

Evaluation of the Knowledge and Attitudes of Dental Students toward Occupational Blood Exposure Accidents at the End of the Dental Training Program

Abdelhadi Hbib¹, Jalal Kasouati², Reda Charof³, Souad Chaouir⁴, Karima El Harti⁵

¹Dental Center of Bettana – Salé, Ministry of Health, ²Laboratory of Biostatistics, Clinical and Epidemiological Research, ⁴Department of Radiology, Faculty of Medicine and Pharmacy, Mohammed V University, ³Department of Bacteriology, National Institute of Hygiene, ⁵Department of Oral Surgery, Faculty of Dental Medicine, Mohammed V University, Rabat, Morocco

Received : 02-08-17.
Accepted : 10-11-17.
Published : 22-02-18.

INTRODUCTION

According to the Center for Disease Control (CDC), occupational exposure to blood and body fluids is defined as a percutaneous injury (e.g., a needlestick or cut with a sharp object) or a contact of mucous membrane or nonintact skin, for example, exposed skin that is chapped, abraded, or flicted with dermatitis with blood, tissue, or other body fluids that are potentially infectious.^[1]

The exposure to such pathogens affects almost 385,000 health-care workers (HCW) annually.^[2]

The risk of these occupational incidents is due to the risk of transmission of infectious agents carried by the blood such as:

- Hepatitis B virus (HBV)
- Hepatitis C virus (HCV)
- Human immunodeficiency virus (HIV).

The magnitude of these risks depends on the biological fluid to which the victim is exposed, its pathogenicity, injury characteristics (location, depth, extension) and patient's immunity status.

In dental practice, serological status of patients remains difficult to disclose for several reasons:

Address for correspondence: Dr. Abdelhadi Hbib, 22, Lotissement Badre, Hay Rja Fellah, CYM, Rabat, Morocco. E-mail: abdlhadi_h@hotmail.com

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Hbib A, Kasouati J, Charof R, Chaouir S, El Harti K. Evaluation of the knowledge and attitudes of dental students toward occupational blood exposure accidents at the end of the dental training program. J Int Soc Prevent Communit Dent 2018;8:77-86.

ABSTRACT

Aims and Objectives: This study was conducted to assess knowledge, attitudes, and behavior regarding occupational blood exposure accidents (OBEA) among dental students at the end of the whole dental education program.

Materials and Methods: The survey was performed using a student self-administered questionnaire during July 2015 in the dental teaching hospital in Rabat. It was conducted on 117 dental students registered in the 5th year. The results were analyzed by SPSS Software, Version 13.0. Univariate analysis was performed by descriptive statistics, and bivariate analysis was used to identify correlations between different variables.

Results: Eighty-three students answered the questionnaire (participation rate: 70%). Most participants had incomplete knowledge about the management and the risks of OBEA. Thirty-five participants (42%) experienced at least one occupational exposure to patients' blood. Needle recapping has been the main cause of such injuries (41%). Most accidents occurred, respectively, in the oral surgery (51%) and the restorative dentistry (17%) departments. According to many participants, they had received insufficient education concerning this topic.

Conclusions: More effective education on prevention and management of OBEA is highly recommended to reduce the prevalence of such injuries. Dental schools should set up a local management unit for following and supporting the exposed students.

KEYWORDS: Blood, dental student, evaluation, occupational exposure

Access this article online

Quick Response Code:



Website: www.jispcd.org

DOI: [10.4103/jispcd.JISPCD_282_17](https://doi.org/10.4103/jispcd.JISPCD_282_17)

- Patient's fear due to the risk of stigmatization or even the refusal of care by the practitioner
- The patient may have the status of a healthy virus carrier, disregarding his/her true serological status
- The first incubation phases by some viruses (HIV, HBV, HCV) are not necessarily accompanied by clinical symptoms.

The clinical rules consider any patient as having a positive serology until proven otherwise. This is due to the worrying epidemiology of hepatitis and HIV infection worldwide. The typical example of HCV seroepidemiology makes the situation even more dramatic. According to the World Health Organization (WHO), Africa and the Eastern Mediterranean would have about 53.2 million HCV-seropositive individuals compared with 116.5 million in the rest of the world, including 22 millions in Europe and North America.^[3] In Middle East and North Africa Region, the viraemic prevalence of hepatitis C was estimated between 0.2% (Iran) and 6.3% (Egypt).^[4] In Morocco, this prevalence is estimated at 0.8%.^[4] This country is transformed from a transit country of sub-Saharan immigrants and those from conflict zones in Middle East to a destination country. This brings social changes that could have an effective impact on the local public health since the prevalence of HIV, HCV, and HBV infections in the sub-Saharan region is increasing. Those immigrants, from endemic countries, cumulate risk factors for several viral infections,^[5] and they are actually among patients consulting at the dental teaching hospital as much as the other health-care centers.

