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Notification of work accidents with exposure to biological material: cross study

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ABSTRACT

Objective: To identify the occurrence and characteristics of work accidents recorded in the Information System for Notifiable Diseases (SINAN) directed to the Regional Centre for Occupational Health (CEREST) from an inland city of Sao Paulo, Brazil. **Method:** Descriptive, transversal and quantitative study, composed by data sheets formed by WA directed to CEREST, 2010. **Results:** 52 WA, of which 34.5% were preventable. Of the total, 61.5% involved nursing staff, 15.4% nursing students and 15.4% cleaning professionals. In 23.1% the source was unknown and in 5.8% the source was positive for HIV. Chemoprophylaxis was prescribed to 34.6% of the victims. There was no serologic conversion registered, but 3.5% abandoned treatment and 25.9% did not meet the development. **Conclusion:** The inadequacy of the Registration Tool WA hampers the adoption of preventive strategies, revealing the need for training of workers responsible for the records.

Keywords: Occupational Accident; Exposure to Biological Agents; Nursing

INTRODUCTION

Work accident (WA) is defined as the occurred by the exercise of work at the service of a company, causing bodily injury or functional disorder that causes death, loss or reduction of work capacity, which may be temporary or permanent. It further states that the WA is independent of participation of workers in the labor market. It is also considered to be a work accident the professional disease and occupational disease[1].

Among the occupational hazards, biological risk is very discussed topic in recent decades and deserves attention because of the serious problems it causes, not just the individual at risk, but for the family, community and state. Occupational exposure to biological hazards may lead the exposed worker to serious health problems and even death, in which case the most troubling are the ones involving exposure to HBV, HCV and HIV viruses[2].

Ordinance No. 777/GM of the Health Ministry[3], sets forth the technical procedures for mandatory reporting of injuries to workers' health, which makes a total of 11 grievances, among which is regulated the notice of WA with exposure to biological material. The regulation of the notification of these conditions should be made on a specific sheet, standardized by the Ministry of Health, in the Information System for Notifiable Diseases (SINAN) and specific sentinel networks, like the Regional Centers of Occupational Health(CEREST).

According to the Ministry of Health, 2007[4], the systematic use of SINAN NET, in a decentralized manner aims to contribute to the democratization of information related to aggravations in health, allowing health professionals to have access to information, in order to make them available to the community. Thus, the SINAN NET fits as an important instrument to assist in health planning, focusing on defining priorities in interventions and evaluating their impact.

In 2007, the *Centres for Disease Control and Prevention*[5] published an updated guideline regarding safety precautions aimed at the health team, called Standard Precautions (SP). The SP includes a group of practices to prevent infections that are applied to all patients

regardless of infection status confirmed or suspected in any health care institutions. These include: hand hygiene, the use of personal protective equipment (PPE) like gloves, waterproof aprons, masks, eye protection; safe working practices in order to prevent contamination of professionals to biological agents potentially contaminated, including the correct handling of sharps, health surveillance targeted to vaccination of health professionals and patients, among other safe health practices.

In Brazil, since 2005 it was approved the Regulatory Norm for Safety and Health in Health Care Work - RN 32[6], which aims to establish guidelines in order to implement measures of protection and safety to the health of workers placed in health institutions as well as workers engaged in promotion activities and health care in general.

According to this RN, it is established the following: every health institution should provide the provision of Personal Protective Equipment (PPE) to workers, assessment and recognition of the diseases to which workers are exposed, the location of risk areas, the medical surveillance of workers potentially exposed, as well as the establishment of the vaccination program of immuno-preventablediseases such as Hepatitis B.

The Centres for Disease Control and prevention[7], shows that 143 new cases of HIV infection were reported among health workers in the U.S., which reported no other risk factors associated with exposure to HIV between 1981 and 2006, and whose reports were occupational exposure to blood, other body fluids or laboratory material contaminated by the virus, but seroconversion after exposure was not documented. In addition, 57 other health workers presented seroconversion to HIV in the U.S. after occupational exposure, and 26 were infected by the acquired immunodeficiency syndrome.

Therefore, the number of workers who have acquired due to occupational reasons is unknown and it is noteworthy that, according to the source because of the voluntary nature of the reporting system, there might be cases of underreporting, and the relatively low number of documented and possible cases of seroconversion, may not reflect the reality of the number of actual cases of accidents.

