

Prevalence and Epidemiological Profile of Accidents with Exposure to Blood Among Health Professionals in Two Hospitals in the North of Togo

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Abstract: Accidents with exposure to blood (AEBs) remain a reality in healthcare settings and are, by their frequency, a major concern for health professionals. This study was conducted to evaluate the prevalence of AEBs history, to identify the types, circumstances and mechanisms of occurrence and to describe the practices of health professionals with respect to AEBs. We conducted a descriptive cross-sectional study over a period of two (02) months (September-October 2018) in two hospitals, the Kara's teaching hospital and Kara's regional hospital, both located in the north, 418 kilometers from Lomé, economic capital of Togo. The study population was represented by health professionals practicing in the district pediatrics, surgery, gynecology-obstetrics, emergencies and laboratories of the said centers. Were included in the study health professionals presents and available in the above-mentioned services at the time of the survey. Hospital staff not directly involved in patient care (administrative, mortuary staff, vigils, pharmacy salesmen) were excluded from the study. This research was a descriptive-analytical technique using interviews and questionnaires anonymized and adapted in such a way that it meets our objectives. Methods of data analysis were made using the Sphinx V5 software version 5.1.0.2. The Chi-square statistical test was used to compare the proportions with a significance threshold of 5%. The prevalence of AEBs was estimated at 67.6%. The results show that AEBs were frequent among men compared to women (72.7% vs 58.3%), without significant difference. Age, occupational qualification and seniority in the medical profession were significantly associated to AEBs. The most common mechanism of occurrence was the skin break (89.1%). The equipment or sharp objects handled at the time of the accident were a hollow needle (58.8%), and the most incriminated body fluid was blood (71.7%). AEBs are a reality in health care in Togo with a very high prevalence and concern daily all socio-professional categories especially the nurses and the midwives during the care tasks. Exposure is roughly daily, however, the amount of vaccination coverage in these two hospitals is low. In addition, for health care workers to some dangerous actions, such as disposal of used needles, lack of attention to wearing PPE will be accepted in certain circumstances without risk, it is observed.

Keywords: Accident with Exposure to Blood, Prevalence, Healthcare, Togo

1. Introduction

Accidents with exposure to blood (AEBs) remain a reality in healthcare settings and are, by their frequency, a major concern for health professionals [1-4]. In 2002, in its World Health Report, WHO estimated that of the world's 35 million health care providers, 3 million people each year had percutaneous exposure to pathogens transmitted by the disease, two million for HBV, 0.9 million for HCV and 170,000 for HIV [5-6]. Defined as accidental contact with blood or biological fluid contaminated with blood when biting with a needle, cutting with a sharp object or contact with blood or contaminated fluid on a wound, an injured skin or a mucous membrane [7], AEBs exposes the healthcare professionals, as part of their daily activities to the risk of contamination by a variety of germs [8], the most formidable of which are the hepatitis B viruses, C and HIV [9-13]. In developed countries, while the incidence of AEBs is decreasing because of the epidemiological studies that have identified the contributing factors and planning prevention [14-15], this is not the case in our countries developing countries, particularly in Togo, where sometimes unsuitable working conditions and the diversity of tasks performed by healthcare professionals make it difficult to identify a particularly risky function of AEBs [16] and Biological risk management is virtually non-existent in most health facilities. In this context, the role of the occupational health physician in the monitoring of work places and conditions is essential in order to contribute to the identification of risk factors, the compilation of statistics on occupational accidents and the development of a prevention plan adapted to the workplace [17]. The purpose of this work is to provide a database that can be used as a support for planning the prevention of AEBs and other body fluids in the health care setting. The objectives of this study are to estimate the prevalence of AEBs history, to identify the types, circumstances and mechanisms of occurrence of AEBs and to describe the practices of health professionals with respect to AEBs.

2. Materials and Methods

We conducted a descriptive cross-sectional study over a period of two (02) months (September-October 2018) in two hospitals, the Kara's teaching hospital and Kara's regional hospital, both located in the north, 418 kilometers from Lomé, the capital of Togo. The study population was represented by health professionals practicing in the departments of medicine, pediatrics, surgery, gynecology-obstetrics, emergencies and laboratories of the said centers. This population was made up of medical staff (doctors and

surgeons of various specialties) and paramedical staff (nurses, midwives, laboratory technicians, nursing assistants). Were included in the study health professionals presents and available in the above-mentioned services at the time of the survey. Hospital staff not directly involved in patient care (administrative, mortuary staff, vigils, pharmacy salesmen) were excluded from the study.