In this particular epidemiological context, numerous surveys on occupational blood exposure accidents (OBEA) have been conducted among different categories of health professionals: surgeons, nurses, and medical students.^[6-8] However, few studies have focused on this issue among dental students on the African and Mediterranean scale. Our survey would be the first study to assess the knowledge and the history of dental students regarding blood exposure accidents at the end of the whole dental training program. Those students are particularly vulnerable to occupational infections due to the typical clinical practice and the instrumentation used in dental training. The aim of this study is to help dental students to be aware of the professional risk of the blood exposure accident (management of infections risk), to remind them of the basic emergency practices, to emphasize reporting such injuries to the related authorities, and to give a clear vision on axis to be reinforced at the pedagogical level. Similarly, this work could serve as a baseline for the development of recommendations for good practice, adapted to the local and regional context, regarding OBEA in dental students community.

MATERIALS AND METHODS

STUDY POPULATION

This survey was carried out in July 2015 among dental students in training at the dental teaching hospital in Rabat.

THE INCLUSION CRITERIA INCLUDED

- Dental students, continuing their studies at the Faculty of Dental Medicine in Rabat (The Mohammed V University in Rabat), enrolled in the 5th year, performing their clinical training at the related dental teaching hospital (CCTD), which belongs to the Ibn Sina Hospital Center. Such students completed their undergraduate training curriculum in July 2015, the end of the current academic year.

EXCLUSION CRITERIA

- Students not enrolled at the Faculty of Dental Medicine related to Mohammed V University in Rabat
- Students not enrolled in the 5th year of dental studies
- Students who have not completed their training curriculum until July 2015
- Students who refused to participate in the survey.

117 students were eligible for our study. In this work, we have only included dental students at the end of the dental clinical training to have a global vision on their knowledge and experiences concerning OBEA during undergraduate dental studies.

STAGES OF THE RESEARCH

1st Step: Ethics

This study respects the standards of the Helsinki Declaration governing ethical principles in the medical research on human beings. Thus, the Ethics Committee for Biomedical Research, of Mohammed V University in Rabat, has approved the study protocol (IORG0006594).

2nd Step

A self-administered questionnaire was provided to the individuals (from July 20, 2015 to July 31, 2015). Before answering the form, the students signed an Informed Consent Form.

The questionnaire included:

- Sociodemographic informations
- 34 closed questions
- 4 open-ended questions
- Knowledge and attitudes in two parts: primary and secondary prevention.

Data were collected by Excel[®] software. Evaluation of the accuracy of the emergency measures undertaken by the students in relation to blood exposure incidents was determined by the following score scale:

- Score 0: Total disagreement: None of the measures cited is correct

- Score 1: Partial disagreement: Combination of correct and incorrect measures
- Score 2: Partial agreement: Cited measures are correct but incomplete
- Score 3: Total agreement: Citation of all basic measurements.

We have defined as a reference attitude, to occupational blood exposure, the application of three basic measures:

- Washing the wound (cutaneous) by abundant water with antiseptic soap
- Application of an antiseptic solution (preferably sodium hypochlorite) with contact beyond 5 min
- Reporting accident.

3rd Step: Data analysis

The results were analyzed by SPSS Software, Version 13.0. Univariate analysis was performed by descriptive statistics through frequencies and percentages. Bivariate analysis, the Pearson’s Chi-square test, or Fisher’s exact test were used to measure the exposure effect on some variables. The confidence interval of 95% was considered statistically significant, $p \leq 0.05$.

RESULTS

A total of 83 out of the 117 students who constituted the study population responded to the questionnaire (participation rate: 70.9%). This comprised 83.1% females. The mean age was 22.9 years. Most participants were single (85.5%) [Table 1].

KNOWLEDGE ABOUT THE PREVENTIVE MEASURES REGARDING OCCUPATIONAL BLOOD EXPOSURE ACCIDENTS

The majority of the students have reported that they wear gloves for any consultation (98.8%), as well as protective masks (80.7%). However, before wearing such protective tools, 47% of them wash their hands systematically. Similarly, the systematic protection of wounds, when wearing gloves, is undertaken by 56.6% of responding students. The use of protective eyewear is occasional among 77.1% of the respondents.

Table 1: Sociodemographic characteristics of the studied population

Characteristics	n (%)	Age (years) (mean±SD)
5 th grade students	117 (100)	-
Surveyed students	83 (70.9)	22.93
Gender		
Male	14 (16.9)	23.71±2.05
Female	69 (83.1)	22.76±0.81
Marital status		
Single	71 (85.5)	22.92±1.22
Married	12 (14.5)	23±0.63

SD=Standard deviation

We also asked participants about the interest of the history assessment of the patients’ general health. All respondents reported that they assessed this condition before starting the treatment, of which 80.7% contacted the responsible physician in case of general pathology.

The use of cutting instruments is quite common in dental practice. Thus, 90.4% of the surveyed students have been recapping needles when using anesthesia syringes, and 97.6% of the participants throw the contaminated sharp instruments into a container. Table 2 summarizes students’ responses to preventive measures questions.

STUDENT KNOWLEDGE AND PRACTICES ABOUT OCCUPATIONAL BLOOD EXPOSURE ACCIDENTS

Although almost all the surveyed students state that they knew what is an OBEA, half of them said they had not received any training in this topic.

