Bulletin of the *Transilvania* University of Braşov
Series VI: Medical Sciences • Vol. 7(56) No. 1 - 2014

THE STUDY OF PRODUCTION CONDITIONS AND THE PREDISPOSING FACTORS IN THE ACCIDENT WITH EXPOSURE TO BIOLOGICAL PRODUCTS OF HEALTHCARE PERSONNEL

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Abstract:
Background: *Some professional categories are more susceptible to accidents also some measures are often causing exposure to biological products.*
Method: *Descriptive analysis of data collected from 326 cases recorded in the Registry of case accidents within the Cluj Public Health Department.*
Results: *The large hospitals in Cluj-Napoca report the highest number of exposure. The most affected was the age between 25-29 years old. Over 81% were female. 65.03% of exposures occurred between 06 AM and 2 PM. Most exposures were needle stick injuries - 248 cases, followed by the projection of fluids on mucous membranes or injured skin and cutting injuries. Most people, 95.09%, correctly applied the measures after exposure, but ¼ of the injured medical personnel was not wearing the appropriate protective equipment.*
Conclusions: *This study identified the need to improve knowledge of health personnel on preventing the exposure to biological products, and their reporting need.*

Keywords: *exposure to biological products, health personnel, predisposing factors, reporting, prevention.*

1. Introduction

Regarding the nature of the work they perform, the healthcare workers present at any time the risk of injury through different mechanisms that lead to exposure of biological products and potential pathogens of serious illnesses [4], [14].

Knowing more precisely the main production mechanisms and the factors that may increase disease risk of exposed personnel; we can propose and implement additional safety measures [7], [29], [30],

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[31]. The degree of fatigue, evidenced by the number of worked hours before the accident, is also a factor that influences the potential for injury [1], [8].

Potential improvement of working conditions could be provided; certain working procedures could be revised and information activities of medical personnel to comply with good practice could be organized [7], [8], [24], [27].

2. Material and method

This is a retrospective study, for a period of five years (2008-2012); the database from the Department of Epidemiology of the Department of Public Health Cluj has been used. Data collection was retrospective longitudinal by consulting the Register of evidence in cases of accidents involving exposure to biological products completed on mandatory reporting of medical units on "Post-accident sheet monitoring the exposure to biological products of health personnel". Data processing was made using Excel 2010.

The variables used in the study are qualitative and were as follows:

1. Sanitary units where there have been accidents with exposure to biological products
2. Activity profile sections, departments, laboratories, home patient etc, where the exposure occurred
3. Occupational categories: the medical and non-medical staff, but in contact with health facilities
4. Age groups: include 9 groups
5. Distribution by gender
6. Seniority in current position
7. Day time when the accident occurred
8. Exposure type: needle sticks injuries, cutting, projecting of biological fluids
9. Mechanism of the accident
10. Wearing protective equipment
11. Known or unknown status of the accident source
12. Applying immediate measures after the accident
13. The time from the injury to the first aid

It was conducted a descriptive analysis of data collected from 326 cases recorded in the Registry of accident cases with exposure to biological fluids. The data were processed by statistical and mathematical methods; their presentation was made in Excel.

3. Results

During 2008-2012 in Cluj County, based on the monthly reports received from health units, the County Public Health Department registered 326 cases with exposure to biological fluids. After the county health units, most cases reported are coming from large state hospitals, - Regional Institute of Gastroenterology-Hepatology "Prof. Dr. Octavian Fodor" 29.45%, Emergency County Hospital 26.99%, few cases were reported from private or public hospitals with low number of beds, private laboratory, but few exposures of medical staff during home patient care.

There are differences between the profiles of the sections where the event occurred, more frequently was in the surgical units, including operating rooms - total of 29.76%, of which two thirds are in the operating room. Next are the medical units - 28.83%, and intensive care unit - 15.95% (Table 1).

Table 1

Profile sections where exposure to biological fluids occurred

Units	No. of cases	Percentage (%)
Medical units	94	28.83
Operating room	62	19.02
Intensive care unit	52	15.95
Surgical units	35	10.74
Emergency	26	7.98
Interventional manoeuvres	14	4.29
Waist space	8	2.45
Paediatrics	7	2.15
Ambulatory	5	1.53
Home partients	4	1.23
Laboratory	3	0.92
Hospital Laundry	3	0.92
Anatomic pathology	2	0.61
Sterilization	2	0.61
Delivery room	2	0.61
Courtyard	2	0.61
Blood transfusion unit	1	0.31
Not specified	4	1.23
Total	**326**	**100.00**

Analysing the different professional categories, more than half of the cases were encountered in nurses - 51.23%, followed by resident physicians - 17.79%, caregivers, physicians and cleaners. A small number of cases have been reported in non-medical personnel, but which carries on activities inside a sanitary unit: psychologist, driver, electrician (Table 2).

