Safety and Health at Work 12 (2021) 66–73

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.net

Original Article

An Assessment of the Knowledge, Attitude, and Practice Toward Standard Precautions Among Health Workers From a Hospital in Northern Cyprus

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ARTICLE INFO

Article history:
Received 17 April 2020
Received in revised form
9 July 2020
Accepted 3 September 2020
Available online 11 September 2020

Keywords:
Health care workers
Needle stick injury
Standard precautions
Northern Cyprus

ABSTRACT

Background: The objective was to assess the knowledge level, attitude, and practice of health care workers towards standard precautions, and to identify the related factors. Furthermore, it was attempted to identify the proportion of having the experience of needle stick injuries (NSIs) and associated factors among participants.

Methods: A cross-sectional study was conducted in a teaching hospital among 233 health workers using a self-administrated questionnaire. The questionnaire included eight knowledge items, seven practice items, and five attitude items. Based on the mean score of each category, responses were grouped into "satisfactory" and "unsatisfactory". Univariate, bivariate, and multivariable logistic regression analyses were done.

Results: The mean age of the participants 32.95 (SD ± 9.70) and 62.2% of them were women. 57.5% of the staff had a satisfactory level of correct knowledge (>5 correct answers), 37.3% had a satisfactory positive attitude (>3 correct answers), and 30.9% had a satisfactory practice (>3 correct answers) towards standard precautions. The occupation was one of the predictors as doctors were less likely to have satisfactory knowledge and practice compared to nurses (OR = 0.269, 95% CI: 0.10–0.70 and OR = 0.248, 95% CI: 0.08–0.77, respectively). Out of 174 participants, 31.6% of them reported experiencing NSIs and support staff were 71% less likely to experience NSIs compared to nurses & paramedics.

Conclusion: The findings revealed a substandard adherence of standard precautions among participants, which highlighted the necessity of the provision of a periodic, tailored training program based on the occupation and risk exposure.

1. Introduction

Healthcare workers (HCWs) play an important role in providing prevention, diagnosis, treatment, and care to people in diverse healthcare settings. According to the World Health Organization (WHO), HCWs are all people who are involved in activities that aim at enhancing health, include those who provide health services such as doctors, nurses, laboratory technicians, pharmacists, and those providing health management and supporting services such as officers, drivers, cleaners, and cooks [1,2]. Health workers are exposed to a number of occupational hazards in healthcare settings, including biological, chemical, ergonomic, physical, and stress/violence [1,3–6] Among these, blood-borne pathogens such as hepatitis B virus, hepatitis C virus, and human immunodeficiency virus (HIV) comprised major risks to health workers, particularly HCWs who are exposed to blood and body fluids through sharps or needlestick injuries (NSIs) during the care for the patients [1,3,5–7].

It was reported that of 35 million HCWs worldwide, about two to three million of them every year experience NSIs that contributed to 40–65% of all hepatitis B virus and hepatitis C virus, and 4.4% of HIV infections globally [1,3,6–8]. Gabriella et al stated in a review that according to the nationwide surveillance report by the Italian Study Group for Occupational Risk of HIV infection (SIROH), of 24,009 mucocutaneous exposures, 4% occurred in the laboratory, 65% took place in transporting and manipulating samples, 6% occurred while performing phlebotomy to the patients, and 14% while cleaning and

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2093-7911/$ – see front matter
https://doi.org/10.1016/j.shaw.2020.09.003

disinfecting the environment [10]. This report also suggested inadequate compliance and a lack of knowledge about standard protections (SPs) using personal protective equipment [10].

To reduce the occupational risks for HCWs, it is essential to educate and encourage health workers to practice SPs in healthcare settings, which is defined as "a group of infection prevention practices that apply to all patients, regardless of infection status. It is based on the principle that all blood, body fluids, secretions, excretions except sweat, nonintact skin, and mucous membranes may contain transmissible infectious agents" [7,10,11]. Particularly, infection control education is one of the crucial components of the risk management training in healthcare settings; the training should highlight the implementation of a series of standard precaution measures and enforce routine safe practices to protect both HCWs and service users [7,10]. The routine safety practices include hand hygiene; the use of personal protective equipment; the safe use and disposal of sharps/needles; safe handling and disposal of clinical waste, spillage of blood, and bodily fluids; decontamination of equipment and the environment; and safe management of linen [10,11,38,40,41].