In terms of the transmission risk of some bloodborne pathogens, 95.2% of respondents recognized the risk of HIV transmission, compared to 65.1% who considered OBEA as a risk factor for HCV transmission. Other questions deal directly with students’ practices in terms of emergency measures undertaken in relation to OBEA. About 71.9% of respondents have reported that they are aware of these measures and 64% applied them [Table 3]. The knowledge level concerning these measures, among the targeted participants having detailed it (37 students), is considered relatively good [Table 4].

Reporting OBEA to the related authorities is part of the emergency measures taken by 40% of the victims of such incidents (rate deducted from their open answers to this question). The administrative deadline to report OBEA (24 h) is known to 62.7% of the individuals. However, the majority of the respondents (80.2%) are not aware of the existence of a work injury form, and 95.1% of them do not know any occupational medicine specialist. The same percentage describes the respondents’ awareness to the serological follow-up after an OBEA. Nearly, 23.2% of the individuals have reported that they are aware of the antiretroviral chemoprophylaxis. Finally, most of the participants (86.7%) feel the need for an additional education in terms of OBEA [Table 3].

OCCUPATIONAL BLOOD EXPOSURE ACCIDENT CIRCUMSTANCES

Thirty-five students have experienced OBEA (42.7%) once to three times. The most common cause was needle recapping (41.7%), disassembling (19.4%), and cleaning (16.7%) contaminated instruments, respectively. Most incidents occurred in oral surgery department (51%), conservative dentistry (17%), and the periodontology department (10.6%) as well. Two

Table 2: Students knowledge about the preventive measures against occupational blood exposure accident

Questions	Answers	n (%)
Do you evaluate your patient's general health before the dental care?	Yes	83 (100)
	No	
Do you use a printed questionnaire?	Yes	51 (61.4)
	No	27 (32.5)
	Sometimes	5 (6)
If so, is it you who fill it, or your assistant or the patient himself/herself?	Practitioner	25 (44.6)
	Assistant	29 (51.8)
	Patient	2 (3.6)
If the patient has a general disease, do you contact his/her responsible physician?	Yes	67 (80.7)
	No	2 (2.4)
	Sometimes	14 (16.9)
What do you use for your medical uniform?	Medical gown	81 (98.8)
	Medical scrubs	15 (18.3)
	Medical shoes	10 (12.2)
Do you wear a medical uniform during dental care?	Always	82 (98.8)
	Sometimes	1 (1.2)
	Never	0
Do you change your medical uniform?	Every day	6 (7.2)
	Whenever it is soiled	60 (72.3)
	Every week	28 (33.7)
Do you use a protective eyewear?	Always	6 (7.2)
	Sometimes	64 (77.1)
	Never	13 (15.7)
Do you use a protective mask?	Always	67 (80.7)
	Sometimes	11 (13.3)
	Never	5 (6)
Are these masks made?	Of paper	25 (35.2)
	Of synthetic fibers	43 (60.6)
	Of glass fibers	3 (4.2)
Do you change them?	For each patient	64 (82.1)
	Once a day	14 (17.9)
Do you use gloves?	For any consultation	82 (98.8)
	For all nonbloody care	10 (12)
	Only for bloody care	2 (2.4)
Do you protect your injuries by dressing, even when wearing gloves when you work?	Always	47 (56.6)
	Sometimes	29 (34.9)
	Never	7 (8.4)
Do you wash your hands before examining a patient?	Always	39 (47)
	Sometimes	42 (50.6)
	Never	2 (2.4)
Do you wash your hands using?	Soap in pieces	2 (2.5)
	Liquid soap	58 (71.6)
	Disinfecting solution	35 (43.2)
Do you dry your hands after washing them	Always	57 (69.5)
	Sometimes	24 (29.3)
	Never	1 (1.2)
If so, do you use?	Paper towels	2 (2.4)
	Tissue towels	82 (98.7)
After using anesthetic syringe, do you recap the needle?	Always	75 (90.4)
	Sometimes	6 (7.2)
	Never	2 (2.4)

Contd...

Table 2: Contd...

Questions	Answers	n (%)
Do you throw away the sharp instruments in a container?	Yes	81 (97.6)
	No	1 (1.2)
	Sometimes	1 (1.2)

students reported that they have used antiretroviral chemoprophylaxis.

There is no significant statistical difference between the exposed and nonexposed students in our cohort regarding prior knowledge about OBEA ($p = 0.20$), prior avoiding needle recapping ($p = 1$), and sex ($p = 0.24$) [Table 5].

DISCUSSION

The frequency of OBEA among dental students in our cohort is relatively high (42.7%). This finding seems to be similar to other studies [Table 6].^[9-12] Thus, in the Mediterranean context, Gatto *et al.* report a prevalence of 40% in an Italian population.^[12] This prevalence is 86.9% among senior students in Egypt.^[13] Similarly, one-third of the surveyed students had experienced an OBEA in two Chinese dental schools.^[15] Furthermore, Pavithran *et al.* reported a fluctuating prevalence among postgraduate dental students in an Indian establishment (between 14.3% and 42.9%).^[16] This observation supports the hypothesis that the frequent use of sharp and rotary instruments in dental practice, the lack of experience of dental students, and the incomplete knowledge could lead to serious occupational hazards. In our sample, more factors could explain the prevalence of OBEA. The significant rate of student absenteeism for theoretical teaching may limit its effectiveness despite the valuable efforts made by the administrative and the teaching staff to encourage the attendance to such courses (which is optional). Furthermore, the dental trainee student, having the concern to practice the maximum, finds himself/herself more stressed to accomplish the operative procedures on time. This stress in dental student community is widely discussed in the literature^[17-19] and may explain, in part, the prevalence of OBEA in our population. This stress could increase over the grades of dental studies to reach its peak in the 5th year,^[20,21] which is the subject of our survey.

