Descriptive correlational study of knowledge, attitudes and practices related to blood exposure accidents among operating room nurses in the two university hospitals of Sousse

Étude descriptive des connaissances, attitudes et pratiques liées aux accidents d'exposition au sang chez les infirmières du bloc opératoire dans les deux hôpitaux universitaires de Sousse

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Abstract

Introduction: The occupational infectious risk in the health care environment is potentially ubiquitous. Several infectious agents are transmitted to healthcare professionals, especially by blood and body fluids.

Aim: To describe the knowledge; attitudes and practices related to blood exposure accidents (BEA) among operating room nurses and to determine their associated factors.

Methods: A descriptive correlational study was conducted from February 24 to April 10, 2022, among nurses of the operating rooms in the two university hospitals of Sousse using an auto administrated questionnaire inspired from the literature.

Results: Our population was composed of 133 nurses. The average age was 38.79 ±7.75 years and the average length of work was 12.02 ±7.8 years. Overall, the respondents had moderate knowledge about BEA. Indeed, 17.3% did not know the meaning of the acronym BEA. Concerning the attitudes, almost (63.1%) had been the victim of at least one BEA. The most frequent types of BEA were pricks (81%), cuts (37%) and splashes (33.3%). The mechanisms of occurrence were mainly recapping (91.7%) and disposal of health care waste (74.4%). Only 48.1% of respondents had received training on BEA. The systematic use of gloves for health care procedures was unsatisfactory (66.2%). According to the studied practices, in case of injured skin, (82.7%) of the respondents wore gloves if they had any skin lesions. Almost all respondents (90.2%) were vaccinated against hepatitis B. Women had better knowledge about the meaning of the acronym BEA (p=0.011). The comparison of practices showed that recapping dirty needles after use was significantly higher among females than males (p=0.011).

Conclusion: The solid knowledge about the BEA and systematic application of standard precautions in health care settings must be concretely manifested in the daily practices of health professionals.

Key words: Hospital, Blood accident, epidemiology, Tunisia.

Résumé

Introduction: Le risque infectieux professionnel dans l'environnement des soins est potentiellement omniprésent. Plusieurs agents infectieux sont transmis aux professionnels de la santé, en particulier par le sang et les fluides corporels.

Objectifs: Décrire les connaissances, les attitudes et les pratiques liées aux accidents d'exposition au sang (AES) chez les infirmières du bloc opératoire et de déterminer les facteurs associés.

Méthodes: Une étude descriptive a été menée du twenty-four février au 10 avril 2022 auprès des infirmiers des blocs opératoires des deux hôpitaux universitaires de Sousse à l'aide d'un questionnaire auto-administré inspiré de la littérature.

Résultats: Notre population était composée de 133 infirmières. L'âge moyen était de 38,79±7,75 ans et l'ancienneté moyenne de 12,02±7,8 ans. Les répondants avaient une connaissance modérée de la BEA. En effet, 17,3% ne connaissaient pas la signification de l'acronyme BEA. Concernant les attitudes, presque tous les répondants (63,1%) avaient été victimes d'au moins une agression. Les types of de BEA les plus fréquents étaient les piqûres (81%), les coupures (37%) et les éclaboussures (33,3%). Les mécanismes de survenue étaient principalement le récapuchonnage (91,7%) et l'élimination des déchets de soins de santé (74,4%). Seuls 48,1% des répondants avaient reçu une formation sur les BEA. L'utilisation systématique de gants pour les actes de soins n'est pas satisfaisante (66,2%). Selon les pratiques étudiées, en cas de lésions cutanées, (82,7%) des personnes interrogées portaient des gants. La quasi-totalité des répondants (90,2%) étaient vaccinés contre l'hépatite B. Les femmes avaient une meilleure connaissance de la signification de l'acronyme BEA (p=0,011). La comparaison des pratiques a montré que le récapuchonnage des aiguilles sales après utilisation était significativement plus élevé chez les femmes que chez les hommes (p=0,011). Conclusion: La bonne connaissance du BEA et l'application systématique des précautions standard en milieu de soins doivent se traduire concrètement dans les pratiques quotidiennes des professionnels de santé.

Mots clés: Hôpital, Accidents d'exposition au sang, épidémiologie, Tunisie.

