exposure. Rio Grande do Norte, RN, Brazil, 2007-2009

Type of exposure	2007		2008		2009	
	n	%	n	%	n	%
Mucosa	10	3.8	19	4.3	30	5.6
Intact skin	82	31.4	147	33.6	112	20.8
Non-intact skin	10	3.8	4	0.9	19	3.5
Percutaneous	158	60.5	268	61.2	376	69.9
Others	1	0.4	0	0.0	1	0.2
Total	261	100.0	438	100.0	538	100.0

Source: SINAN/SUVIGE/CEREST/SESAP

Regarding the circumstances of the accident, the following was evident: recapping of the needles, handling of material or trash with sharps, besides the invasive procedures such as administration of medicine, surgical and odontological procedures.

**Table 3** - Distribution of the number of accidents with exposure to the biological material, according to the circumstances of the accident. Rio Grande do Norte, RN, Brasil, 2007-2009

Circumstances of the accident	2007		2008		2009	
	n	%	n	%	n	%
Recapping	28	10.8	23	5.5	47	9.6
Handling of sharp objects box	25	9.7	38	9.0	22	4.5
Intravenous administration of medication	20	7.7	39	9.3	52	10.6
Odontological procedure	19	7.3	20	4.8	16	3.3
Inadequate discharge of trash	14	5.4	31	7.4	61	12.4
Laboratorial procedure	14	5.4	14	3.3	17	3.5
Administration of subcutaneous administration	9	3.5	13	3.1	11	2.2
Inadequate discharge on the floor	8	3.1	36	8.6	50	10.2
Material washing	8	3.1	4	0.9	17	3.5
Administration of intramuscular medicine	7	2.7	24	5.7	17	3.5
Surgical procedure	7	2.7	21	4.9	39	7.9
Puncture/collection	6	2.3	13	3.1	18	3.7
Non specified puncture	6	2.3	10	2.4	11	2.2
Dextro	6	2.3	---	---	---	---
Administration of intraderm medicine	5	1.9	9	2.1	14	2.9
Laundry	1	0.4	3	0.7	3	0.6
Ignored/blank	47	18.1	50	11.9	28	5.7

Source: SINAN/SUVIGE/CEREST/SESAP

The most present organic material in the accident with exposure to biological material was blood (63.5%).

**Table 4** - Distribution of the number of accidents with exposure to the biological material, according to the type of organic material. Rio Grande do Norte, RN, Brasil, 2007-2009

Organic material	2007		2008		2009	
	n	%	n	%	n	%
Blood	155	59.8	210	49.9	378	77.1
Liquor	---	---	1	0.2	2	0.4
Pleural fluid	2	0.8	2	0.5	1	0.2
Amniotic fluid	1	0.4	---	---	3	0.6
Fluid with blood	1	0.4	2	0.5	12	2.4
Serum/plasma	2	0.8	1	0.2	3	0.6
Ignored/blank	91	35.1	196	46.5	49	10
Others	7	2.7	9	2.1	42	8.6
Total	259	100.0	421	100.0	490	100.0

Source: SINAN/SUVIGE/CEREST/SESAP

Regarding the vaccination against hepatitis B, more than 50% of workers who suffered accident with biological material were vaccinated throughout the period, but there is no information regarding the evaluation of the vaccine response, therefore not discharging the possibility of a lower rate of immune protection when evaluated by the acquisition of anti-HBs antibodies.

**Table 5** - Distribution of the number of accidents with exposure to the biological material, according to the vaccine situation of the worker against hepatitis B. Rio Grande do Norte, RN, Brazil, 2007-2009

Situation of the worker regarding hepatitis B vaccination	2007		2008		2009	
	n	%	n	%	n	%
Vaccinated	131	50.6	227	53.9	338	68.9
Non vaccinated	65	25.0	112	26.6	86	17.6
Ignored/blank	63	24.3	82	19.5	66	13.5
Total	259	100.0	421	100.0	490	100.0

Source: SINAN/SUVIGE/CEREST/SESAP

In the evolution of the cases of accident with biological material, it was noticed that 87.3% of the notifications (no=1,021) reported the conclusion as

ignored or unknown. This epidemiological information shows the loss of the supervision of the health professional and reveals that there is no register of seroconversion, or not, of the health professional after biological exposure.