In the present study, compliance with some precautions seems to be good: wearing gloves (98.8%) and protective masks (80.7%). This was particularly similar to the studies conducted by Ramich,^[22] and Westall.^[23] However, the use of protective eyewear in the current survey (between 7.2% and 77.1%) remains to be systematized. Despite the fact that the compliance with the use of universal precautions is well grounded,^[24] only 52%–62% of dentists used appropriate tools to

Table 3: Knowledge, history, and circumstances of occupational blood exposure accident among participants

Questions	Answers	n (%)
Knowledge		
Do you know what an OBEA is?	Yes	82 (98.8)
	No	1 (1.2)
Did you receive any special education to deal with OBEA?	Yes	41 (50)
	No	41 (50)
If so, can you give more details about this training	Theoretical teaching	45 (95.7)
	Directed workshops	4 (8.5)
	Practical workshops	0
	Others	2 (4.3)
Do you have at your disposal a work-related accident form?	Yes	0
	No	65 (80.2)
	I don't know	16 (19.8)
Do you know the emergency measures in case of OBEA?	Yes	46 (71.9)
	No	18 (28.1)
Do you process to the required emergency measures?	Yes	32 (64)
	No	15 (30)
In your opinion, is it necessary to report the OBEA within?	24 h	52 (62.7)
	48 h	18 (21.7)
	72 h	1 (1.2)
	I don't know	12 (14.5)
Do you know any occupational medicine specialist?	Yes	4 (4.9)
	No	78 (95.1)
In your opinion, a simple sting exposes you to an infection by	HIV	79 (95.2)
	HBV	72 (86.7)
	HCV	54 (65.1)
	Syphilis	29 (34.9)
Do you know chemoprophylaxis antiretroviral therapy?	Yes	19 (23.2)
	No	63 (76.8)
In your opinion, is it necessary to process to a serological monitoring after an OBEA?	Yes	77 (95.1)
	No	4 (4.9)
Do you feel the need for additional education in terms of OBEA?	Yes	72 (86.7)
	No	11 (13.3)
History/circumstances		
Do you have a history of an OBEA?	Yes	35 (42.7)
	No	47 (57.3)
If yes, please specify the number	1	12 (14.5)
	2	8 (9.6)
	3	4 (4.8)
What is the clinical situation in which you had the OBEA?	Recapping needles	15 (41.7)
	When making the sutures	0
	Dismantling the soiled instruments	7 (19.4)
	During an incision	3 (8.3)
	When cleaning soiled instruments	6 (16.7)
	Others	10 (29.4)
	Projection of blood in the eyes	2 (2.4)
	Scaling	1 (1.2)
	Tooth extraction	1 (1.2)
	Caries curettage	1 (1.2)
In which clinical department did you have the OBEA?	Oral surgery	24 (51)
	Conservative dentistry	8 (17)
	Orthodontics	0
	Pedodontics	3 (6.3)
	Periodontology	5 (10.6)

Contd...

Table 3: Contd...

Questions	Answers	n (%)
If you had a history of OBEA, did you process to the antiretroviral chemoprophylaxis?	Removable prosthodontics	3 (6.3)
	Fixed prosthodontics	4 (8.5)
	Emergency	0
	Yes	2 (2.7)
	No	31 (42.5)
	I do not have a history of OBEA	40 (54.8)

OBEA=Occupational blood exposure accident, HBV=Hepatitis B virus, HCV=Hepatitis C virus, HIV=Human immunodeficiency virus

Table 4: Accuracy assessment of the emergency measures undertaken by the participants against occupational blood exposure accident

Score	n (%)	Proportion compared to all participants, n (%)
0	4 (10.8)	4 (4.8)
1	7 (18.9)	7 (8.4)
2	17 (45.9)	17 (20.4)
3	10 (27)	10 (12)
Total	37 (100)	83 (100)

Table 5: Impact of sociodemographic and clinical factors on the occurrence of occupational blood exposure accident

Variables	OBEA (+), n (%)	OBEA (-), n (%)	p*
Sex			
Male	4 (28.6)	10 (71.4)	0.24
Female	31 (45.6)	37 (54.4)	
Training for OBEA			
Trained	20 (48.8)	21 (51.2)	0.20
Untrained	14 (35.0)	26 (65.0)	
Needle recapping			
Always	32 (43.2)	42 (56.8)	1
Sometimes	2 (33.3)	4 (66.7)	
Never	1 (50.0)	1 (50.0)	
Using the container			
Yes	34 (42.5)	46 (57.5)	0.35
No	0	1 (100)	
Sometimes	1 (100)	0	
Using the protective eyewear			
Always	1 (20)	4 (80)	0.51
Sometimes	29 (45.3)	35 (54.7)	
Never	5 (38.5)	8 (61.5)	

*p<0.05. OBEA (+)=Exposed students, OBEA (-)=Nonexposed students, OBEA=Occupational blood exposure accident

protect themselves.^[25] The unclear view, regular fog, and light reflection could explain the irregular use of such equipment.