A study conducted in the same city in the countryside of São Paulo with consultations to

SINAN NET AT with biological material of the period between 2008-2009 revealed the possibility of underreporting by the health facilities, compared with the number of workers exposed in each institution and the amount of casualties[8].

Given the above, the epidemiological analysis of information of AT with notified biological material in CEREST through SINAN can provide support for planning and implementation of interventions aimed at preventing and controlling these diseases, as well as investigation of possible underreporting of the data.

OBJECTIVES

Identify the occurrence and characteristics of occupational accidents with exposure to biological material occurring among workers in health institutions linked to a Regional Reference Center for Occupational Health.

METHODS

Descriptive study, cross-sectional and with a quantitative approach of data. The population of the study was composed by the notification forms of the Disease Surveillance System (SINAN-NET) concerning AT with occupational exposure to biological material, in 2010, involving professionals placed in health institutions in São João da Boa Vista - Brazil who suffered AT and were directed to the Regional Reference Center for Occupational Health.

Data were collected from January to December 2010 regarding the following health facilities:

- Unit A: A philanthropic Hospital with 224 beds.
- Unit B: institutions tied to the City Hall (eight Basic Health Units (BHU), five Family Health Programs - PSF, an Ambulatory of Specialist Care (ASC), two Clinical Analysis Laboratories (CAL) and an Emergency Room (PS).
- Unit C: A private Hospital linked to the Cooperative.
- Unit D: School for training technical nursing professionals.

- Unit E: Institution of Higher Education, trainer of nurses.
- Unit F: Private institution specialized in kidney diseases.

The characteristics of AT recorded were obtained by means of the following variables present in standardized SINAN form for the AT notification with biological material: professional category, type of exposure; organic material involved, the circumstances of the accident, the causal agent, use of Personal Protective Equipment (PPE) at the time of the accident, vaccination status of the worker in relation to Hepatitis B and behaviors after occupational exposure.

Moreover, the risk coefficients (RC) were calculated for each occupational category exposed to the risk of occupational accidents with biological material, and this is the result of all casualties of each institution by the total number of exposed workers.

Information was collected by one of the authors of the research and recorded and encoded in a spreadsheet, in the form of an Excel Database for Windows, transferred and analyzed by Epi-Info software, version 3.5.1.

The project was approved by the Ethics Committee in Research of the Nursing School of RibeirãoPreto / USP, according to Resolution 196/96, the National Council of health[9]. For the study, was requested authorization from the coordinating body of the CEREST from São João da Boa Vista. The project was authorized under protocol 1128/2010.

RESULTS

During the observation period were recorded 52 AT among employees of the institutions listed in Table 1.

Table 1 - Characteristics of workers who are victims of occupational accidents with exposure to biological material according to the variables: age, professional category and health institutions. Sao Joao da Boa Vista - Brazil, 2010

Variables	2010 (n= 52)

	N	%
Age (years)		
19 |☐ 30	14,0	26,9
30 |☐ 40	20,0	38,5
40 |☐50	11,0	21,1
≥ 50	6,0	11,5
Gender		
Female	45,0	86,5
Male	7,0	13,5
Professional category		
Nursing Assistant	20,0	38,5
Nursing Technician	6,0	11,5
Nurse	6,0	11,5
Cleaning worker	4,0	7,7
Nursing student	4,0	7,7
Others	12,0	23,1
Health institution		
Santa Casa de Misericórdia	13,0	25,0
Prefeitura Municipal	14,0	26,9
Private Hospital Co-op	9,0	17,3
Technical school of nursing	3,0	5,9
Institution of Undergraduate Education	2,0	3,8
Private Institution for kidney diseases	2,0	3,8
OtherInstitutions	9,0	17,3

Blood was the material involved in 76% of exposures to fluids with blood, pleural fluid and cerebrospinal fluid were present in 6.0% of the exposures. In 12% of exposures were reported other non-specified materials.

As to the type of exposure suffered, the accident with percutaneous exposure was responsible for 78.8% of the exposures and only 5 cases of mucosal exposure were reported. With regard to dermal exposure, the exposure of healthy skin was 30.8% and 3.8% cases of exposure to broken skin. It is noteworthy that in some AT there was more than one type of exposure.

The needle with lumen was responsible for 63.5% of the exposures, those without lumen for 9.6% of the accidents. The glasses, the lancets and blades totaled 7.6% and 17.3% of reports indicated other sharps.