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INTRODUCTION

The hospital is defined as a high-risk infectious environment, which requires staff to be constantly vigilant and aware of the dangers and risks that surround them at all times [1]. Among these risks, blood exposure accidents are of particular importance [2].
According to the World Health Organization in 2013, 3 million health professionals are exposed to a needle stick with a risk of transmission of HCV, HBV, and the AIDS virus [3]. This type of accident is defined as any exposure through contact with potentially infectious biological fluids (blood, blood-stained biological fluids, serous fluids) at the level of a cut (puncture, cut, injured skin) or a mucous membrane (eye, mouth, etc.) [4].
It is accepted that this risk is strongly linked to the type of procedure performed. In addition, many pathogens (bacteria, viruses, parasites, and fungi) are likely to be transmitted by different transmission routes, notably by blood or other biological fluids [5].
The risk of BEA exists in all hospital activities, whether they be: care activities, collection and treatment of waste, road cleaning, sanitation, laboratory activities [5], or operating theaters [4].
Indeed, surgical interventions are considered as high-risk BEA activities, due to the handling of sharp objects, the frequency of contact with biological liquids and the particular organization of the operating theater where it is sometimes difficult to interrupt tasks during the intervention [2].
Physicians are the first victims of these accidents according to a study published in December 2019[7].
The profession of «operating room nurses» obliges us to be in direct contact with all types of biological fluids of a human nature, particularly blood, which can lead to professional contamination through the transmission of a pathogenic agent [8].
In practice, however, the hepatitis B virus (HBV), the hepatitis C virus (HCV) and the immunodeficiency virus (HIV) are feared above all, with a medium risk of transmission after percutaneous exposure to blood [9]. Indeed, the risk of transmission is 0.3% for HIV, between 0.5 and 3% for HCV and between 2 and 40% for HBV [10].
Despite the importance and seriousness of this problem, the level of knowledge of health professionals about BEA is still low [4]. Indeed, according to a study of Reis et al, the average knowledge in two groups of students and professionals was 11.32% [7]. The professional infectious risk related to BEA is insufficiently considered, which leaded us to choose this subject of work to describe the knowledge, attitudes and practices related to blood exposure accidents among operating room nurses in the two university hospitals of Sousse and to determine the associated factors.

METHODS

Study design

To answer the objectives of the study, we used a correlational descriptive study.

Study population

The study was conducted from 24 February to 10 April 2022 among health professionals working in the operating rooms of two university hospitals, namely CHU Farhat Hached and
Sahloul of Sousse. We included operating room nurses.
To be selected as a participant in the study, the following criteria must be met:

To be operating room nurses (ORN) occupying the function during the study period.
The criteria for non-inclusion are the operating theatre supervisors, students, trainees, nonconsenting staff, and the employees with a long period of leave.

Measurement instrument

For data collection, we used a self-administered questionnaire, consisting of twenty-eight closed multiple choice questions (MCQ). There are MCQs with five propositions and others with four propositions. The questionnaire was inspired by the literature [12,13].
It consists of four parts. Part 1 contained socio-professional characteristics (profession, age, gender, experience, operating units, and institution). Part 2; knowledge about blood exposure accidents. Part 3; attitudes towards BEA and part 4; practices relating to BEA and their prevention.
One of the fundamental issues to be addressed before undertaking any research project is to verify its validity (expert opinion + pre-test).
We validated the relevance of the questions designed by asking the opinion of five experts (two in preventive medicine , two in health sciences and one in occupational medicine)
who judged our measurement tool and gave their opinion on the questionnaire.
A pre-test was conducted to enable the interviewers to familiarize themselves with the measurement tool used in the data collection. The use of a pre-test allows the detection of some errors, to ensure the clarity of the questions and to check whether they have been formulated in a language that is accessible to the population. It is also an effective way to assess the time needed to administer the measurement instrument. The questionnaire was initially pre-tested with ORNs. Following this pre-test, the average completion time was estimated at 10 minutes. The pre-test participants were included in our study population. No problems were found with the comprehension of the questionnaire.

Data Collection

It was conducted from 24 February to 10 April 2022 with nurses working in all the operating theatres of the two university hospitals of Sousse.
It was conducted during the working hours of the staff. The objectives of the study were explained to the participants. The time allocated to complete the questionnaire was 10 to 15 minutes.