In the current study, needle recapping was widely practised (90.4%). This high-risk practice was therefore the main cause of OBEA in our population (41.7%).

Other studies show a lower prevalence of such practice. In Asia, Shaghaghian *et al.* and Bhattarai *et al.* reported a prevalence of 19%.^[9,26] However, the students in Brazil seem to have the lowest prevalence of needle recapping in the literature (3.5%).^[14] The used technique in such recapping was not questioned in our survey. Other studies discussed many options to recap needles in their samples. Using both hands was the main technique used by HCW in Muralidhar *et al.*^[27] and Rais and Jamil^[28] populations. This wrong technique could be widely used among students. The one-handed technique (scoop technique), which is more safe, was mostly used (69%) in Pavithran *et al.*'s^[16] sample. Some authors recommend to dental students to never recap a needle.^[9,26] This can be understood to protect trainees who are still underexperienced. However, it is during the clinical education that the student should learn the good and safe gestures in the high-risk situations. Avoidance is not the best solution. If the student does not recap the used needles, it is up to the nurses to do, in which case we only shift the risk from the student to the nurse. These care providers have the same right to protect themselves against occupational hazards. The WHO confirms that the scoop technique is a quite secure gesture and therefore can be practised by all the HCW,^[29] even if prohibited by National Institute of Occupational Safety and Health (NIOSH, CDC) since 90s.^[30]

More reasons could explain the prevalence of OBEA in our population. The practice of incision during oral surgery leads to 8.3% of OBEA, while dismantling and cleaning soiled instruments lead to 19.4% and 16.7% of OBEA, respectively. This was too frequent in comparison to the study conducted by Bhattarai *et al.*^[26] (8%) and Gatto *et al.*^[12] (0.05%). No accident was reported by suture needles in the present study, while 27.8% sustained injury by these needles in Bhattarai *et al.*'s^[26] sample and 28% in Morinaga^[31] population over 10 years. Other probable causes were not investigated in our survey, such as the practice of injection, using elevator during dental extraction and while taking impressions.

Most incidents have occurred in the oral surgery department (51%) [Table 3]. This proportion is

Table 6: Prevalence of occupational blood exposure accident among dental students in the literature

Authors	Country	Percentage OBEA
Sedky, 2013 ^[13]	Egypt	86.9
Shaghaghian <i>et al.</i> , 2015 ^[9]	Iran	81
Sofola <i>et al.</i> , 2007 ^[10]	Nigeria	58.8
Our study	Morocco	42.7
Xu <i>et al.</i> , 2013 ^[11]	China	41.7
Gatto <i>et al.</i> , 2013 ^[12]	Italy	40
Machado-Carvalhais <i>et al.</i> , 2007 ^[14]	Brazil	35.6

OBEA=Occupational blood exposure accident

significantly higher than Shaghaghian *et al.* and Xu *et al.*, 39.8% and 16%, respectively.^[9,11] The nature of the operative procedure performed in this clinical department in addition to the instrumentation used may explain such results. Moreover, the absence of OBEA in the emergency unit and orthodontics departments is due to the fact that trainee students do not take the patients in charge. Conversely, oral surgery, conservative dentistry, and periodontology departments have the most common charge of patients assigned to the students. Moreover, the significant prevalence of OBEA in this department compared with other studies can also be explained by the inadequate number of supervisors compared to the student number per group. The permanent accompaniment of the trainee during surgery, even minor, could reduce such prevalence. Accompaniment and working in a close cooperation with the student are to be preferred to an authoritarian framework which can become a stress source.^[32,33] This can influence the proper coordination of clinical gestures and end with an easily preventable accidents. Oral surgery remains at risk not only for trainee students but also for experienced practitioners.

In the present study, no case of occupational transmission of infections was reported, while many studies have reported cases of occupational transmission of HIV, HBV, and HCV. In 1998, 13 cases of HIV infections were confirmed in France among health professionals.^[34] In the Netherlands, 10–20 cases of HBV infection are allocated annually to OBEA among health workers.^[35] In the United States, Shah *et al.* have highlighted such infections among dental professionals in Washington: 3 cases of HIV infection, 6 cases of HBV, and 3 HCV seroconversion.^[36] In our knowledge, no study has focused on this kind of contamination among dental students. It may be due to the lack of centralized archiving of these incidents. This reflects the interest of reporting OBEA to the related authorities. In the current survey, only 40% of OBEA victims have reported these accidents. This is almost similar with a study conducted by Jain^[37] but still insufficient compared to other studies.^[9,11,36]

Such reporting prevalence reflects student awareness regarding the high infectious incurred risk. However, the underreporting or the absence of reporting in our population can be linked to the underestimation of OBEA risks and the restrictive-related clauses in the administrative system. The unavailability of an occupational medicine specialist at the same dental teaching hospital (the victim is referred to another hospital: Ibn Sina hospital in Rabat) do not encourage exposed students to comply with the occupational exposure protocol. The serological follow-up and the use of antiretroviral treatment, even if given for free by the referral department in such cases (Department of Medicine A-Ibn Sina Hospital), do not seem to emphasize the victim sufficiently. Furthermore, most individuals (76.8%) do not know the principle of antiretroviral chemoprophylaxis.