Table 2 - Distribution of occupational accidents according to the circumstances responsible for the accidents that occurred in health institutions. São João da Boa Vista - Brazil, 2010

Variables	2010 (n=45)	
	N	%
Circumstances of the Accident		
Intravenous medication application	2	3,8
Intramuscular medication application	4	7,8
Subcutaneous medicationapplication	3	5,8
Intra-dermal medicationapplication	0	0
Venous/arterial puncture for blood collection	3	5,8
Non-specified venous/arterial puncture	1	1,9
Sharps disposal in garbage bag	5	9,6
Sharps disposal in other places	2	3,8
Laundry	0	0
Material Washing	1	1,9
Handling of box with sharps	9	17,3
Surgical procedure	4	7,8
Dentistry procedure	0	0

Laboratorial procedure	1	1,9
Dexter	2	3,8
Recapping	2	3,8
Others	13	25
Ignored	0	0
TOTAL	52	100

The immunization status of the victim showed that 100% were vaccinated against Hepatitis B, but regarding the efficacy of immunization, five workers proved to be negative for anti-HBs, two records reported an inconclusive result, and in two notifications this important data was not reported, which makes a total of 18.4% of the victims. Of the notifications made, 40 have reported to have the antibody, which matches 81.6% of cases. Regarding the Anti-HIV two cases were not met, two cases were inconclusive, in two cases the test was not conducted, in three injured the item was ignored and this finding was not filled in a form, which amounts to 17.3% of notifications. The registration of Hepatitis C serology was inconclusive in two cases, was not performed in two accident victims and was not completed in three occurrences, totaling 13.5% of notifications.

The source patient was known in 75.0% of the cases; in 23.1% of the notified AT the source was not reported; there were two cases of non-compliance and a notice was ignored. Serological tests showed three positive tests for HIV, confirming the severity of this type of occupational accident; no cases were reported positive for Hepatitis B and C, but in 13.6% of exposures serum testing was not performed.

With regard to decisions taken at the exposure to potentially contaminated biological material, it was found that 18 workers (34.6%) needed to use chemoprophylaxis. The standard form of SINAN NET reports developments in the case of the affected professional and the analysis shows that there were no notifications of discharge with serologic conversion. In 36.5% discharged was allowed without conversion and in 48.0% discharge was prescribed because the source patient had of negative serology results.

However, it was reported that there were two cases of abandonment by the professional, being that to one of these was prescribed the indication of antiretroviral chemoprophylaxis. Six reporting sources did not meet this information, adding 11.5% of the developments.

The Work Accident Communication (CAT) was issued in 84.6% of occupational accidents; in 5.8% of cases it has not been completed and in 9.6% of cases the data was ignored or not properly completed.

To better understand the chance of occurrence of the reported accidents, we calculated the hazard ratio (RC) for the classes most affected by these injuries, nursing assistants, nursing technicians, nurses, cleaning workers and nursing students. The RC is the result of the total number of injured by the total number of workers exposed to biological risk, by occupational category in each health institution.

Thus, the Unit A reported 13 AT with exposure to biological material, of a total of 236 exposed (RC=5.5). The RC by occupational category shows that nurses had the highest RC exposure, and of the total of 21 workers exposed to risk, three were hurt (RC=14.2). The auxiliary totaled four occurrences (RC=4.0), the nursing technicians three accidents (RC=3.9) and cleaning workers only one notification (RC=2.4). It is worth noting the occurrence of an accident with a surgical instrumentator and only one AT with the medical class.

Unit B, represented by health institutions linked to City Hall, there was notification of 14 AT with biological material (RC=9.0). 12 accidents were registered with nursing assistants (RC=11.0), the professional category most affected in this Unit. It is noteworthy that there were two records of accidents involving laboratory assistants.

Unit C, the private hospital linked to the cooperative, notified the occurrence of nine AT in 2010, of 13 workers exposed (RC=6.9). The working class that was more affected was the cleaning workers (RC=14.3), followed by nurses (7.7). Three accidents involved nursing assistants (RC=6.7) and three technicians (RC=5.7).

Unit D, technical school of nursing, has notified three accidents with biological material involving their students, with nearly 75 exposed per year (RC=4.0). Unit E, Higher Education Institution, reported two accidents, with 140 students exposed (RC=1.4).