There are abundant studies published in this area to assess the knowledge, attitude, and practice of health workers in different countries toward universal precautions in various healthcare settings worldwide [5,7,9,12–18]. Most of them have reported a low level of knowledge about infection control precautions [9,13,14,17,19,20] and poor adherence [7–9,13,20,21,39] with the standard precautions among health professionals. Some studies highlighted that factors such as having an infection-control policy, providing periodic training programs on safety injections and precautionary practice, as well as establishing a well-developed infection reporting system in the healthcare settings significantly affect the level of knowledge and compliance of health workers with the prevention strategies [7,15–18,20,22–25]. However, there is a vast information gap in this area as there is no single study done in the Turkish Republic of Northern Cyprus (TRNC) among HCWs. Thus, the objective of the study was to assess participants' knowledge level, attitude, and practice of HCWs toward SPs, and to identify the related factors attributed to the knowledge, attitude, and practice toward SPs. Moreover, we attempted to identify the proportion of having the experience of NSIs and related factors that increase the risks of NSIs among participants. The long-term aim of the study is to provide evidence-based recommendations for the stakeholders to develop adequate training programs and practical guidelines in the healthcare settings in the country.

2. Materials and methods

2.1. Study design and duration

The cross-sectional study was conducted from March to April 2019 at the Kyrenia University Dr. Suat Günsel Hospital. The ethical approval was obtained from the ethics committee of Near East University with a project number of YDU/2019/67-765 (approved on 28.03.2019). Meanwhile, official permission was obtained from the hospital management to conduct the research among health personnel.

2.2. Study setting and sampling

The study site was Kyrenia University Dr. Suat Günsel Hospital, which is among the four private health facilities situated in Kyrenia. The private hospital has 150 beds consisting of all health units, including emergency, surgery, cardiology, internal medicine, pediatrics, gynecology and obstetrics, and operating rooms. In this study, HCW was defined as "all paid and unpaid persons working in healthcare settings who have the potential for exposure to infectious materials (e.g., blood, tissue, and specific body fluids and medical supplies, equipment, or environmental surfaces contaminated with these substances)" [26]. Thus, a purposive sampling method was used, and all personnel working at the hospital at the time of the data collection were included in the study. Of the total 258 health workers, 233 of them responded to the questionnaire with a respondent rate of 90.3%. The health workers included were medical doctors, nurses, laboratory scientists, paramedics, pharmacists, physiotherapists, administrators, drivers, and cleaning staff that work at the hospital as all of them are known to be exposed to different levels of hospital hazards.

2.3. Study tools

A structured self-administered questionnaire was constructed through an extensive literature review [7–9,13,17,25,28]. Content validation was done by four public health experts, and construct validation was completed through a pilot testing of the questionnaires before data collection [29]. Detailed information was provided to the participants regarding the purpose of the study and confidentiality. A written informed consent was taken from the participants before the data collection, and the data were collected under the supervision of the researchers. The questionnaire consisted of 38 questions with four components. The first section included questions related to participants' sociodemographic characteristics, such as sex, age (in years), nationality (Turkish, Northern Cyprus, others), marital status (married, single, others), education level, occupation, department, and work experience. The educational level indicated the highest level of schooling attained and was classified into three groups: "secondary or less," "high school," and "university or above". Information on medical checkups status was assessed using questions: "Have you ever done medical checkups before you start your current job?" and "Have you ever been asked to do routine medical checkups at your current workplace?" with answers of "yes", "no," and "do not remember". Based on the responses, the occupation of the participants was categorized into three groups: "doctors", "nurses and paramedics," and "support staff". Participants' departments were grouped into three, namely, "emergency and wards," "clinics & polyclinics," and "support & administrative units".

The second part comprised eight questions regarding the participants' perceptions and knowledge regarding standard precautions, workplace hazards, and hospital safety and control measures (Table 1). The knowledge toward standard precautions, such as washing hands before and after touching the patient and wearing gloves when touching the patients, was asked. Moreover, participants' knowledge of the existence of infection control measures, the safety training program provided to them at the hospital, and its adequacy was assessed. Responses to items of knowledge were "yes" or "no," and correct responses were given a score value of "1" according to the Disease Control and Prevention Center guideline on standard precautions [27,28] (Table 1).

The third part consisted of seven questions pertaining to the practicing of standard precautions such as using protective clothing that include goggles/eyeglasses, gowns, bonnets when caring for patients. There were four questions regarding the safety precautionary practices while performing injections. The practice of wearing gloves when they perform injections was asked with "yes" or "no" responses. In addition, participants were asked if they change the gloves while contacting with another patient (yes or no). Lastly, there were two questions regarding the practice of safe disposal of sharps/needle waste, including whether they recap the needle again (always, sometimes, never, or not applicable) and whether they dispose of the

used needle in the specific sharps container. The answer was described in 5 categories “always,” “sometimes,” “never,” “there is no sharp container,” or “not applicable”. For each question, “1” score was given for the correct response of “always”, while the zero score was assigned to all other responses. The total score for practice ranged from zero to seven (0–7), whereas for the total knowledge score ranged from zero to eight (0–8).