The survey support is an individual questionnaire, anonymized and adapted in such a way that it meets our objectives. It includes socio-demographic and occupational data (age, sex, professional qualification, seniority in the medical profession); the existence of a history of AEBs, the number of accidents that occurred; the AEBs profile (current task, mechanism and type, material or sharp object, contaminant involved, evaluation of biosafety and AEBs prevention practices, and evaluation of hospital staff practices following an AEBs. The questionnaire was given to each of the interviewees after an explanation of the objectives of the study, which had a period of three (03) days to fill it out and then we look for the answer. Data analysis were made using the Sphinx V5 software version 5.1.0.2. The Chi-square statistical test was used to compare the proportions with a significance threshold of 5%.

3. Results

3.1. General Information

Out of 181 professionals we met, 136 agents filled out our questionnaire (a participation rate of 75.1%). The average age of the respondents is 39.59 ± 8.45 years, with a high representation of the 35-45 age group (44.1%) and a male predominance (64.7%). The responding professionals had less than 5 years of seniority in 17.6% and more than 10 years in 48.5%. All professional qualifications were represented among respondents: nurses (55.9%); Doctors and surgeons (4.4%); midwives (11.8%); nursing assistants (19.1%) and laboratory technicians (8.8%).

3.2. Prevalence of Accidents with Exposure to Blood

Of the 136 respondents, 92 professionals reported a history of AEB, a prevalence of 67.6%. Of the victims of AEBs, 32 (34.8%) reported a single accident and 28 (30.4%) reported at least 3 accidents.

AEBs antecedents were common among men compared to women (72.7% vs. 58.3%), with no significant difference. By contrast, age, professional qualification and seniority in the medical profession were significantly associated with the history of BEA. Table 1 summarizes the prevalence of AEBs by demographic and socio-occupational characteristics.

Table 1. Prevalence of AEBs by demographic and socioprofessional characteristics.

	N	N AEBs	%	p
Age				
< 35 years	34	14	41,2	p<0.001
> 35 years	102	78	76,5	
Sex				
Males	88	64	72,7	NS
Females	48	28	58,3	
Professional qualification				
Doctors and surgeons	6	2	33,3	p=0.037
Nurses	76	58	76,3	
Midwives	16	12	75	
Laboratory technicians	12	6	50	
Carers	26	14	53,8	
Seniority in the medical profession (years)				
< 5	24	8	33,3	p=0.004
5-10	46	34	73,9	
>10	66	50	75,8	

3.3. Profile of Accidents with Exposure to Blood

It has been reported on average 2.37 AEBs per victim. The majority of these AEBs occurred during nursing and surgical procedures in 41.3% and 23.9% respectively. The most common mechanism of occurrence was skin break-in (89.1%), of which 71.7% were stings. The equipment or

sharp objects handled at the time of the accident were a hollow needle (58.8%), a full needle (13%) and a scalpel (13%). The most incriminated body fluid was blood (71.7%). Other contaminants such as biomedical waste and soiled lingerie were reported in 8.7% and 2.2% of situations respectively (Table 2).

Table 2. Profile of Accidents with Exposure to Blood (n = 92).

	n	%	p
<i>Tasks in progress</i>			
Medical care	38	41,3	p<0.001
Chirurgical act	22	23,9	
Handling of blood products	12	13	
Intervention on parturient or newborn	8	8,7	
Transport of waste, storage	12	13	
<i>Mechanism of occurrence</i>			
Skin effraction	82	89,1	p<0.001
Splash	10	10,9	
<i>Type of AEBs</i>			
Needles sticks	66	71,7	p<0.001
Cut	16	17,4	
Spash	10	10,9	
<i>Sharp material or manipulated objects</i>			
Full needle	12	13	p=0.01
Hollow needle	54	58,7	
Surgical or dental instrument	2	2,2	
Bistoury	12	13	
Laboratory materials	4	4,3	
Not applicable (projections)	8	8,7	
<i>Contaminated products under investigation</i>			
Blood	66	71,7	p<0.001
Other biological fluids contaminated by blood	16	17,4	
Biomedical wastes	8	8,7	
Dirty Lingerie	2	2,2	

3.4. Prevention Practices for Biological Hazards and AEBs

- The victims in 63% of cases were not up to date with their vaccination against HBV and 30.4% did not know their HIV status.
- In addition to the work coat, other personal protective equipment (gown, gloves, glasses, apron) were only available in 71.7% of cases. When these were available,

- they were consistently worn in only 43.5% of cases.
- In the wake of the AEBs; 84.8% had immediately stopped the current task, 6.5% had bled the injured party. The cleaning of the exposed part was carried out by 87% of the victims of which 28.3% with simple water, 47.8% with soap and 10.9% with alcohol. Disinfection of the wound followed cleaning in only 65.2% of cases.