Statistical analysis

The results of the qualitative variables were presented as numbers (n) and percentages (%), the results of the quantitative variables were presented as means and standard deviations. For the analytical study, we used Pearson's Chi2 test and Fisher's exact test. The significance level was set at (p <0:05).

Ethical considerations

Permission was obtained from the heads of departments and supervisors of the operating units involved in the study before the start of the survey. We respected the anonymity of the participants and the confidentiality of the data during collection and entry. Written informed consent was obtained for each participant.

RESULTS

Descriptive study

Our population was composed of 138 people, and we collected 133 respondents to the questionnaire, so we had a response rate of 96.37%.

Socio-professional characteristics

Our study population was predominantly female (70%) and had a mean age of 38.79 ± 7.75 years and a mean length of experience of 12.02 ± 7.8 years. Most of the participants (15%) worked in the gynaecological and obstetric operating theatre, and 62.4% worked at the Sahloul University Hospital (Table 1).

Table 1. Distribution of participants according to socio-professional characteristics (n=133)

Socio-professional characteristics	Number	Relative frequency (%)
Age		
< 30 years	19	14.3
30 – 40 years	64	48.1
> 40 years	50	37.6
Gender		
Male	40	30
Female	93	70
Experience		
< 10 years	43	32.3
10 – 15 years	55	41.4
> 15 years	35	26.3
Hospital		
UH of Farhat Hached	50	37.6
UH of Sahloul	83	62.4

Frequency distribution of operating room nurses to its knowledge, attitudes and practices in our study, most respondents had an overall satisfactory knowledge, attitudes, and practices of blood exposure accidents.

Most respondents had a satisfactory knowledge of the acronym BEA (82.7%). According to our study population, the main infectious agents transmitted by blood during a BEA were hepatitis C and B (88.7%) and AIDS (69.2%).

Concerning the Attitudes studied, almost two-thirds of the respondents (63.1%) said they had been a victim of a BEA and (41.7%) of them said it was for three times or more. Only 48.1% of respondents had received training on BEA and almost the entire study population (90.2%) liked to benefit from more knowledge on this topic.

According to the studied practices, in case of injured skin, (82.7%) of the respondents wore gloves if they had any skin lesions. All respondents (90.2%) were vaccinated against hepatitis B. (Table 2)

Analytical study

Participants' knowledge by gender and experience

The best responses regarding the meaning of the acronym BEA were more common among women than men and this difference was significant (p=0.011).

The proportions of those who thought they were at risk of blood-borne infection were significantly greater among women than among men (p=0.01).

In addition, women were more aware of the main infectious agents than men, but without significant difference.

Table 2. Percents of answers to the knowledge attitudes and practices questions (n=133)

Criteria	Answers	Percent (%)
Knowledge		
Meaning of the acronym BEA	Correct answers	82.7
Possibility of being exposed to a risk of blood-borne infection	YES	89.5
Main infectious agents transmitted by blood during a BEA	*Hepatitis C and B *AIDS	88.7 69.2
Hepatitis B vaccination protects against contamination from BEA	Yes	**41.3**
First actions after BEA	*Disinfection *Washing with soap and water *Dressing the wound *Provocation of bleeding	85.7 81.2 47.4 36.1
Measures to take in case of a BEA	*Reporting the work accident *Actively sought the source person's HIV status *Contacted the occupational physician and performed first aid *Contacting a referring physician for virus prophylaxis	94.7 94.0 93.2 75.2
Time of occurrence of a BEA	*During the needle recapping *When disposing of health care waste *In certain difficult care situations *With an inexperienced employee *If there is more work and fewer staff	91.7 74.4 65.4 51.9 39.8
Two pairs of gloves protect better than one pair against BEA	* 2 pairs of gloves protect better than one pair against BEA (%)	54.1
Decreased risk of blood exposure with knowledge that a patient is HIV positive	Knowing a patient is HIV positive decreases the risk of blood exposure.	75.9
Means of preventing a blood exposure accident in the operating room	*The respect of general hygiene precautions *Staff vaccination *The competence of the nursing staff	94.0 87.9 86.5
Mandatory reporting of BEA	*Reporting in the case of a BEA is mandatory. *The occupational physician was the main person to report the incident	94.7 93.6
Time to report a BEA	Reporting a BEA should be done immediately (< 1 hour).	52.7
Attitudes		
Being a victim of a BEA:	*YES *For 3 times or more	63.1 41.7
Reporting a BEA:	*NO *Because the procedure was too complicated *Because of lack of time	32.1 74.1 63.0
Performing serology on the source patient after BEA:	YES	83.5