Participants' attitude toward standard precautions was assessed using five questions which were focused on their attitude toward using masks, gloves, aprons, surgical caps, and eyeglasses and how often they should use those protections. The answer provided were “no need to use at all”, “no need to change for each patient”, “change once per day” or “change for each patient”. Positive responses with the right attitude were given the score of “1”, while a zero score was assigned to all other responses. Thus, the total attitude score ranged from zero to five (0–5). Two questions were asked regarding their attitude on their daily job whether it is risky and stressful. An additional question was asked to know that if they were warned by the hospital management when they did not use precautionary equipment such as masks and gloves. The answers provided were “yes,” “no,” or “do not remember”.

In this study, the definition of WHO on sharps or NSIs was adopted as “a penetrating wound with an instrument that is potentially contaminated with blood or body fluid of another person” [28]. Section four included questions regarding participants' experience on NSIs. A further question of “Have you ever had a needle stick injury while you were doing the injection or related activities?” was asked with the four possible descriptions (yes, no, do not remember, or not applicable). For the analysis, only the “yes” and “no” answers were included for the experience of NSI. Further question was asked about where did they report to once they had an injury as an open-ended question and grouped the answers accordingly. Information on any skin discomfort or disease caused by the gloves was asked, and the answers for these questions were “always,” “sometimes,” and “never”.

A pilot study was conducted among 50 health personnel working at the Near East University Hospital to test the feasibility and internal consistency of the questionnaire. The questionnaires used for the pretest were excluded from the final analysis. Some minor modifications were done to improve the readability and quality of the questions. The reliability coefficient for the questionnaire (using Cronbach's alpha internal consistency coefficient) was 0.71.

2.4. Data analysis

The data were analyzed using IBM SPSS (Statistical Package for the Social Sciences) version 23 (SPSS Inc., Chicago, IL, USA). Descriptive statistics including frequency, percentage, mean, and standard deviation (SD) were done to describe the characteristics of the study sample. The total scores of participants' knowledge, practice, and attitude were dichotomized into satisfactory and unsatisfactory categories based on the cutoffs which determined based on the mean scores. Namely, a satisfactory level of knowledge was score > 5, a satisfactory practice was score >3, and a satisfactory positive attitude was score > 3. Bivariate analysis using the Chi-square ($\chi 2$) test [32] was done to examine the relationships between categorical variables such as a satisfactory level of knowledge, attitude, and practice regarding standard precautions using contingency tables. The Fisher's exact test was used for some variables where the expected cells are less than 5 [33]. Exposure variables having a $p < 0.05$ level of significance in bivariate analysis was entered to construct the final model of multivariate logistic regression analysis. The odds ratio (OR) and confidence interval (CI) were presented with the p value set at <0.05.

3. Results

The mean age of the participants was 32.95 (SD $\pm$ 9.70) and 62.2% of them were women. Table 1 illustrates the frequency of the participants with the correct responses regarding each item constituted the knowledge, practice, and attitude toward SPs. Overall, higher proportions of participants had responded correctly to the knowledge and attitude items compared with practice questions. The mean score ($\pm$SD) for knowledge items was 5.73 ($\pm$1.72), while the mean scores for the practice and attitude items were 2.52 ($\pm$1.76) and 2.84 ($\pm$1.68), respectively. Based on the mean scores, 57.5% of the staff had a satisfactory level of correct knowledge (>5 correct answers), 37.3% had satisfactory positive attitude (>3 correct answers), and only 30.9% had a satisfactory practice (>3 correct answers) toward SPs.

Most of the staff answered correctly to the knowledge items related to washing hands (69.4% and 84.5%), workplace safety (85.8%), the existence of the infection control committee (81.1%), and training programs (74.7%). However, almost half of them did not know if the training program was adequate (45.9%). Fewer participants answered correctly in the majority of the practice items, except questions related to using gloves when doing the injections (73.4%), change gloves for each patient (89.3%), and disposing of the used needles to the special container (98.0%). About 47% of them reported that they did recap the used needle before disposal. Moreover, participants had a positive attitude toward using gloves (95.8%) and masks (70.4%), where fewer participants stated that it is necessary to use the bonnet (63.4%), gown (57.7%), and eyeglasses (55.3%) for each patient as SP measures.

The distribution of sociodemographic and other work-related characteristics of the participants by their occupation was presented in Table 2. Except for gender, all other characteristics of the participants have shown statistically significant differences between doctors, nurses/paramedics, and support staff. Support staff consisted of 24 secretaries, 9 drivers, 20 technicians, 9 security personnel, 15 cleaners, 16 porters, and 28 other office personnel. Almost all doctors have shown to have a university or above education level ($p = 0.000$), more than 10 years of working experience ($p = 0.000$), married ($p = 0.005$), and worked in the clinics, polyclinics, emergency, and ward units compared with nurses/paramedics and support staff ($p = 0.000$). However, a significantly higher proportion of participants who worked as support staff were from TRNC compared with other occupational groups ($p = 0.004$). A significantly higher proportion of doctors have reported that they had work-related diseases ($p = 0.011$) and stated that their job is stressful ($p = 0.001$) compared with their counterparts.