## DISCUSSION

The nursing team (nurse, technician or nursing assistant) constitutes the professional group with the highest number of participants in the health service, rendering assistance to the patients, performing a diversity of invasive procedures or not, thus being more vulnerable to the exposure to the biological material and consequently to the acquisition of infectious diseases<sup>(1)</sup>. Furthermore, those are the professionals with the longest time of permanence in the health services and therefore, with the highest time of exposure to accidents.

The main cause of work accidents with exposure to biological material was related to the handling of sharps. So, it is observed that the circumstances and frequency of the handling of this material by health professionals contribute to increase the risk of accidents and the consequent exposure to biological material, especially blood<sup>(5)</sup>.

It was also noticed that the biological accidents involving nursing assistants kept stable or even decreases, but the cases involving technicians and nurses tripled in the period analyzed. Results of researches made in health services with workers who suffered work accidents with the exposure to biological materials, showed that the nursing team was the category which presented the highest number to exposure to this kind of accident, being the sharps the main cause<sup>(6-10)</sup>.

This research also revealed a high occurrence of accidents among physicians, odontology and laboratory professionals. This situation shows that these health workers who perform invasive procedures are more

vulnerable to this kind of accident, corroborating the exposure to the biological risks in the health services<sup>(5,7,10)</sup>.

One of the factors which contribute to increase the vulnerability to the exposure to biological risks is the lack of knowledge and sensitization by part of the health workers in subject regarding the health of the worker<sup>(1)</sup>.

Results of researches made in health services throughout the country highlight that the factors which cause or contribute to the occurrence of accidents with exposure to biological material are: little professional experience, inadequate conditions of work, lack or inadequacy of equipment of protection, physical and mental tiredness, need of greater agility in the performance of the routine activities, handling of sharps, manipulation of biological materials, among others<sup>(4,10-16)</sup>.

Blood was the most present organic material in the accidents with exposure to biological material, which has been frequently reported in studies made on this topic, being responsible for contamination that can generate infections in the exposed workers<sup>(10-12)</sup>.

The transmission of several types of viral and bacterial agents is registered after the accident with sharps, once the human blood is one of the main sources of contagion. The HIV-1, the HBV and the HCV are the most frequent agents involved in these occupational infections. The prevention of the exposure to blood or to other biological materials is the main measure not to occur infection by pathogens of blood transmission in the health services. Basic precaution or standard precautions are normalizations which aim at reducing the exposure to biological materials and these measures must be used in the handling of medical hospital articles and in the assistance to the patients. Besides that, the appropriate behaviors to be adopted after the exposure are also an important component of security in the work environment for the worker and for the patient<sup>(4,10,17)</sup>.

However, the non implementation of the measures of bio-security, both by the workers and by the managers of health services in Brazil, it was frequently noticed, a explicit noncompliance to the legislation related to the promotion of health and security of the worker showing little concern with prevention. That posture is sustained by a strongly curative practice in the area of health from the education to the professional practice<sup>(1,14,18)</sup>.

Besides the risks for the health of the professionals, the accident with exposure to biological material brings with itself the stigma of the possible contamination, the risk of the transmission of diseases to the family members and patients, the prejudice, the difficulty to re-adequacy to the professional activities, besides the trauma and the fear experienced in the long and conflicting process involved in the post-accident procedures. Such facts generate changes in the life of the victimized worker which are many times irreversible<sup>(1,10)</sup>.

This study showed that half of the health professionals had not been vaccinated against hepatitis B or there was no record of vaccination regarding them. Such fact shows that these workers are susceptible, and this condition is inadmissible once hepatitis B is an immune-preventive disease whose vaccine is available in the public health system, with special indication for the workers in situation of risk for accidents with exposure to biological material. Other studies presented similar results<sup>(7,15)</sup>.

The transmission of the HBV after the exposure to blood or body fluids in health services represents an important risk for the health professional, ranging from 6% to 30%. Therefore, the vaccination against hepatitis B is especially important once the risk of transmissions of the virus of hepatitis B is from 3 to 5 times higher in these health professionals than in the community. The vaccine must be granted to all the workers who are in risk of occupational exposure to blood or its derivatives,

besides other materials potentially contaminated with secretions of patients and accidents with sharps<sup>(3,16-20)</sup>.

Considering that the health professional present an increased risk of acquiring and transmitting infectious diseases in the performance of work activities or in the occurrence of accidents, it becomes indispensable that these workers are properly immunized. The vaccination decreases the risk of morbidity by immune-preventive diseases and the active immunization is considered one of the most effective ways of prevention (90 to 95%)<sup>(19-22)</sup>.