Table 2. (continued) Percents of answers to the knowledge attitudes and practices questions (n=133)

Criteria	Answers	Percent (%)
Insurance against the risk of seroconversion:	YES	61.7
BEA training:	Training on BEA *Benefit from more knowledge on this topic	48.1 90.2
Practices		
Organization of care before starting labor	Yes	93.2
Recapping dirty needles after use:	Yes	41.4
Needle disposal:	disposal of needles in a needle container.	95.5
Availability of containers:	The containers were always located right next to the care action	72.9
Wearing of gloves to perform all care procedures:	Yes	66.2
Wearing gloves if staff have skin lesions	Yes	82.7
First action to take if staffs are injured at the time of care.	Cleaning the wound	88.0
Mode of practice when infected with a virus (HIV, hepatitis B, hepatitis C)	Could continue their activity + medical follow-up.	48.9
Hepatitis B Vaccination:	Vaccinated against hepatitis B	90.2
Performance of HBS antibody testing	Yes	57.9

Knowledge that knowing a patient is HIV-positive decreases the risk of blood exposure was significantly greater among staff with more than 10 years of experience than those with less than 10 years (p=0.001) (Table 3).

Table 3. Association between participants' gender and experience, and their knowledge (n=133)

Answers	Gender			Experience		
	Males (n=40) n (%)	Females (n=93) n (%)	P-value	<10 years (n=43) n (%)	≥10 ans (n=90) n (%)	P-value
Meaning of the abbreviation BEA						
Blood Exposure Accident	28(70,0)	82(88,2)	**0,011**	38(88,4)	72(80,0)	0,232
Don't know.	12(30,0)	11(11,8)		5(11,6)	18(20,0)	
Perception of exposure to a risk of blood-borne infection						
Yes	30(75,0)	89(95,7)	**0,001**	42(97,7)	77(85,6)	**0,036**
No	10(25,0)	4(04,3)		1(0,3)	13(14,4)	
Types of infections						
Hepatitis A	16(40,0)	33(35,5)	0,621	12(27,9)	37(41,1)	0,140
Hepatitis C	34(85,0)	84(90.3)	0,382	37(86,0)	81(90,0)	0,562
Syphilis	15(37,5)	37(39,8)	0,804	19(44,2)	33(36,7)	0,406
AIDS	29(72,5)	63(67,7)	0,586	28(65,1)	64(71,1)	0,484
Tuberculosis	7(17,5)	15(16,1)	0,845	10(23,3)	12(13,3)	0,150
Hepatitis B	36(90,0)	82(88,2)	1,000	37(86,0)	81(90,0)	0,562
Vaccination against hepatitis B protects against contamination from the BEA.						
Yes	19(47,5)	36(38,5)	0,345	15(34,9)	40(44,4)	0,295
No	21(52,5)	57(61,6)		28(65,1)	50(55,6)	
The first things to do after a BEA.						
Wash thoroughly with soap and water.	33(82,5)	75(80,6)	0,802	31(72,1)	77(85,6)	0,063
Disinfection	34(85,0)	80(86,0)	0,877	36(83,7)	78(86,7)	0,650
Dressing of the wound	22(55,0)	41(44,1)	0,248	19(44,2)	44(48,9)	0,611
Provocation of bleeding	13(32,5)	35(37,6)	0,572	14(32,6)	34(37,8)	0,558
Measures to take in case of BEA.						
Perform first aid.	36(90,0)	88(94,6)	0,452	39(90,7)	85(94,4)	0,470
Actively seek the source person's HIV status	36(90,0)	89(95,7)	0,241	40(93,0)	85(94,4)	0,713
Immediately contact a referring physician for virus	32(80,0)	68(73,1)	0,399	30(69,8)	70(77,8)	0,317
Report the accident at work	38(95,0)	88(94,6)	1,000	41(95,3)	85(94,4)	1,000
Have the initial medical certificate drawn up	25(62,5)	54(58,1)	0,633	22(51,2)	57(63,3)	0,181
Immediately contact a referring physician for virus	38(95,0)	87(93,5)	1,000	39(90,7)	86(95,6)	0,272
The mode of occurrence of a BEA						
When recapping needles	36(90,0)	86(92,5)	0,733	39(90,7)	83(92,2)	0,746
When disposing of health care waste	32(80,0)	67(72,0)	0,335	29(67,4)	70(77,8)	0,201
In certain difficult care situations	29(72,5)	58(62,4)	0,260	29(67,4)	58(64,4)	0,734
More work and fewer staff	15(37,5)	38(40,9)	0,717	19(44,2)	34(37,8)	0,480
With an inexperienced employee	17(42,5)	52(55,9)	0,156	20(46,5)	49(54,4)	0,392
Two pairs of gloves are better than one pair to protect against BEA.						
Yes	20(50,0)	52(55,9)	0,530	21(48,8)	51(56,7)	0,397
No	20(50,0)	41(44,1)		22(51,2)	39(43,3)	
Knowing a patient is HIV positive reduces the risk of blood exposure						
Yes	30(75,0)	71(76,3)	0,868	25(58,1)	76(84,4)	**0,001**
No	10(25,0)	22(23,7)		18(41,9)	14(15,6)	
The ways to prevent a blood exposure accident in your operating room are.						