Table 3 shows the relationships between sociodemographic characteristics of the participants having a satisfactory level of knowledge, practice, and attitude toward SPs. Younger participants (<25 years compared with >30 years) and nurses/paramedics shown a significantly higher tendency of having a satisfactory knowledge compared with other occupational groups. Regarding the practice of SPs, factors such as being a doctor, working in clinics and polyclinics, and also having a university or above education level have significant relationships with having satisfactory practice compared with their counterparts. On the contrary, having a lower education level and being a support staff were shown to be significantly related to having a positive attitude, while a significantly higher proportion of staff from other countries showed to have a positive attitude compared with staff who were originally from Turkey and TRNC. The experience of having a NSI did not show any significant relationship with having satisfactory knowledge, practice and attitude toward SPs among participants.

Of all, 174 participants answered the question regarding the experience of NSIs and 31.6% (55) of them reported experiencing

Table 1
Standard precaution items to measure the frequency of the participants with the correct responses.

Items for knowledge of SPs (yes = 1)		n/total	%
Q1	Do you wash your hand before patient care?	161/232	69.4
Q2	Do you wash your hand after patient care?	197/233	84.5
Q3	Do you wear gloves while caring for the patient?	146/233	62.7
Q4	Do you think your workplace is safe in terms of hospital related infections?	200/233	85.8
Q5	Do you know if the infection control and prevention measures are adequate at your workplace?	126/233	54.1
Q6	Do you know if there is an infection control and committee at the hospital?	189/233	81.1
Q7	Do you know if there is any workplace training and education program for workers?	174/233	74.7
Q8	Do you think the training program is adequate for workers?	143/233	61.4
	Mean Knowledge score (±SD) = 5.73 (±1.72), Range: 0–8		
Items for practice of SPs (always = 1)		**n/total**	**%**
Q1	Do you wear goggles/eyeglasses during patient care to protect from body fluids/bloods, splashes or sprays?	10/233	4.3
Q2	Do you wear a gown during patient care to protect mucous membranes from body fluids/ bloods, splashes or sprays?	50/233	21.5
Q3	Do you wear surgical cap (bonnet) when you care for patients?	29/233	12.4
Q4	Do you use your gloves when you perform injection for patients?	113/154	73.4
Q5	Do you change your gloves when you perform injection for another patient?	158/177	89.3
Q6	Do you recap the used needle after injection?	79/147	53.7
Q7	Do you dispose the used needle in the special sharps' container?	149/152	98.0
	Mean Practice Score (±SD) = 2.52 (±1.76), Range: 0–7		
Items for attitude regarding SPs (Yes = 1)		**n/total**	**%**
Q1	Do you think it is necessary to wear a mask when caring for patients?	143/203	70.4
Q2	Do you think it is necessary to use gloves when caring for patients?	205/214	95.8
Q3	Do you think it is necessary to wear a gown when caring for patients?	105/182	57.7
Q4	Do you think it is necessary to wear goggles/eyeglasses when caring for patients?	73/132	55.3
Q5	Do you think it is necessary to wear bonnet/cap when caring for patients?	90/142	63.4
	Mean attitude score (±SD) = 2.84 (±1.68), range: 0–5		

AD, standard deviation; SP, standard protection.

NSIs at least once during the work. Table 4 illustrates the relationship between sociodemographic characteristics and job-related factors with experiencing NSIs during work. Being a nurse/paramedic has shown to have a significantly higher tendency of experiencing NSIs compared with other occupations. Meanwhile, it was shown that a significantly higher proportion of participants who had the experience of NSIs reported being aware of the infection control committee at their workplace.

The results of multivariate logistic regression analysis were presented in Table 5. Types of occupation have shown to be a significant predictor for the participants to have a satisfactory level of knowledge and practice toward SPs. Doctors were less likely to have a satisfactory knowledge and practice compared with nurses and paramedics (OR = 0.269, 95% CI: 0.10–0.70 and OR = 0.248, 95% CI: 0.08–0.77, respectively), whereas the support staff were four times more likely to have satisfactory knowledge toward SPs compared with nurses and paramedics (OR = 4.017, 95% CI: 2.03–7.95). Moreover, participants who worked at the support units were less likely to have satisfactory practice compared with nurses and paramedics. Interestingly, being a foreigner was the only predictor attributed to having a satisfactory attitude as participants from other countries had 2.93 (95% CI: 1.06–8.12) times the odds of having a positive attitude compared with those who did not. Those who worked as support staff at the hospital (OR = 0.392, 95% CI: 0.18–0.86) tend to have fewer experiences of NSIs compared with nurses and paramedics.