Table 2

Professional categories that reported exposure to biological fluids

Professional category	No. of cases	Percentage (%)
Nurse	167	51.23
Resident physician	58	17.79
Caregiver	28	8.59
Physician	24	7.36
Cleaner	20	6.13
Practitioner student	6	1.84
Stretcher	5	1.53
Student	4	1.23
Paramedic	3	0.92
Laundrywoman	3	0.92
Driver	2	0.61
Psychologist	1	0.31
Imagistic technician	1	0.31
Electrician	1	0.31
Not specified	3	0.92
Total	**326**	**100.00**

8 age groups were created; most cases were registered in the range of 25-29 years - 85 exposures, representing 26.07%, followed by age group 30-34 years and 35-39 years - 65, respectively 67 cases. The average age was 35 years old.

As a professional experience we can analyse the people's length of work in their profession. Regarding the work experience 36.50% of the cases had worked between 1 and 5 years. 61 cases - 18.71% had worked between 5-10 years and 10-20 years.

81.29% were women.

It was tracked the time of the day when the accident occurred, or "morning, afternoon and night shift". In "the "morning shift", between 6 AM and 2 PM, the number of exposures registered was 65.03% of all cases. The degree of fatigue may lead to an accident. It is noticed more accidents after 5-8 hours worked.

Most exposures were needle stick injuries - 248 cases, followed by projection of biological fluids on mucous membranes or injured skin - 43 cases and cutting - 33 cases (Table 3).

Table 3

Distribution of accidents by the type of exposure

Type of exposure	No of cases	Percentage (%)
Needle stick injuries	248	76.07
Projection of biological fluids	43	13.19
Cutting	33	10.12
Not specified	2	0.61
Total	326	100

It depends on the knowledge of healthcare personnel about accidents, if they apply prophylaxis measures after exposure and how long after the accident. Data analysis shows that most people - 95.09% were able to implement these measures and in the minimum amount of time - less than 5 minutes after the accident. It was found that a quarter of the medical staff injured was not wearing the appropriate protective equipment.

The exposures occurred most frequently during the blood collection - 32 cases, mounting of various types of vascular catheters - 28 cases, administration of parenteral medication - 22 cases, re-capping needles - 18 people, but in many report sheets was not described the procedures (Table 4).

Table 3

Manoeuvres performed at the time of the accident

The procedure performed at the time of the accident	No. of cases	Percentage (%)
Not specified	95	29.14
Blood collection	33	10.12
Mounting of vascular catheters	28	8.59
Parenteral administration	22	6.75
Re-capping needles	18	5.52
Surgical intervention	16	4.91
Skin suture	16	4.91
Handling infectious waste	15	4.60
Collecting materials used in manoeuvres	8	2.45
Glucometer test	8	2.45
Handling dirty laundry	7	2.15
Prickly waste handling	6	1.84
Cleaning activity	5	1.53
Handling of unspecified type waste	5	1.53
Domestic waste handling	5	1.53
Withdraw the needle of puncture	4	1.23
Decontamination prior to sterilization	4	1.23
Endoscopy assistance	3	0.92
Blood compatibility for transfusion	3	0.92
Intubation patient	2	0.61
Handling anatomical piece	2	0.61
Handling perfusion kit	2	0.61
Patient mobilization	2	0.61
Taking the syringe after anaesthesia	2	0.61
Cutting the saline bottle with scalpel	2	0.61
Nasogastric tube suction	1	0.31
Connect the dialysis machine	1	0.31
Patient consult	1	0.31
Cleaning the drain tube	1	0.31
Remove the prosthesis of patient	1	0.31
Foot puncture with the needle from the floor	1	0.31
Handling trocar	1	0.31
Measuring blood pressure of patient with hematemesis	1	0.31
Umbilical puncture	1	0.31
CPR	1	0.31
Transport blood from the syringe into vacutainer	1	0.31
Obstetrical emergency	1	0.31
Total	**326**	**100.00**