4. Discussion

4.1. Prevalence

The AEBs are very common in health care settings and pose a health and safety problem in developing countries, particularly in Africa, because of the danger of infectious diseases [1]. The major concern of these AEBs is that of the transmission of hepatitis B and C viruses and AIDS to health care workers who are exposed to it during the multiple tasks they perform. In our study, the prevalence of AEBs antecedents was estimated at 67.6%. Our data are close to those of Patassi A in Togo in 2003, which reported 77.8% on all five hospitals [17], while Kara-Peketi K reported in 2011 prevalences of 59.6% and 62, 3% respectively in the northern region (same region as the present study) and at the national level [18]. Other authors have also found in their respective series, high prevalences [19-22]. This observation could be explained mainly in our context by the absence of a real occupational risk management system in general and particularly the risk of infection in most public and private health facilities. The inappropriate working conditions (high workload, emergency work, difficult tasks) [23], as well as insufficient knowledge of several aspects of standard precautions and inappropriate or even dangerous practices related to infectious risk reported in the health care setting by some authors could also be mentioned as explanatory factors [22, 24-26].

In our series AEBs were more frequent among men without any significant difference, comparable to the results reported by Zannou et al in Benin [27]. On the other hand, in his series, Kara-Peketi in Togo [18] found a significantly higher frequency of AEBs among women, which is also reported by other authors [23, 28]. The prevalence of AEBs by professional qualification was highest among the nurses and the midwives, the same observation reported by several authors [23, 27, 29-32], this being explained by the nurses by the heavy workload and performing care procedures most of which are at risk (intramuscular or intravenous injections, blood sampling, stitches or wound dressings). In the same instance, Yassi A and McGill M [33] had previously reported that nurses, and especially nursing students, were at the highest risk of needle sticks, thus making this occupational group the most at risk.

4.2. Profile of Accidents with Exposure to Blood

Nursing had been reported in 41.3% in the occurrence of the AEBs and in 89.1% of cases it was a skin break-in. The same observations were made by Zannou and al in Benin who reported manipulation of blood products, intravenous and intramuscular injections as a task performed at the time of the accident. AEBs by needles sticks were the most common type in our series at 71.7%, this is not a particularity in our context as almost all studies report similar findings [16, 18, 23, 27, 34-36]. However, needles sticks are closely linked to the notion of AEBs, we could dissociate needles

sticks by care acts from those emanating from practices at risk in the event of non-compliance with universal precautions (recapping, re-boring used needles) and those related to the management of health care waste (picking up dirty stained objects) as reported by some authors [21, 23, 27, 37-41]. Beside accidents with exposure to blood occurring by stings, it should also be noted as highlighted by Kara-Peketi [18], the particular situations of projections of liquids of which the midwives are victims and in relation to the variety of tasks performed in the delivery room. To prevent this type of AEBs, it is possible as recommended by Jagger et al. [42] to change the design of needles and other sharp instruments to prevent a significant proportion of percutaneous exposures. There should be a fixed barrier between the hands and the needle after use. Any security system should be built into the device and its design should be simple and require little or no training. Despite the almost universal threat of hepatitis B virus to health care workers, especially in endemic African countries, low immunization coverage against viral hepatitis B has been found in the order of 37%. Indeed, 63% of AEBs victims were not up to date with their vaccination against HVB. This situation could be likely to increase the risk of contamination following an Accident with exposure to blood if we take into account the prevalence of HVB infection (estimated at 10.87% in the general population [41], type of accident such as accidental stings (more frequent) and transmission rate for HBV ranging from 6 to 45% [18]. This could be explained by the fact that in our context, the viral hepatitis B control programs, which are based on the global health sector strategy against viral hepatitis [43], are still lacking. Regardless of these programs, the culture of workplace prevention, especially in the health care setting, is not sufficiently developed, and it should be kept in mind that unvaccinated health care staff would not only be exposed but could also be a potential source of contamination to those around them or to patients as part of chronic carriage as reported by Grob et al. [44]. If preventive measures are taken with an accent for personal protection, it appears from our data, that they are still insufficient insofar as this equipment would be available at only 70% especially for gloves, other equipment such as bibs, glasses and safety shoes are rarer [18]. It is also noted that personal protective equipment (PPE) was systematically carried only in 43.5% of cases, indicating a risk-taking by staff to increase exposure to blood or other body fluids, where the need to define protocols or procedures for care in addition to sensitization. The immediate actions to be carried out following an AEB are insufficiently mastered by our victims since only 84.8% had immediately interrupted the task in progress and 65.2% had correctly executed the emergency actions following an AEB including the cleaning of the wound followed by disinfection by a suitable solution. It is therefore essential, on the one hand, to set up and then follow the instructions and procedures in case of AEB, and on the other hand to periodically organize simulations to evaluate staff practices to ensure mastery of these procedures.