4. Discussion

One of the key strengths of the present study was to provide evidence-based information on the knowledge, practice, and attitudes of the health personnel who were working at a teaching hospital toward workplace health and safety measures, which is remaining as a knowledge gap in Northern Cyprus. Furthermore, the findings of this study, which revealed a substandard adherence of health personnel toward standard precautionary measures, highlighted the necessity of the government-driven, nationwide studies on this topic among health personnel from all public and private health facilities in the country. Such studies are essential to provide evidence to develop specific strategies and customized training programs to improve the awareness, adherence, and compliance of health personnel toward prevention measures in healthcare settings.

In the present study, all sociodemographic characteristics of the participants except gender were shown statistical significant differences between doctors, nurses and paramedics, and support staff. Some differences (education, work experience, departments) were comparable with the findings from a study by Asmr Y. et al [8], whereas some (gender, age) were inconsistent with a study conducted in Iran [29]. It was found that the correct answers for each knowledge, practice, and attitude items were much lower than the findings from a study by Askarian et al in the university-affiliated hospital of Shiraz, Iran [29]. For instance, the proportion of answering correctly to the knowledge items related to washing hands before (69.4% vs 94.0%) and after (84.5% vs 94%) caring for patients and wearing gloves (62.7% vs 95%) was much lower in our study. The proportion of correct answers for all practice and attitude items was much lower than that for knowledge items, and this was in line with the aforementioned study. Such discrepancy might be due to the differences in study designs and study participants in these studies as a majority of these study participants were doctors [29], surgeons [30], and some were only conducted among nurses [31]. Particularly, the usage of goggles/eyeglasses (4.3%), gowns

Table 2
Distribution of sociodemographic characteristics and some work-related factors of the participants by occupations (N = 233).

	Doctors		Nurses/paramedics		Support staff		Total		χ^2	*p*
	n	%	N	%	n	%	n	%		
Total	38	16.3	74	31.8	121	51.9	233	100		
Gender										
Male	20	52.6	26	35.1	42	34.7	88	37.8	4.271	0.118
Female	18	47.4	48	64.9	79	65.3	145	62.2		
Age (years)										
<25	—	—	18	24.3	15	12.4	33	14.2	57.33	0.000*
25–30	2	5.3	40	54.1	56	46.3	98	42.0		
>30	36	94.7	16	21.6	50	41.3	102	43.8		
Marital status										
Married	27	71.1	29	39.2	63	52.1	119	51.1	14.66	0.005*
Single	8	21.1	43	58.1	54	44.6	105	45.1		
Divorced	3	7.8	2	2.7	4	3.3	9	3.8		
Nationality										
Turkish	21	55.3	32	43.2	38	31.4	91	39.1	15.50	0.004*
TRNC	15	39.5	40	54.1	63	52.1	118	50.6		
Others	2	5.2	2	2.7	20	16.5	24	10.3		
Department										
Emergency and ward units	8	21.1	22	29.7	42	34.7	72	30.9	31.93	0.000*
Clinics and polyclinics	29	76.3	37	50.0	35	28.9	101	43.3		
Support units	1	2.6	15	20.3	44	36.4	60	25.8		
Work experience										
<5 years	2	5.3	46	62.2	96	79.4	144	61.8	104.37	0.000*
5–10 years	8	21.2	18	24.3	20	16.5	46	19.7		
>10 years	28	73.7	10	13.5	5	4.1	43	18.5		
Education level										
High school or less	1	2.6	2	2.7	54	44.6	57	24.5	159.89	0.000*
College and undergraduate	9	23.7	70	94.6	59	48.8	138	59.2		
University or above	28	73.7	2	2.7	8	6.6	38	16.3		
Work-related diseases										
Yes	5	13.2	1	1.4	2	1.7	8	3.4	13.04	0.011*
No	28	73.6	64	86.5	103	85.8	195	84.1		
Don't remember	5	13.2	9	12.1	15	12.5	29	12.5		
Perceived workplace risk										
Yes (risky)	36	94.7	66	89.2	99	81.8	201	86.3	4.86	0.088
No	2	5.3	8	10.8	22	18.2	32	13.7		
Perceived workplace stress										
Yes (stressful)	36	94.7	72	97.3	97	80.2	205	88.0	14.71	0.001*
No	2	5.3	2	2.7	24	19.8	28	12.0		

* Fisher's exact test.