Unit F reported two exposures, in which the cleaning worker is the victim in one instance, out of a total of eight workers (RC=15.3) and the other notification came from a social worker who was in contact with intact skin of potentially contaminated biological material.

DISCUSSION

The age of the exposed group ranged from 21 to 61 years, averaging 35 years of age. The predominant gender was female, covering 86.5% of the victims (Table 1), related to the fact that the vast majority of casualties were nurses and nursing students (69.2%), which agrees with the findings in the literature that females are still predominant[8.10].

Nursing assistants represent the majority of accidents (38.5%), followed by nursing technicians and nurses (11.5%, respectively), cleaning workers and nursing students (7.7%) and 23.1 % was represented by other professionals, such as laboratory assistants, dentists, social worker and soldier. The nursing staff was represented by 61.5% of all accidents.

The professional category of nursing resonates as the most affected by this kind of work accident, considering that out of the 57 documented cases of occupational HIV in the USA, 24 are represented by nurses[7].

Cleaning workers and nursing students were the second most affected category by these injuries. The cleaning professionals (7.7%) deserve special attention, since they are faced with cutting materials from unknown sources, which intensifies the severity of the exposure and the need for the use of chemoprophylaxis. In addition to these reports, the two notifications from third-party Company that provides cleaning services at City Hall are added up. Half the AT with these professionals was from unidentified sources, which

intensifies the seriousness of the accident and the physical and psychological effects resulting from occupational exposure.

The involvement of nursing students directs it in a way that biosecurity practices are reviewed by the curricula of institutions of Undergraduate Education, as some studies have shown that the higher the transmission of knowledge related to occupational diseases, the greater adherence of these to the measures of standard precautions[11].

In the notifications categorized by "other institutions" there is the relationship of three AT occurred in a doctor's office, medical clinic and a clinic specialized in the administration of vaccines. These reports also contemplated two occurrences of AT with cleaning workers of a third party company that provides services to the City Hall. A private company aimed at producing ceramics reported two incidents involving a dental assistant and a dental surgeon in 2010, when providing dental care to factory workers. There were two reports involving soldiers from the Military Police, in which case the two accidents were caused by scratching with the transmission of blood.

A percutaneous exposure was responsible for 78.8% of exposures, as the findings of the literature[8,10].

In 10.6% of cases there was exposure of the mucous membrane and in 36.5% exposure to intact skin. It was found that in some accident there was more than one type of exposure. The records are consistent with a moderate compliance of the injured to the procedure gloves (59.6%) and poor adherence to the apron (26.9%). individual Goggles and masks were used in only 15.7% and 9.8% of procedures, respectively. These protective devices should be used whenever there is possibility of splashing of any potentially contaminated biological material[5].

The use of gloves is essential for the safety of professionals when performing procedures with needle stick materials because the risk factors for the acquisition of seroconversion after exposure to biological material depend on the amount and degree of contact of the worker with the inoculated blood[12]. Findings in the national and international literature meet the evidences of this research, revealing low to moderate adherence of health professionals to the use of gloves[13-14-15].

The addition of preventive measures is considered the best strategy to reduce the occurrence of occupational accidents caused by sharps. To take effect, prevention programs should focus on primary prevention carried out through analysis of work practices, so that one can identify the risks in the workplace and perform the engineering and ergonomic controls of the instruments and materials that reduce the occurrence of percutaneous injuries[16].

Of the 18 workers who needed to make use of chemoprophylaxis, it was prescribed AZT + 3TC to most of the cases, and in three instances there was indication of AZT + 3TC + Efavirenz, AZT + 3TC + Kaletra and AZT + 3TC + Lopinavir + Ritonavir, respectively . Refusal of prophylaxis has been reported in one case, in which the source patient was known, but without notification of the results of serological tests, which agrees with the seriousness of the accident and the possible consequences of it. The service to the affected employee should be done immediately, preferably within the first two hours after the accident. The health worker needs to be monitored and guided at the moment of the accident and during the whole period of treatment prescribed. Special attention should be provided to the victim, as the biological exposure affects him psychologically and emotionally, because of the waiting for the results of serological tests and possible seroconversion[17].

With regard to the recommended immunization scheme against Hepatitis B, it should be performed in the first days of life, at the interval of the three recommended doses, so that the individual's immune response may be achieved. This vaccine is extremely safe and effective, with 90-95% of vaccine response in immunocompetent adults. Its side effects are rare and usually minor. There is no contraindication to the use of vaccine in pregnancy and lactation. Its effectiveness is long and may exceed ten years, not requiring reinforcement, except in cases where post-exposure and health professionals who do dialysis[18].