Nevertheless, after the complete accomplishment of immunization against hepatitis B it is necessary to test anti-HBs in order to verify the vaccine response in the vaccinated workers. This test is very important once many health professionals, despite being vaccinated, are not protected against the infection by HBV, probably for not having completed the vaccine procedure or for not presenting adequate vaccine response<sup>(10,19-22)</sup>.

A research which analyzed accidents caused by sharps involving the nursing team of a university hospital identified the discontinuity of supervision of the injured health professional, of all the accidents occurred, 5.4% had such procedure. The non adhesion to the treatment can be linked to the physical and psychic difficulties faced in a chemoprophylaxy of preventive character. It is also considered that the negative results of the immediate serology lead to the neglecting of the continuity of the proper following<sup>(9-10,20)</sup>.

Similar results were found in a research developed in a hospital of the state public health system of reference in HIV/Aids in the Northeast, proving that most of the nursing professionals, who suffered work accident with sharps, were nursing assistants, of the female sex, working from 9 to 18 years in their profession, suggesting a possibility that the physical and psychic stress originated in the professional practice for a prolonged time in the profession, and, in most cases, the professional practice was in more than one health

institution, favoring the occurrence of work accidents with sharps<sup>(15)</sup>.

Considering the fact that the health workers are permanently in contact with biological agents, the observance of the principles of bio-security in the assistance to the patients in all the situations of the care is fundamental<sup>(10,15,18-22)</sup>.

Facing the magnitude of the occurrence of the accident with exposure to biological material among health workers, the current tools of protection to the health professional within the regulating the Regulatory Norm 32 are highlighted, as well as their recommendation concerning the Plan of Prevention of Risks of Accidents with Sharps<sup>(23)</sup>.

In this context, this study shows a progressive increase in the notification of the cases of work accidents, especially the biological ones. This is probably due to the deeper knowledge of the existing legislation and the obligatoriness of its compliance by the employers<sup>(24)</sup>. Besides that, the workers are now better informed as to the importance of the legal necessity of the notification of these accidents.

However, the sub-notification related to the work accidents is still a serious problem in Brazil which hampers the activities of prevention and control of this harm of unquestionable epidemiological importance and of great impact in the process health/disease of the health worker, especially the nursing professional<sup>(5,10,20,25)</sup>.

The most important limitations of this study were the deficiencies found in SINAN, once much information is ignored and left without filling the notification and investigation forms, which jeopardizes the epidemiological characterization of the situation of the accidents with biological material in the state of Rio Grande do Norte, Brazil. This situation jeopardizes the planning and organization of the activities of promotion, specific prevention and supervision of the injured health professionals once the lack of information does not allow

knowing about the reality in a more trustworthiness manner.

## CONCLUSION

A progressive increase of work accidents notified at SINAN was noticed, in the state of Rio Grande do Norte, Brazil, from 2007 to 2009, especially related to the exposure to biological material.

It is understood that such fact is resulting from a better understanding of the worker regarding the importance of the notification of these accidents, and the health services, in turn, are more prepared to notify these cases through the commissions of control of infection and of the hospital epidemiological surveillance.

The largest numbers of notified cases occurred among the nursing workers especially the technicians and nurses, a category that has historically been affected by accidents with exposure to biological materials, due to the characteristics of the work they perform and also by the great number of workers.

There is a sub-register of the data of accidents with biological material, once many data were found ignored or in blank in SINAN. Such fact strengthens the need to improve the process of investigation and registration of accidents, once the sub-registers and the inconsistencies make SINAN less trustworthy in the characterization of the epidemiological profile of these harms.

There is the discontinuity of supervision of the injured health professional, once the register of seroconversion of the health professional post-biological exposure is made or not. So, the supervision of the affected worker and conclusion the accident is lost, which is the main objective of the care and recovery of the worker.

For the nursing team, the knowledge of the occurrences of biological accidents which jeopardizes the health of the workers, provides the taking of decision for changes and improvement in the practices regarding the

risks and the adhesion to measures of biosafety in order to make them safer.

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#### COLLABORATIONS

Cavalcante CAA, Cavalcante EFO and Macêdo MLAF contributed for the conception, analysis and data interpretation, writing of the article and final approval of the version to be published. Cavalcante ES and Medeiros SM contributed for the writing of the article and final approval of the version to be published.

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