Table 3. (continued) Association between participants' gender and experience, and their knowledge

Answers	Gender			Experience		
	Males (n=40) n (%)	Females (n=93) n (%)	P-value	<10 years (n=43) n (%)	≥10 ans (n=90) n (%)	P-value
Compliance with general hygiene precautions	38(95,0)	87(93,5)	1,000	41(95,3)	84(93,3)	1,000
The organization of the operating room	28(70,0)	68(73,1)	0,713	29(67,4)	67(74,4)	0,399
The competence of the nursing staff	36(90,0)	79(84,9)	0,435	36(83,7)	11(12,2)	0,522
Supervision of supervisors	19(47,5)	49(52,7)	0,583	23(53,5)	45(50,0)	0,707
Vaccination of staff	32(80,0)	85(91,4)	0,082	35(81,4)	82(91,1)	0,107
The obligation to report the BEA.						
Yes	37(92,5)	89(95,7)	0,429	39(90,7)	87(96,7)	0,212
No	3(7,5)	4(4,3)		4(9,3)	3(3,3)	
If yes, a blood exposure accident must be reported to						
To the Emergency Physician	10(27,0)	23(25,8)	0,890	8(20,5)	25(28,7)	0,332
To the occupational physician	34(85,0)	84(90,3)	0,656	37(94,9)	81(93,1)	1,000
To the supervisor	15(40,5)	42(47,2)	0,495	18(46,2)	39(44,8)	0,890
To the hospital management	5(13,5)	12(13,5)	1,000	5(12,8)	12(13,8)	0,883
The time frame for reporting a blood exposure accident must be						
Immediate (<1 hour)	24(60,0)	46(49,5)		23(53,5)	47(52,2)	
Within 24 hours	11(27,5)	34(36,6)		12(27,9)	33(36,7)	
Within 48 hours	5 (12,5)	13(14,0)	0,518	8(18,6)	10(11,1)	0,391
Later	0(0)	0(0)		0(0)	0(0)	

Association between Participants' gender and experience and their attitudes

BEA by cut is higher for males than females with a statistically significant difference (p=0.022). The proportions of participants who did not know to report are significantly higher for males than females (p=0.044). BEAs were more common in NORs with 10 years or more experience (p=0.06). BEAs by splashing were more frequent among health care workers with 10 years or more experience (p=0.046). The reporting of a BEA accident was significantly more frequent among staff with 10 years of experience or more (p=0.010) (Table 4).