(21.5%), and bonnets (12.4%) of HCWs in our study was much lower than that in other studies [14,18,29,32,33]. However, the proportion of participants that reported to be trained with workplace health and safety precautions in our study was higher (74.7% vs 48.5%) than the findings from a study by Beyamo et al, which questioned the efficiency of the training as the practice and attitude of the HCWs were not adequate in the present study [39]. The insufficiency of the training program was also confirmed by the majority of the participants as 61.4% of them reported that the training was not adequate. Furthermore, a study done in the United Kingdom by Cutter and Jordan (2012) has reported that the relationship between attending the training and the usage of the double glove and eye protection was not found significant, but attending the training was found significantly related to the usage of safety devices among HCWs [28].

Our study found that the proportions of participants with a satisfactory level of knowledge, practice, and attitude were 57.5%, 30.9%, and 37.3%, which were substantially low compared with the findings from studies done in Iran [29], Egypt [34], Malaysia [22], Ethiopia [7,35], and Turkey [6]. One of the studies done in Ethiopia reported that 88.6% of the participants had good knowledge, while 60.2% of them had a good practice, and nurses had better SPs practices (74%) compared with doctors (21.8%) [7]. Similarly, the results of the logistic regression of the present study revealed that the types of occupation were one of the factors that significantly attribute to participant's knowledge and practice regarding SPs, and nurses had better SPs compliance and knowledge compared with doctors, which was comparable with several studies [7,18,30,33,34]. However, support staff had shown a significantly higher level of knowledge compared with nurses which is inconsistent with the findings from several other studies [6,33,36]. This might be due to the differences in sample size, sampling methods, and compositions of our study participants. In the present study, nurses consisted of about 32% (74) of total participants, which was considerably low in comparison with other studies [6,18,30,34].

Most of the sociodemographic (such as gender, marital status) and work-related characteristics (work experience) of the participants in our study were shown no significant relationships with their knowledge, practice, and attitude toward SPs. These findings are comparable with the results from some studies [29,33], whereas contrary to the study findings from other developing countries, where the gender [6,7,31,36], marital status [35], and work experience [6,34–36] were shown to be significant factors related to their knowledge and compliance toward SPs. In the present study, bivariate analysis of the independent variables with the knowledge level showed that a higher proportion of the younger participants (<25ys) had satisfactory knowledge (66.7% vs 48%, $p < .05$) compared with older personnel (>30ys), which is consistent with the findings from a study by Hakim et al in Egypt [38]. However, Beyamo et al reported that older HCWs (>30ys) were more likely to comply with the SPs than younger counterparts (<25ys), whereas our study did not show a statistically significant difference with age [39]. Moreover, the same study also found that participants with shorter work experience (≤5ys) were 2.5 times more likely to comply with the SPs than those who have more than 10 years of work experience [39]. In

Table 3
Relationships between sociodemographic characteristics of the participants by having a satisfactory level of knowledge, practice, and attitude (N = 233).

Factors	Satisfactory knowledge	Satisfactory practice	Satisfactory attitude
	% (n)	% (n)	% (n)
Total	57.5 (134/233)	30.9 (72/233)	37.3 (81/217)
Gender	ns	Ns	ns
Male	62.5 (55)	35.2 (31)	40.0 (32)
Female	54.5 (79)	28.3 (41)	35.9 (49)
Age (years)	**a**	Ns	ns
<25	66.7 (22)	30.3 (10)	37.5 (12)
25–30	64.3 (63)	28.6 (28)	38.7 (36)
>30	48.0 (49)	33.3 (34)	35.9 (33)
Marital status	ns	Ns	ns
Married	56.3 (67)	30.3 (36)	41.3 (45)
Single	59.0 (62)	30.5 (32)	34.3 (34)
Divorced	55.6 (5)	44.4 (4)	22.2 (2)
Nationality	ns	Ns	**a**
Turkish	56.0 (51)	38.5 (35)	34.1 (29)
TRNC	58.5 (69)	26.3 (31)	33.9 (37)
Others	58.3 (14)	25.0 (6)	65.2 (15)
Occupation	**c**	**C**	**a**
Doctors	44.7 (17)	57.9 (22)	23.7 (9)
Nurses and paramedics	79.7 (59)	23.0 (17)	32.4 (24)
Support staff	47.9 (58)	27.3 (33)	45.7 (48)
Department	ns	**A**	ns
Emergency and ward units	62.5 (45)	33.3 (24)	37.7 (26)
Clinics and polyclinics	61.4 (62)	37.6 (38)	33.7 (34)
Support units	45.0 (27)	16.7 (10)	44.7 (21)
Work experience	ns	Ns	ns
<5 years	62.5 (90)	27.1 (39)	41.1 (53)
5–10 years	50.0 (23)	32.6 (15)	35.6 (16)
>10 years	48.8 (21)	41.9 (18)	27.9 (12)
Educational level	ns	**A**	**b**
High school or less	57.9 (33)	24.6 (14)	56.3 (27)
College & Undergraduate	60.9 (84)	28.3 (39)	34.4 (45)
University above	44.7 (17)	50.0 (19)	23.7 (9)
NSI experience (174)	ns	Ns	ns
Yes	20.1 (35)	10.3 (18)	10.1 (17)
No	40.2 (70)	27.0 (47)	26.6 (45)

ns: nonsignificant ($p > .05$). Raw percentages are presented.[a,b,c,d]
[a] $p < .05$.
[b] $p < .01$.
[c] $p < .001$.
[d] Fisher's exact test.