The fear of stigmatization by colleagues and the impact risk on the couple life are serious. The Moroccan society still has a negative perception to the known seropositive patients by some viral infections qualified as “dangerous.” This could explain the major concern of our students (95.2%) to contract HIV, following an OBEA.

In the current study, more than 65% of the surveyed students have a good knowledge about the main infections transmitted by through an OBEA (HIV, hepatitis B, and C viruses). This was in accordance with a study conducted by Kasat *et al.*,^[38] Souza *et al.*,^[39] and Khandelwal *et al.*^[40] where the majority of the students had a good knowledge in this issue. Nevertheless, most students in our survey had incomplete knowledge about management of the OBEA. This was similar to two Chinese dental schools.^[15]

The students’ awareness level highlighted in our survey should lead to a deep reflection to design appropriate strategy against OBEA among our students. This plan should underpin the concept of a secure gesture that protects both health-care workers and patients. The reporting procedures are to be more simplified to improve the students’ security. It would be interesting to ensure the availability of an occupational medicine specialist within the dental teaching hospital to emphasize students to comply with the related administrative procedures while respecting and protecting anonymity. The adoption of a regular awareness program on this subject could keep students consciousness vigilant. The posters that explain emergency measures for OBEA would be multiplied in all clinical departments.

The administered questionnaire in this cross-sectional study could improve students’ awareness of the infectious risk of OBEA and the value of the hepatitis B vaccine. Similarly, the questions related to reporting

and chemoprophylaxis aspects could pay participants' attention to such preventive measures.

The participation rate in this survey is likely good (70.9%) but may be indicative of students' concern about occupational risks of dental clinical practice. These future graduate students can avoid OBEA if they reinforce the standard precautions against all patients, maintain vigilance regarding the contamination sources, replace some high-risk habits (e.g., recapping needle) by more secure practices since the preclinical practice,^[41] and engage in a regular continuing education program throughout their careers. More research are needed to identify and synthesize the global reasons leading to the OBEA, to enhance the safety conditions in dental practice, to improve students' awareness regarding infection control, and to modulate educational methods related to the current concepts of prevention. Preclinical skills have to be reinforced to upgrade the accurate gestural. The current educational technology, such as the virtual reality, could help the dental student to improve his/her dexterity to perform appropriate tasks in a safe environment.^[42,43] Surgical procedures could even be learned with secure tools and give more confidence to the student in the high-risk situations.^[44,45] Using such technologies for infection control education may have a large perspective since the primary feedback seems to be satisfactory.^[46]

The exhaustive analysis of the causes of the OBEA and related student knowledge requires a systematic review, which is not yet available in the literature. In our knowledge, the only systematic review dealing with almost similar subject is Kapoor *et al.*'s review.^[47] This one is much more focused on needlestick injuries (NSI) among dental students, related knowledge level, awareness level regarding management of NSI and postexposure prophylaxis.

The current study is evaluating OBEA among dental student at the end of the whole training program (only 5th year students were involved, and the survey was done at the end of the academic year). This gives a global idea on occupational hazards to which the dental student was exposed to during the totality of dental curriculum, while many other studies^[13,15,16,23,25] made in this issue have evaluated the individuals during the curriculum and not at its end and so provide an overview on instant knowledge and prevalence of injuries. This has an implication on the quality of judgment of dental program effectiveness. This is the reason why we have chosen to make the survey at the end of the academic year and only for the 5th year students, so we can judge objectively the educational program and provide recommendations to improve the quality of dental education.

When interpreting the results of the current study, certain limitations have to be considered. First, the present survey does not focus on the vaccination students' status to hepatitis B in which the interest is no longer debatable. Since several years, the CCTD has launched annual free vaccination campaigns for dental students and health-care professionals. Nevertheless, it would be important to control the antibodies status for vaccinated students. Second, this research was carried out in a single establishment with relatively a low number of individuals evaluated, and so, it would be difficult to generalize the results. More longitudinal studies including participants from several institutions are needed to issue a standardized guidelines.

CONCLUSIONS

Dental students are future health-care workers and could have an effective impact on the public health. Their health and well-being have to be preserved, as well as upgrading their clinical skills. This could help students to make a significant contribution to oral health care in their countries. Their safety should be a daily concern and should be inculcated in their learning. Changing inappropriate habits is more difficult once they are integrated in the daily clinical practice. The teaching staff role is the cornerstone of all hospital strategies that aim to reduce occupational risks.

New clinical reflection should be based on the work safety. The cooperation of all participants in the public health system could improve local standards according to the latest evidence-based guidelines.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the Dean of Faculty of Dental Medicine in Rabat, Pr Sana RIDA, for her sincere cooperation. Also the authors would like to thank the contribution made by the students of the 5th grade of the undergraduate dental program at the Mohammed V University in Rabat through their participation in the present study.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Kuhar DT, Henderson DK, Struble KA, Heneine W, Thomas V, Cheever LW, *et al.* Updated US Public Health Service guidelines for the management of occupational exposures to human immunodeficiency virus and recommendations for postexposure prophylaxis. *Infect Control Hosp Epidemiol* 2013;34:875-92.
2. Díaz JC, Johnson LA. Health care worker follow-up compliance after occupational bloodborne pathogens exposure: A brief report.