Table 4. Association between Participants' attitudes and their gender and experience (n=133)

Answers	Gender			Experience		
	Males (n=40) n (%)	Females (n=93) n (%)	P value	<10 (n=43) n (%)	>=10 (n=90) n (%)	P value
Being a victim of a blood exposure accident						
Yes	23(57,5)	61(65,6)	0,375	20(46,5)	64(71,1)	**0,006**
No	17(42,5)	32(34,4)		23(53,5)	26(28,9)	
Number of times						
1 time	7(30,4)	19(31,1)	0,719	9(45,0)	17(26,6)	0,075
2 times	5(21,7)	18(29,5)		7(35,0)	16(25,0)	
3 times or more	11(47,8)	24(39,3)		4(20,0)	31(48,4)	
Type of blood exposure accident						
Sting	17(73,9)	51(83,6)	0,356	15(75,0)	53(82,8)	0,516
Cut	13(56,5)	18(29,5)	**0,022**	6(30,0)	25(39,1)	0,463
Projection	10(43,5)	18(29,5)	0,226	3(15,0)	25(39,1)	**0,046**
The declaration of a blood exposure accident						
Yes	17(42,5)	42(45,2)	0,643	11(25,6)	46(51,1)	**0,010**
No	8(20)	19(20,4)		9(20,9)	18(20)	
Causes of non-reporting						
I did not know that I had to report.	4(50,0)	2(10,5)	**0,044**	3(33,3)	3(16,7)	0,367
I didn't know how to do it.	2(25,0)	4(21,1)	1,000	3(33,3)	3(16,7)	0,367
I felt at fault.	2(25,0)	3(15,8)	0,616	1(11,1)	4(22,2)	0,636
Procedure too complicated	5(62,5)	15(78,9)	0,633	6(66,7)	14(77,8)	0,653
Lack of time	5(62,5)	12(63,2)	1,000	5(55,6)	12(66,7)	0,683
Performing serology on the source patient after a BEA						
Yes, with agreement	32(80)	79(84,9)	0,481	36(87,3)	75(83,3)	0,955
No	8(20)	14(15,1)		7(16,3)	15(16,7)	
Insurance against the risk of occupational seroconversion						
Yes	21(52,5)	61(65,6)	0,154	26(60,5)	56(62,2)	0,845
No	19(47,5)	32(34,4)		17(39,5)	34(37,8)	
Receive blood exposure accident training						
Yes	18(45)	46(49,5)	0,637	23(53,5)	41(45,6)	0,392
No	22(55)	47(50,5)		20(46,5)	49(54,4)	
Receive more knowledge on this topic						
Yes	37(92,5)	83(89,2)	0,754	39(90,7)	81(90)	1,000
No	3(7,5)	10(10,8)		4(9,3)	9(10)	

Association between participant's practices and their gender and experience

Comparison of BEA practices between male and female caregivers showed that recapping of soiled needles after use was significantly higher among women compared to men (p=0.011).

As well, the proportions of women who had an anti-HBs test were higher than men with a significant difference (p=0.018).

Continued activity with medical follow-up was statistically more common among women than among men (p=0.036).

The organization of care, the disposal of needles after use in containers, the wearing of gloves to perform care procedures or in case the staff is a carrier of skin lesions, were better in participants with an experience more or equal than 10 years than in participants with an experience less than 10 years, however this difference was not statistically significant.

The distribution of participant practices by gender and experience are shown in table 5.

Table 5. The association between participants' practices by their gender and experience (n=133)

Answers	Gender			Experience		
	Males (n=40) (n%)	Females (n=90) (n%)	P-value	<10 (n=43) (n%)	>=10 (n=90) (n%)	P-value
Organization of care before starting work						
Yes	36(90)	88(95,6)	0,452	38(88,4)	86(95,6)	0,148
No	4(10)	5(5,4)		5(11,6)	4(4,4)	
Recapping dirty needles after use						
Yes	14(35)	41(44,1)	**0,011**	16(37,2)	39(43,3)	0,720
No	5(12,5)	27(29)		12(27,9)	20(22,2)	
Sometimes	21(52,5)	25(26,9)		15(34,9)	31(34,4)	
Disposal of used needles after use						
In a needle container	37(92,5)	90(96,5)	0,365	40(93)	87(96,7)	0,388
Other	3(7,5)	3(3,2)		3(7)	3(3,3)	
Are these containers always located right next to the care action						
Yes	25(62,5)	72(77,4)	0,076	32(74,4)	65(72,2)	0,790
No	15(37,5)	21(22,6)		11(25,6)	25(27,8)	
Gloves are worn for all care procedures.						
Yes	22(55)	66(71)	0,074	28(65,1)	60(66,7)	0,860
No	18(45)	27(29)		15(34,9)	30(33,3)	
Wearing gloves in case of skin lesions						
Yes	28(70)	82(88,2)	**0,011**	34(79,1)	76(84,4)	0,443
No	12(30)	11(11,8)		9(20,9)	14(15,6)	
First action in case of injury at the time of care						
Continue the treatment.	4(10)	12(12,9)	0,776	4(9,3)	12(13,3)	0,504
Clean my wound.	36(90)	81(87,1)		39(90,7)	78(86,7)	
Mode of practice in the event of a virus infection						
Prohibition to practice	18(45)	26(28)	0,055	12(27,9)	32(35,6)	0,381
Prohibition to perform invasive procedures.	15(37,5)	27(29)	0,335	11(25,6)	31(34,4)	0,304
Continuation of activity subject to medical follow-up	14(35)	51(54,8)	**0,036**	23(53,5)	42(46,7)	0,462
No restriction of activity	11(27,5)	17(18,3)	0,232	8(18,6	20(22,2)	0,632
Vaccination against hepatitis B						
Yes	34(85)	86(92,5)	0,209	39(90,7)	81(90)	1,000
No	6(15)	7(7,5)		4(9,3)	9(10)	
Anti-HBS antibody test						
Yes	17(42,5)	60(64,5)	**0,018**	29(67,4)	48(53,3)	0,123
No	23(57,5)	33(35,5)		14(32,6)	42(46,7)	