5. Conclusion and Suggestions

The accidents with exposure to blood in health care in Togo remain a reality with a very high prevalence and concern daily all socio-professional categories especially the nurses and the midwives during the care tasks. The needle sticks and the splashes are the most common types of AEB involving blood manipulation most often. Despite this almost daily exposure, it is noted a low vaccination coverage, however mandatory for health care staff as well as some risky practices such as recapping used needles, neglect of wearing PPE under certain circumstances perceived as risk-free.

According to these results, it appears necessary to establish and implement a prevention plan in a healthcare setting:

- a. define a policy to combat occupational hazards with a focus on biological risks,
- b. identify and evaluate exposure situations;
- c. define procedures for the secure realization of certain tasks;
- d. develop the culture of prevention through awareness campaigns and talks;
- e. put in place instructions to follow in case of AEB;
- f. set up a vaccination strategy for health care staff from health sciences training schools.
- g. make known and apply the general hygiene precautions (standard precautions) as well as the supply (and use) of protective equipment

Conflict of Interest Statement

The authors declare that they have no competing interests.

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References

- [1] A. Yassi, L.J. Warshaw. Health care: nature and problems of health. In: Stellman JM, Viot A, editors. [Les soins de santé: nature et problèmes de santé. In: Stellman JM, Viot A, editors.] Encyclopedia of safety and health at the work. 3rd éd French, translation of the 4th English edition. Geneva; 2002, volume 3, 97: 2-10.
- [2] L.S. Martin, R.J. Mullan, DM. Bell. Prevention of the transmission of pathogenic agents per blood way in work environment. In: Stellman JM, Viot A, editors. Encyclopedia of safety and health at the work. 3rd éd French, translation of the 4th English edition. Geneva; 2002, volume 3, 97: 44-9.
- [3] EB. Gutierrez, MH. Lopez, MA. Shikanai Yasuda. Accidental exposure to biological material in healthcare workers at a university hospital: Evaluation and follow-up of 404 cases. Scandinavian Journal of Infectious Diseases 2005; 37: 295-300.
- [4] F. Lot. Monitoring of professional contaminations by the VIH, the VHC and the VHB among health care professionals. Situation at December 31, 2007. <http://invs.sante.fr/publications/lepoinffin2007.pdf>.
- [5] World Health Organization. The world health report 2002: reducing risks, promoting health life. World Health Organization, Geneva: p. 74.
- [6] A. Pruss-Ustun, E. Rapiti, Y. Hutin. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. Am J Ind Med 2005; 48 (6): 482-90.
- [7] A. Cantineau, G. Brauer, V. Deiss, N. Guillet, MT. Hecht. Health care strategy. Accidents with exposure to blood prevention and action-formation. Care 2002; 671: 42-4.
- [8] A. Tarantola, D. Abiteboul, A. Rochine. Infection risks following accidental exposure to blood or body fluids in health care workers: a review of pathogens transmitted in published cases. Am J Infect control 2006; 34: 365-75.
- [9] Centers for Disease Control. Case-control study of H.I.V. seroconversion in health-care workers after percutaneous exposure to H.I.V.-infected blood-France, United Kingdom and United States, January 1988 August 1994. MMWR 1995; 41: 823-5 Traduction dans le BEH 1996; 18: 81-82.
- [10] D. Sicard. Occupational HIV infection risk for health care professionals. Conc Med 1992; 114 (17): 1491-6.
- [11] M. Domard, D. Abiteboul. Infectious risks analyzed by occupational sectors. Health care Professionals. Arch Mal Prof 1996; 57 (3): 312-7.
- [12] F. Lot, AC. De Benoist, D. Abiteboul. Occupational Infectious by HIV among health care professionals in France. Point at 30 juin 1998. BEH 1999; 18: 69-70
- [13] F. Lot, D. Abiteboul. Occupational HIV and HCV infections in France among health workers. BEH 1999; 44: 193-1940.
- [14] Circular DGS/DH/DRT/DSS n°98/228, 1998. Recommendations for the implementation of antiretroviral treatment after exposure to the risk of HIV transmission.
- [15] Circular DGS/DH n°98/249 of the 20th April 1998 on the prevention of the transmission of infectious agents carried by blood or biological fluids during care in health institutions. BEH 1998; 25: 107-11.
- [16] S. Doumbia, E. Bouvet, J. Diarra, F. Mentre, A. Rocaline, A. Tarantola. Predictive factors of accidents with blood exposure occurring at Treichville University Hospital (Abidjan, Ivory Coast). In: Book of Abstracts, XXII International Conference on AIDS and STDs in Africa, 2001; 12 BT3-1: 221.
- [17] A. Patassi, TN. Mangbassim. Accidents with exposure to blood among healthcare workers in five hospitals in Togo. Thesis for the graduation of the diploma of higher health technician. University of Lomé, 2003.
- [18] K. Kara-Pékéti, H. Magnang, J-S. Bonny, H. Robin, P. Frimat. Prevalence of occupational exposure to blood among healthcare workers in Togo (Africa). Arch. Mal. Prof. Env. 2011; 72: 363-369.
- [19] K. Djeriri, R. Charof, H. Laurichess and al. Occupational risk for blood exposure and staff behaviour in a cross-sectional study in 3 Moroccan health care centers. Med Mal Infect 2005; 35 (7-8): 396-401.