It is important to know some facts about the source of the accident, such as the status of any carrier of hepatitis B or C, or HIV. Based on reports it was found that in almost 80% of accidents - 264 cases, the source was a known person. Analysing the tables with the presence or absence of hepatitis B and C viruses and HIV at the source, it was noted that the sheets monitoring post exposure accident are incorrectly completed to 4.5% to 12.5% of cases not being indicated the positive or negative status of the source. In approximately 30-40% of cases the source

status is listed as unknown, the tests were carried out after the accident; the results were not recorded in the monitoring sheet. Also it cannot be collect the data from the surveillance sheet regarding the follow up of post exposure to people with positive sources to one or more of the viruses of interest, because there is no appropriate box to complete that data.

Among those injured only 54% said they had done previously the complete hepatitis B vaccination. 1/3 of the subjects are not vaccinated, and about 3% of them abandoned vaccination after 1 or 2 doses.

4. Discussions

This study was conducted over a period of five years (2008-2012). 324 accident cases involving exposure to biological products to healthcare workers were analysed.

It was noted that hospitals in Cluj-Napoca reported over 95% of cases, the rest of the cases are from Turda. The cases from the smaller hospitals of the territory and medical or dental offices were not found in the database.

Most accidents occurred in medical units - almost one third of cases. In surgical units there were recorded 10% of all accidents, but if we add the events from the operating rooms, which are in surgical department's structure, it reaches a rate comparable to the medical units. Nurses reported most of the accidents, with just over half of all cases - 51.23%.

Most affected by exposures to biological fluids was the age group 25-29, representing 1/4 cases. 80% of those injured were female.

The lack of experience should predispose the occurrence of accidents and be more common among beginners. On the other hand, beginners are not providing yet care complex manoeuvres, their job is much easier. This would explain the fact that 36% of cases belong to the group with 1 to 5 years length at work.

The time of day [1] when most accidents occurred - 65% is between 06 AM and 2 PM or morning shift when both the number of medical staff at work and the number of medical manoeuvres is higher. The degree of fatigue may lead to an accident. It was observed several accidents after 5-8 hours worked [1, 8]. By type of exposure, the most common accidents - more than 75% have the way of production transcutaneous puncture [7, 29, 30, 31].

After exposure, 80% of cases of injured people acted correctly and under 5 minutes [2, 22, 30, 33], although only 75% of them wear appropriate protective equipment when the accident occurred [14], [15], [30], [33].

The procedures often involved in accidents were about 10% of the blood collecting, 8% mounting various types of peripheral and central vascular catheters and about 7% intravenous, intramuscular, subcutaneous parenteral administration [17], [21], [22]. These procedures are well defined in working protocols and the compliance with this protocol should reduce the possibility of accidents. Other procedures causing accidents are prohibited or not recommended, such as those used re-capping needle, gesture that represented 5.5% of the causes of accidents, or taking syringe from another person after anaesthesia, cutting the saline bottle with the scalpel, blood transfer collected by syringe into vacuteiner, one case being described from each. Improper medical waste sorting has been the cause of exposure to biological products [4], [13], [17], [22], [25].

To 80% of exposed cases it could be identified the source of the accident, the healthy or carrier status of the source at the time of the accident is known only approximately to 55% of cases. In the

remaining cases it was necessary to determine the source of viral markers, these results were not available by analysing the surveillance sheets [2], [23]. Health workers are not protected by hepatitis B vaccine in 31% of cases [2], [16], [24], [30].

5. Conclusions

In order to increase local hospitals and medical and dental practices' addressability it is needed to develop protocols to each health unit on accident with exposure to biological products attitudes, these protocols should be communicated to the persons involved in the provision of medical services or medical care related activities [11].

To find more accurate frequency of cases of accidents on different locations inside the medical units and their distribution on professional categories involved the circumstances of production, it is needed to develop an original questionnaire completed anonymously, that will complete this first study or support the results obtained by analysing the data that we disposed.

In order to follow the centralized evolution of post-exposure reported cases it should be introduced in post-accident monitoring exposure to biological products to medical staff sheet the sections which allows to notify the determination of viral markers to the injured person when the event occur, 6 weeks, 3 months and 6 months after the time of the accident, where the source is known to be positive for one or more viral markers [2], [3], [5], [6], [20], [30].

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