Table 4
Relationships between some sociodemographic and job-related factors with having the experience of sharps and needle stick injuries (NSIs) at the workplace (N = 174).

Factors	NSI experience				Total		χ^2	p
	Yes		No					
	n	%	n	%	n	%		
Total	55	31.6	119	68.4	174	100		
Occupation								
Doctors	15	27.3	19	16.0	34	19.5	10.64	**0.005**
Nurses & paramedics	27	49.1	41	34.5	68	39.1		
Support staff	13	23.6	59	49.5	72	41.4		
Recapping the used needle								
Yes	23	50.0	47	54.7	70	53.0	0.26	0.610
No	23	50.0	39	45.3	62	47.0		
Disposing the used syringe to the special sharp's container								
Yes	48	100.0	86	96.6	134	97.8	1.65	0.271*
No	—	—	3	3.4	3	2.2		
Have ever had any training about SPs								
Yes	40	72.7	85	71.4	125	71.8	0.03	0.859
No	15	27.3	34	28.6	49	28.2		
Perception on the adequacy of the SPs training								
Adequate	34	61.8	71	59.7	105	60.3	0.07	0.787
Not adequate	21	38.2	48	40.3	69	39.7		
Perceived workplace risk								
Yes (risky)	52	94.5	103	86.6	115	89.1	2.47	0.116
No	3	5.5	16	13.4	19	10.9		
Perceived workplace stress								
Yes (stressful)	52	94.5	106	89.1	158	90.8	1.35	0.246
No	3	5.5	13	10.9	16	9.2		
Awareness of having an infection control committee at workplace								
Yes	51	92.7	92	77.3	143	82.2	6.10	**0.009***
No	4	7.3	27	22.7	31	17.8		
Work-related diseases								
Yes	2	3.6	5	4.2	7	4.0	2.83	0.242
No	43	78.2	103	86.6	146	83.9		
Don't remember	10	18.2	11	9.2	21	12.1		

SP, standard protection.
* Fisher's exact test.

contrast to these results, there were no statistically significant differences found between working experience and the knowledge, practice, and attitude regarding SPs in our study.

The findings of our study showed that the types of departments in which HCWs were working have shown to be a significant predictor of the compliance toward SPs as the personnel from the support units were 58% less likely to practice SPs than the HCWs in emergency and ward units (OR = 0.420, 95%CI: 0.18–0.99). This finding is in line with the findings of the study done by K. Nichol et al in Canada [35]. In our study, positive attitudes toward workplace health and safety precautions among participants were low which is in line with a study conducted in Iran [29], and participants from other countries have shown to have three times more likely to have positive attitudes compared with the participants originally from Turkey. This might be due to the sample size and the data collection method of our study.

Of 174 participants who answered questions on NSIs, 31.6% (55) of them reported to have experienced NSIs at least once in their workplace, and this is lower than that in several studies in developing countries [7,8,33,37]. Asmr Y. et al reported that having the experience of NSIs was not statistically associated with their knowledge level which is similar to the findings in our study [8]. However, the study also found that having NSI experience was reversely related to their practice of SPs [8], which was not seen in the present study. It was found that 53.7% of the participants in our study had recapped the used needle during work, and the proportion is lower than the percentage of HCWs suffered from NSIs (67.9%) in a study conducted at the University of Alexandria teaching hospitals. The study also revealed that recapping used needle was one of the most common risk factors to have a higher risk of NSIs as it accounted for over one-third (36%) of NSIs among HCWs [8]. Similar to our findings, another study by Arinze- Onyia et al among 629 HCWs at the University of Nigeria Teaching Hospital has reported that 52.9% of HCWs recapped needle, and 42.5% of them discard both syringes and used needle into the safety box without recapping [19].