Tests performed at the time of AT revealed that three patients were positive for HIV and in 13.6% of reports, serologies were not performed. Having as reference the total number of source patients known, 39 patients (75%), there is the prevalence of 7.7% of HIV in the studied population. Thus, researchers warn so that cities with large numbers of residents and municipalities in growth trend, as is the case of the municipality examined in this study, improve the model of intervention aimed at prevention and better coverage of primary health care in a way that educational strategies aimed at reducing HIV transmission are designed and implemented[19].

Of the total number of reports, two of them underwent only anti-HIV testing in the source patient, which demonstrates the need for awareness of the reporting units when there is an AT involving biological material on the risk of contamination of viruses B and C. The focus should be directed to occupational exposure to the Hepatitis C virus because

there is no existing prophylaxis at the moment. The action recommended for workers who had accidents with HCV positive source consists in performing some tests, taking into account that at the moment of the accident the serum alanine aminotransferase test (ALT) should be carried out and pursue the tracking[17].

The injurious circumstances show that 34.5% of the occurrence of AT was due to: disposal of sharps in trash bags, sharps disposal elsewhere, recapping and manipulation of sharps box, and this last one was responsible for 17 3% of recorded accidents.

Analysis of notifications of this city held in the period 2008-2009 reported an occurrence rate of 8.5% and 7.8% of AT related to the handling of cases of needlestick collector[8]. Given the growing number of AT by this causality in 2011 (17.3%) and since this is a preventable condition, it is suggested the planning of interventions to raise awareness of the professionals of health facilities.

In order to develop effective strategies, health education should be taken as a premise for nurses and health professionals with a view to enable the transformation of health practices[20].

The evolution of the event of the injured professional showed that there were no cases of serological conversion. Most professionals were discharged because the source patient was negative to serology (48.1%) or was discharged without serologic conversion (36.5%). Cases of non-compliance were 11.5% and there were 3.8% cases of abandonment.

As to the opening of CAT, in every circumstance of AT with biological material, with or without removal of the worker, the CAT should be issued, even with the notification of AT at SINAN[6].

The cleaning professionals were the most affected by this type of accident (RC=15.3, RC=14.3). Then there are the nurses (RC=14.2, RC=7.7) and nursing assistants (RC=11.0 RC=6.7), with findings similar to the research conducted in this city in the years 2008 and 2009[8], except for nursing students, in which a decrease was noticed in the records of this AT targeted to CEREST.

The category of physicians was recorded in only one AT with potentially contaminated biological material, number that was not statistically significant compared to the number of workers exposed in several health facilities. Furthermore, we observed a decrease in notifications by these professionals compared the years 2008 and 2009[8]. Researchers say the likely underreporting of AT with exposure to biological material among professionals is related to the lack of awareness of the risk by workers and management of hospitals; the fear on the part of leadership and fear of job loss by the worker; the culpability on the part of the injured; the lack of organization of the actions for proper care service to the worker; the difficulties of the information system and also to the disbelief of the importance of AT with exposure to biological material[21].

Of the health units surveyed, Unit B had the highest number of notifications involving AT with exposure to biological material (RC=9.0), which shows an increase in notifications compared to the year 2008 (RC=6.6) and 2009 (RC=3.3)[8].

The private cooperated hospital (Unit C) comes in second (RC=6.9), showing a slight decrease compared to the years 2008 and 2009. The same goes for the philanthropic hospital (Unit A), which RC was presented as declining when compared to the previous biennium (RC=7.0 in 2008 and RC=6.0 in 2009)[8].

CONCLUSIONS

The number of AT with biological material recorded in SINAN and directed to CEREST is low considering the population exposed and the literature data, which mention some impeding factors or discouraging to the notice of AT. However, given the importance of the record of this information for the planning of preventive actions to the occurrence of AT with exposure to biological material, it is necessary to raise workers' awareness regarding the importance of notification, to train and prepare professionals to properly record the data and improve the flow of information to feed the electronic system.

Further studies are needed to investigate which difficulties are encountered to notify the AT, because the small number of AT reported may be underestimated when analyzing the number of exposed workers and the amount and diversity of procedures performed by professionals working in health facilities that involve risk of exposure.

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