- [20] B. Shariati, A. Shahidzadeh-Mahani, T. Oveysi and al. Accidental exposure to blood in medical interns of Teheran University of Medical Sciences. *J Occup Health* 2007; 49 (6): 317-21.
- [21] O. Laraqui, S. Laraqui, S. Laraqui, S. Laraqui, D. Tripodi, LC. Ouazzani, A. Caubet, C. Verger, CEH. Laraqui. Evaluation of knowledge, attitudes and practices on viral hepatitis B and C in healthcare settings in Morocco. *Public Health* 2009, 21 (3): 271-286.
- [22] SP. Eholie, E. Ehui, BY. Yebouet-Kouame, BP. Simo, A. Tanon, C. Coulibaly-Dacoury, A. Kakou, E. Bissagnene, A. Kadio. Analysis of the practices and knowledge of healthcare workers on accidents with exposure to blood in Abidjan (Ivory Coast). *Med Mal Infect* 2002; 32: 359-68.
- [23] Mr. Ndiaye, comic book. Cissokho, ML. Sow. Accidents with exposure to blood at the Fann National Hospital in Dakar (Senegal). Camip 2011-1, 10p, pdf. Available online: http://www.camip.info/etudes-et-recherches/numerous-precedents/2011/Camip-2011-1/les-accidents-avec-exposition-au/Resume,2123?&var_recherche=ndiaye. "(Accessed on November 12, 2018).
- [24] NM. Bambenongama, JL. Likwela. Knowledge, attitudes and practices of health professionals regarding standard precautions in hospitals. *Public Health* 2013; 25 (5): 663-73.
- [25] F. Mérat, F. Trillaud, S. Mérat, S. Deschamps. Incidence of accidents with exposure to blood in an army training hospital. *Arch. Bad. Prof.* 2004; 65 (4): 335-39.
- [26] M. Bouhleh, S. El Guedri, AB. Afia, S. Mlayah, I. Kacem, M. Maoua, A. Brahem, H. Kalboussi, O. El Maalel, S. Chatti, N. Mrizek. Accidents with exposure to blood among young physicians: frequency and risk factors. *Arch. Bad. Prof. Env.* 2018; 79: 221-233.
- [27] DM. Zannou, G. Adè, F. Hougbe, SP. Fanou, B. Fayomi. Epidemiological factors related to accidents with exposure to blood in Cotonou hospitals (Benin). *Black African Medicine* 2006; 53 (7): 414-18.
- [28] I. Sellami, M. Hajjaji, Z. Charmi, A. Kchaou, N. Kotti, KJ Hammami, ML. Masmoudi. Causes of under-reporting of accidents with exposure to blood. *Arch. Mal. Prof. Env.* 2018; 79: 221-33.
- [29] B. Gumodoka, I. Favot, ZA. Berege, WMV. Dolmans. Occupational exposure to HIV infection among health care workers in Mwanza region in Tanzania. *WHO Bull* 1997; (75): 133-40.
- [30] D. Abiteboul, F. Lamontagne, I. Lolom, A. Tarantola, JM. Deschamps, E. Bouvet. Incidence of blood-exposure accidents among nurses in metropolitan France 1990-2000: results of a multicentric survey in 32 hospitals. *Bull Epid Hebdo* 2002; (51): 256-9.