A study by Cutter and Jordan (2012) reported that among nurses (43%) and surgeons (57%) of total 315 HCWs, 58.1% of them had NSIs during the last five years, which is considerably higher than our results [28]. This is most probably due to the higher proportion of doctors in this study than ours. The study also found that the type of the profession was one of the predictors for sustaining an NSI at five years, which is comparable with the results of our study. However, doctors were more likely to have NSIs than nurses, whereas in our study, nurses were at higher risk than doctors and support staff [28]. Moreover, the results of the logistic regression analysis have shown that support staff were about 61% less likely to experience NSIs than nurses. Other work-related factors did not

Table 5
Factors related to the satisfactory level of knowledge, practice, and attitude and the experience of having NSIs at workplace: multivariate logistic regression analysis.

Factors	Satisfactory knowledge		Satisfactory practice		Satisfactory attitude		Experience of having NSI	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (years)								
<25	Ref							
25–30	0.923	(0.38–2.23)						
>30	1.383	(0.55–3.48)						
Occupation								
Doctors	0.269	(0.10–0.70)[b]	0.248	(0.08–0.77)[a]	1.380	(0.42–4.49)	1.237	(0.53–2.87)
Nurses and paramedics	Ref		Ref		Ref		Ref	
Support staff	4.017	(2.03–7.95)[c]	0.621	(0.29–1.33)	0.89	(0.43–1.85)	0.392	(0.18–0.86)[a]
Department								
Emergency and ward units			Ref					
Clinics and polyclinics			0.923	(0.97–1.95)				
Support units			0.420	(0.18–0.99)[a]				
Educational level								
High school or less			Ref		Ref			
College and undergraduate			1.360	(0.61–3.05)	0.481	(0.22–1.06)		
University above			1.402	(0.40–4.88)	0.385	(0.11–1.32)		
Nationality								
Turkish					Ref			
TRNC					1.034	(0.55–1.95)		
Others					2.933	(1.06–8.12)[a]		
Aware of an infection control committee at workplace (Yes vs No)							0.349	(0.11–1.09)

CI, confidence interval); OR, odds ratio; Exp(B).
[a] $p < .05$.
[b] $p < .01$.
[c] $p < .001$.

show any significant relationship with having NSIs experience among participants. Particularly, receiving education/training regarding SPs, self-perception of job risks, and stress were not statistically significant in relation to having NSIs, which is in line with several other studies [6,8,18,30,37].

The study has a few limitations to be noted. First, the results of this study should be evaluated with caution because of the study design and the purposive sampling method used. Only one teaching hospital was included as it is challenging to obtain permission to conduct research in the government hospitals and other health facilities in Northern Cyprus. The Kyrenia University Dr. Suat Günsel Hospital is one of the two teaching hospitals under Near East University, and because of lack of funding and limited timeline, it was feasible to conduct the study in this hospital. Second, the small sample size might be one of the disadvantages, and the result will not be able to represent all the HCWs in the island. Nevertheless, this study is the first of its kind to provide a brief glimpse on the topic in the local context. Most importantly, as one of the tangible outcomes of our study, researchers had conducted a four-hour training workshop to the study participants regarding the practice of standard precaution measures, how to prevent from NSIs, what to do and whom to report to when NSIs happened, etc. to improve their general knowledge and practice of SPs and to create a safer workplace by minimizing various hazards.

5. Conclusion

The study has revealed that the majority of HCWs who participated in this study has an unsatisfactory level of knowledge, inadequate practice, and negative attitude toward standard precautions at the workplace. The types of occupations were one of the attributable factors to significantly influence their perception and compliance with SPs. Moreover, nurses have shown to be the highest risk group in experiencing NSIs among all. It is highly recommended for hospital management and stakeholders to provide a periodic training program, which is tailored to each occupation group based on their job descriptions and risk exposures. Having an actively functioning hospital infection control committee would positively affect HCWs' adherence with SPs. The results of this study might provide preliminary evidence to the stakeholders and government to take action to conduct further nationwide studies on this topic to fill the gap in knowledge. Furthermore, in the long run, the systematic improvement in HCWs' knowledge and practice toward SPs will improve the overall quality of the service delivery and economy of the entire healthcare system as a result of improving the health of HCWs and reducing various hospital-associated infections.

Authors' contributions

GA was involved in the study design, data collection, data entry, analysis, and drafted the original manuscript. SAV was involved in the study design, data collection, data entry, and analysis. OA and SC contributed to the study design particularly the questionnaire development, data collection, and data entry. All authors read and approved the final manuscript.

Conflicts of interest

All authors have no conflicts of interest to declare.

Acknowledgments

The study was a part of the intern project of sixth-year medical students in the Near East University. The authors would like to thank all the intern students and study participants for their contributions to this study. We would like to thank Int. Dr. Altan Kamburca, Int. Dr. Osman Yangin, Int. Dr. Kerem Berk Toprak, Int. Dr. İbrahim Yangin and Int. Dr. Yusuf Abodan for thier contributions during the data collection process.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.shaw.2020.09.003.

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