- Am J Infect Control 2016;44:1738-40.
3. World Health Organization. Hepatitis C: global prevalence. *Rel Epidemiol Hebd* 1999; 74: 421-28.
 4. Polaris Observatory HCV Collaborators. Global prevalence and genotype distribution of hepatitis C virus infection in 2015: A modelling study. *Lancet Gastroenterol Hepatol* 2017;2:161-76.
 5. Daw MA, El-Bouzedi A, Ahmed MO, Dau AA, Agnan MM; In Association with the Libyan Study Group of Hepatitis & HIV. Epidemiology of hepatitis C virus and genotype distribution in immigrants crossing to Europe from North and Sub-Saharan Africa. *Travel Med Infect Dis* 2016;14:517-26.
 6. Hasak JM, Novak CB, Patterson JM, Mackinnon SE. Prevalence of needlestick injuries, attitude changes, and prevention practices over 12 years in an urban academic hospital surgery department. *Ann Surg* 2018;267:291-6.
 7. Samargandy SA, Bukhari LM, Samargandy SA, Bahlas RS, Aldigs EK, Alawi MA, *et al.* Epidemiology and clinical consequences of occupational exposure to blood and other body fluids in a university hospital in Saudi Arabia. *Saudi Med J* 2016;37:783-90.
 8. Wyzgowski P, Rosiek A, Grzela T, Leksowski K. Occupational HIV risk for health care workers: Risk factor and the risk of infection in the course of professional activities. *Ther Clin Risk Manag* 2016;12:989-94.
 9. Shaghaghian S, Golkari A, Pardis S, Rezayi A. Occupational exposure of Shiraz dental students to patients' blood and body fluid. *J Dent (Shiraz)* 2015;16:206-13.
 10. Sofola OO, Folayan MO, Denloye OO, Okeigbemen SA. Occupational exposure to bloodborne pathogens and management of exposure incidents in Nigerian dental schools. *J Dent Educ* 2007;71:832-7.
 11. Xu YL, Zhu JY, Huang CF, Hu X, Xiong YH. Occupational exposure to blood and body fluids among dental personnel in a Chinese dental hospital. *Chin J Dent Res* 2013;16:119-25.
 12. Gatto MR, Bandini L, Montevecchi M, Checchi L. Occupational exposure to blood and body fluids in a department of oral sciences: Results of a thirteen-year surveillance study. *ScientificWorldJournal* 2013;2013:459281.
 13. Sedky NA. Occupational bloodborne exposure incident survey & management of exposure incidents in a dental teaching environment. *Int J Health Sci (Qassim)* 2013;7:174-90.
 14. Machado-Carvalho HP, Martins TC, Ramos-Jorge ML, Magela-Machado D, Paiva SM, Pordeus IA, *et al.* Management of occupational bloodborne exposure in a dental teaching environment. *J Dent Educ* 2007;71:1348-55.
 15. Wu L, Yin YL, Song JL, Chen Y, Wu YF, Zhao L, *et al.* Knowledge, attitudes and practices surrounding occupational blood-borne pathogen exposure amongst students in two Chinese dental schools. *Eur J Dent Educ* 2016;20:206-12.
 16. Pavithran VK, Murali R, Krishna M, Shamala A, Yalamalli M, Kumar AV, *et al.* Knowledge, attitude, and practice of needle stick and sharps injuries among dental professionals of Bangalore, India. *J Int Soc Prev Community Dent* 2015;5:406-12.
 17. Alzahem AM, van der Molen HT, Alaujan AH, Schmidt HG, Zamakhshary MH. Stress amongst dental students: A systematic review. *Eur J Dent Educ* 2011;15:8-18.
 18. Elani HW, Allison PJ, Kumar RA, Mancini L, Lambrou A, Bedos C, *et al.* A systematic review of stress in dental students. *J Dent Educ* 2014;78:226-42.
 19. Scholz M, Neumann C, Ropohl A, Paulsen F, Burger PH. Risk factors for mental disorders develop early in German students of dentistry. *Ann Anat* 2016;208:204-7.
 20. Abu-Ghazaleh SB, Sonbol HN, Rajab LD. A longitudinal study of psychological stress among undergraduate dental students at the University of Jordan. *BMC Med Educ* 2016;16:90.
 21. Tangade PS, Mathur A, Gupta R, Chaudhary S. Assessment of stress level among dental school students: An Indian outlook. *Dent Res J (Isfahan)* 2011;8:95-101.
 22. Ramich T, Eickholz P, Wicker S. Work-related infections in dentistry: Risk perception and preventive measures. *Clin Oral Investig* 2017;21:2473-9.
 23. Westall JO, Dickinson C. Compliance with occupational exposure risk management procedures in a dental school setting. *Br Dent J* 2017;222:859-63.
 24. Anders PL, Townsend NE, Davis EL, McCall WD Jr. Observed infection control compliance in a dental school: A natural experiment. *Am J Infect Control* 2016;44:e153-6.