- [31] WL. Boal, JK. Leiss, JM. Ratcliffe, S. Sousa, JT. Lyden, J. Li, J. Jagger. The national study to prevent blood exposure in paramedics: rates of exposure to blood. *Int Arch Occup Environ Health* 2010; 83: 191-9.
- [32] LH. Aiken, DM. Sloane, JL. Klocinski. Hospital occupational exposure to blood: prospective, retrospective and institutional reports. *Am Public Health* 1997; 87: 103-7.
- [33] A. Yassi, M. McGill. Determinants of blood and body fluid exposure in a large teaching hospital: Hazards of the intermittent intravenous procedure. *American Journal of Infection Control* 1991; 19 (3): 129-35.
- [34] EC. Consten, JJ. Van Lanschot, PC. Henny, JG. Tinnemans, JT. Van Der Meer. A prospective study on the risk of exposure to HIV during surgery in Zambia. *AIDS* 1995; 9: 585-8.
- [35] D. Abiteboul, D. Antona, JM. Deschamps, E. Bouvet. GERES, procedures at risk of blood exposure for nurses: surveillance and evolution from 1990 to 1992 in 10 hospitals. *BEH* 1993; 43: 195-6.
- [36] I. El Amri, W. Allouche, B. Benali, A. El Kholti. Blood exposure accidents: biological risk assessment of hemodialysis caregivers. *Arch. Bad. Prof. Env* 2016; 77: 545-6.
- [37] CH. Laraqui, D. Tripodi, A. Rahhali, M. Bichara, S. Laraqui, M. Zahraoui M and al. Knowledge, practice, and behavior of health care workers confronted to AIDS and the occupational risk of HIV transmission in Morocco. *Méd Mal Infect* 2002; 32: 307-314.
- [38] S. Pungpapong, P. Phanuphak, K. Pungpapong, K. Ruxrungtham. The risk of occupational HIV exposure among Thai health care workers. *Southeast Asian J Trop Med Public Health* 1999; 30 (3): 496-503.
- [39] M-A. Denis, G. Poyard, A. Saury, MF. Forissier, O. Robert, C. Volckmann et al. Under-reporting blood exposure accidents in a university hospital. *Arch. Mal. Prof Masson* 1998; 59 (4): 242-248.
- [40] GERES report. Accidents with exposure to blood and risk of transmission. *Knowledge Review*, May 1997: 1-47.
- [41] A. Bagny, O. Bouglouga, M. Djibril, A. Lawson, LY. Kaaga, HD. Sama, A. Balaka, D. Redah. Knowledge, attitudes and practices of health care professionals on the risk of transmission of viral hepatitis B and C in hospitals in Togo. *Tropical Medicine and Health* 2013; 23: 300-303.
- [42] J. Jagger, E. H Hunt, J. Brand-Elnaggar, R. D. Pearson. Rates of needle-stick injury caused by various devices in a university hospital. *New England Journal of Medicine* 1988; 319 (5): 284-8.
- [43] WHO. Global health sector strategy against viral hepatitis 2016-2021, towards the elimination of viral hepatitis. June 2016, 53p, pdf.
- [44] PJ. Grob, B. Bischof, F. Naeff. Cluster of hepatitis B transmitted by a physician. *The Lancet* 1981; 2 (8257): 1218-20.