DISCUSSION

BEA, particularly in the operating units, is one of the most important occupational risks in the hospital environment. A regional exhaustive study in Tunisia for 11 years showed an extremely high prevalence of BEA in Tunisian hospitals [14]. The risk management approach, including BEA, aims to determine the causes of accidents in a preventive manner (anterior management) or in a corrective manner (posterior management) after their occurrence to avoid their recurrence.

In our study, most respondents had an overall satisfactory knowledge, attitudes and practices of the studied problem and has shown a significant difference in some of them related to some characteristics of the respondents (gender, and experience).

According to our study, most respondents had a satisfactory **knowledge** of the acronym BEA: 82.7%. Whereas it was known by only 28.3% in the study by Mufuka Konde David (2020) [15].

According to our study population, the main infectious agents transmitted by blood during a BEA were hepatitis C and B (88.7%) and AIDS (69.2%). A study conducted in 2018 among dental students toward Occupational Blood Exposure Accidents found close results about the infection agents, as 65% of respondents knew that the main infectious agents that can be transmitted by blood during a BEA were hepatitis C, B and HIV [16]. Another Tunisian study has demonstrated the same results [25].

Concerning the Attitudes studied, the rate of BEA that we found is similar to an Algerian survey done in 2022 showing that the frequency of exposure to BEA among hospital staff was 48.5% [17]. Another study by Norbert and Joris reported a higher rate (91.1%), with about two thirds of the respondents saying they had experienced more than two BEA in the last 12 months (66.7%) [17].

The prick is the most frequent type of BEA, in our study found in 57.4% of victims, this result agrees with the results of Ebatetou Ataboho et al (2018) whose prick with a dirty needle is the most frequent mechanism by 86.5% of paramedical staff [18].
Moreover, in our result, almost the entire study population (90.2%) would like to benefit from more knowledge on this topic, which is in line with the results found by Kone et al (2015), who showed that this type of BEA training was received by 36.7% of the staff, as well as, about 94.5% wanted to benefit from training or refresher training on BEA that joined [19]. According to the studied Practices, in case of injured skin, 82.7% of the respondents wore gloves if they had any skin lesions. In contrast, Benboubaker et al (2017), found only 67.6% [21].
In our series, we found a satisfactory vaccination coverage of 90.2%. This result was better than those found by Bawé et al (2018) who reported only 60.5% [22].
In the analytic study, some characteristics of the respondents (gender and experience) had influence in some knowledge, attitudes, or practices.