 25. Shimoji S, Ishihama K, Yamada H, Okayama M, Yasuda K, Shibutani T, *et al.* Occupational safety among dental health-care workers. *Adv Med Educ Pract* 2010;1:41-7.
 26. Bhattarai S, Santosh KC, Pradhan PM, Lama S, Rijal S. Hepatitis B vaccination status and needle-stick and sharps-related injuries among medical school students in Nepal: A cross-sectional study. *BMC Res Notes* 2014;7:774.
 27. Muralidhar S, Singh PK, Jain RK, Malhotra M, Bala M. Needle stick injuries among health care workers in a tertiary care hospital of India. *Indian J Med Res* 2010;131:405-10.
 28. Rais N, Jamil HM. Prevalence of needle stick injuries among health care providers. *Int J Endorsing Health Sci Res* 2013;1:73-9.
 29. World Health Organization. WHO Guidelines on Drawing Blood: Best Practices in Phlebotomy. Geneva: World Health Organization; 2010.
 30. Centers for Disease Control and Prevention: The National Institute of Occupational Safety and Health (NIOSH): STOP STICKS CAMPAIGN. Available from: <http://www.cdc.gov/niosh/stopsticks/sharpsinjuries.html>. [Last accessed on 2017 Sep 18].
 31. Morinaga K, Hagita K, Yakushiji T, Ohata H, Sueishi K, Inoue T, *et al.* Analysis of needlestick and similar injuries over 10 years from April 2004 at Tokyo dental college Chiba hospital. *Bull Tokyo Dent Coll* 2016;57:299-305.
 32. Polychronopoulou A, Divaris K. A longitudinal study of Greek dental students' perceived sources of stress. *J Dent Educ* 2010;74:524-30.
 33. Babar MG, Hasan SS, Ooi YJ, Ahmed SI, Wong PS, Ahmad SF, *et al.* Perceived sources of stress among Malaysian dental students. *Int J Med Educ* 2015;6:56-61.
 34. Lemaire J. Occupational HIV infections in France among health care workers. *Concours Med* 1999 ; 121 : 1922.
 35. van Wijk PT, Schneeberger PM, Heimeriks K, Boland GJ, Karagiannis I, Geraedts J, *et al.* Occupational blood exposure accidents in the Netherlands. *Eur J Public Health* 2010;20:281-7.
 36. Shah SM, Merchant AT, Dosman JA. Percutaneous injuries among dental professionals in Washington state. *BMC Public Health* 2006;6:269.
 37. Jain M, Sabharwal ER, Srivastava D. Practices of health care personnel regarding occupational exposure. *J Clin Diagn Res* 2016;10:DC14-7.
 38. Kasat V, Saluja H, Ladda R, Sachdeva S, Somasundaram K, Gupta A, *et al.* Knowledge, attitude and practices toward post exposure prophylaxis for human immunodeficiency virus among dental students in India. *Ann Med Health Sci Res* 2014;4:543-8.
 39. Souza NP, Villar LM, Moimaz SA, Garbin AJ, Garbin CA. Knowledge, attitude and behaviour regarding hepatitis C virus infection amongst Brazilian dental students. *Eur J Dent Educ* 2017;21:e76-82.
 40. Khandelwal V, Khandelwal S, Gupta N, Nayak UA, Kulshreshtha N, Baliga S, *et al.* Knowledge of hepatitis B virus infection and its control practices among dental students in an Indian city. *Int J Adolesc Med Health* 2017. pii://ijamh.ahead-of-print/ijamh-2016-0103/ijamh-2016-0103.xml.
 41. Field J, Stone S, Orsini C, Hussain A, Vital S, Crothers A, *et al.* Curriculum content and assessment of pre-clinical dental skills: A survey of undergraduate dental education in Europe. *Eur J Dent Educ* 2017;1-6. <https://doi.org/10.1111/eje.12276>.
 42. Wang D, Li T, Zhang Y, Hou J. Survey on multisensory feedback virtual reality dental training systems. *Eur J Dent Educ* 2016;20:248-60.

43. Mirghani I, Mushtaq F, Allsop MJ, Al-Saud LM, Tickhill N, Potter C, *et al.* Capturing differences in dental training using a virtual reality simulator. *Eur J Dent Educ* 2016;doi:10.1111/eje.12245.
44. Khelemsky R, Hill B, Buchbinder D. Validation of a novel cognitive simulator for orbital floor reconstruction. *J Oral Maxillofac Surg* 2017;75:775-85.
45. Roy E, Bakr MM, George R. The need for virtual reality simulators in dental education: A review. *Saudi Dent J* 2017;29:41-7.
46. Ren Q, Wang Y, Zheng Q, Ye L, Zhou XD, Zhang LL, *et al.* Survey of student attitudes towards digital simulation technologies at a dental school in China. *Eur J Dent Educ* 2017;21:180-6.
47. Kapoor V, Gambhir RS, Singh S, Gill S, Singh A. Knowledge, awareness and practice regarding needle stick injuries in dental profession in India: A systematic review. *Niger Med J* 2013;54:365-70.