Association between knowledge of BEA and socio-professional characteristics
Regarding knowledge of the risk of BEA, the proportions of women who knew the meaning of the acronym BEA and thought that they were exposed to the risk of blood-borne infection were significantly greater compared to men with(p=0.011) and (p=0.001) respectively.
There was a significant difference in participants having less than 10 years of experience than in those with 10 years or more of service regarding the risk of exposure to a blood-borne infection with (p=0.036).
On the other hand, the knowledge that knowing a patient is HIV positive decreases the risk of blood exposure is significantly greater among staff with more than 10 years of experience than those with less than 10 years with(p=0.01).
According to the study by K. Kara-Péketi et al (2011), these observed differences are due to the fact that the youngest staff are more aware of the risk than the oldest staff, as well as the accumulation of risk situations for the oldest staff in the profession [22]. On the other hand, the prevalence of BEAs is 53.4% for staff with less than 15 years' seniority and 77.6% for those with 15 years' seniority or more. The difference is significant, which is why they eliminated the independence between the two variables [23].
According to Ebatetou (2018), the lack of continuous training, the forgetfulness of certain safety precautions and the trivialization of the risk are probably the main causes of the higher incidence of BEA in inexperienced staff [24].

Association between BEA attitudes and socio-professional characteristics
BEA by cutting is higher in men than in women, with a significant difference with (p=0.022). While the overall prevalence of SEA is high, it is also dependent on the gender of the subjects [23].

Association between BEA practices and socio-professional characteristics
Our survey revealed significant differences in certain practices, including the prohibition of recapping, the performance of anti-Hbs antibody testing, and the continuation of activity subject to medical follow-up. However, these poor practices were not necessarily the result of lack of knowledge and may have been related to a form of negligence or indifference by staff. In fact, it was found that BEA practices between male and female health care staff regarding recapping of dirty needles after use, is significantly greater in women compared to men with (p=0.011). Norbert Mandana et al (2013), showed that women have increased risk behaviours rather than men [24].
Regarding the organization of care, the disposal of needles after use in containers, the wearing of gloves for all care procedures or in case of skin lesions, were better for participants with a seniority of 10 years or more than for participants with a seniority of less than 10 years. However, this difference was not statistically significant.
Other studies found that there was an association between years of experience and blood accidents [25].

Strengths and limitations
Our study is descriptive-correlational with a response rate of (96.3%). The sample size was large and representative of the entire study population, which obviously reveals the strength of our work.
However, being fully aware of the impact of the choice of the measurement tool on the quality of the results, we were rigorous in its elaboration and submitted the draft questionnaire to the pre-test, which is an effective way to evaluate the data coding procedure and the duration of the measurement instrument and reveals the issues that may pose an ethical, religious and cultural problem.
As for the limitations, in addition to operating room nurses, the BEA were reported and managed by other categories and in other services. To address this, this study should be continued with a survey of all staff. Also, the survey includes only the two health facilities in Sousse.

Recommendations
It is important to put in place recommendations and solutions inspired by the literature and in the light of the results found, and to reduce the risks of BEA in the care environment.

To national health authorities
- To improve the HBV vaccination coverage rate, by vaccinating all unvaccinated subjects, and completing it for incompletely vaccinated subjects. This vaccination should be mandatory and decentralized, and the vaccination team should travel to the caregiver.
- The establishment of an efficient system for reporting BEA in all medical-surgical services and the establishment of information, awareness, and health education system on BEA in all health care facilities (primary, secondary, and tertiary care). - Training of health workers on SEA (reporting, management, and prevention)
- Recruitment of more staff in hospitals to lighten the workload.
- Provision of sufficient protective equipment for caregivers.
- Surveillance systems could improve the rate of surveillance. They would also allow for an analysis of the circumstances in which accidents occur.

Health care workers
- Implement standard precautions.
- Compliance with asepsis rules in general and immediately after a BEA (washing with soap and water, rinsing, application of alcohol or bleach or dakin).
- Development of double gloving and eye protection, at least during high-risk operations
- Development of the use of blunt-tipped needles, abandonment of straight needles and abandonment of woven material
- Take appropriate precautionary measures when they are ill themselves to avoid infecting patients and/or contaminating the work environment.
- Mandatorily report all cases of BEA to the occupational physician.

CONCLUSION

The control of the infectious risk related to BEA among operating room nurses is an important health issue and a goal set by the WHO recommendations. Nevertheless, adherence to these neither measure by ORN is determined by their perceptions of risk as well as by their attitudes regarding BEA.

Our results draw attention to the low rate of compliance with preventive measures.

The systematic non-application of standard precautions in the health care setting by health care professionals should lead to the implementation of an approach that will increase awareness and improve the equipment necessary for strict compliance. Training of health care professionals on standard precautions for good practice should be a priority for the Ministry of Health and further studies should be done to evaluate the effectiveness of educational interventions.

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