

## Original article

## The prevalence of nosocomial infection rates and needle sticks injuries at a teaching hospital, during 2013–2014

Mohammad Effatpanah<sup>a</sup>, Hosein Effatpanah<sup>b</sup>, Sahar Geravandi<sup>c</sup>, Noorollah Tahery<sup>d</sup>, Arghavan Afra<sup>d</sup>, Farid Yousefi<sup>e</sup>, Shokrollah Salmanzadeh<sup>e</sup>, Mohammad Javad Mohammadi<sup>f,\*</sup>

<sup>a</sup> School of Medicine, Ziaiean Hospital, International Campus, Tehran University of Medical Sciences, Tehran, Iran

<sup>b</sup> Department of Public Health, Asadabad School of Medical Sciences, Asadabad, Iran

<sup>c</sup> Asadabad School of Medical Sciences, Asadabad, Iran

<sup>d</sup> Abadan Faculty of Medical Sciences, Abadan, Iran

<sup>e</sup> Infectious and Tropical Disease Research Center, Health Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

<sup>f</sup> Department of Environmental Health Engineering, School of Public Health AND Environmental Technologies Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

## ARTICLE INFO

## Keywords:

Hospital

Needle sticks

Nosocomial infections

Prevalence

Ahvaz

## ABSTRACT

**Introduction:** Nosocomial infections (NIs) and Needle stick injuries (NSIs) could play an important role in transfer NIs among the health care workers (HCWs).

**Objective:** The aim of this study was to evaluate the Prevalence of NIs and NSIs in Razi Hospital, Ahvaz, southwest of Iran, during 2013–2014.

**Materials and methods:** The present study was a descriptive study, conducted on all the patients who were hospitalized with signs and symptoms of infection after 48 h of hospitalization and 600 HCWs in Razi Hospital in Ahvaz, Iran during 2013–2014. Data about the patients' site of infection, ward of hospitalization, type of NIs and about HCWs type of NSIs, ward, their activity were collected. Data were summarized using descriptive statistical methods and were analyzed by Excel and SPSS 16.0.

**Results:** The results of the present study showed that the incidence of NIs were low (NIs < 2%) and 70 cases of NSIs found in this hospital during 2013–2014. The most incidence rates of NIs were reported in wards of obstetrics and gynecological (OBGYN), orthopedic, Intensive Care Unit (ICU), general surgery, infectious diseases, internal medicine and Coronary Care Unit (CCU) during 2013–2014. Based on the findings, recapping the needles was the most risk factor for NSIs. Also the results indicated that nurses were the highest risk of NSIs among other HCWs groups.

**Conclusion:** Based on these findings, NIs and NSIs in this hospital had a lower frequency in comparison with the national rates. Training programs related to the prevention of NIs and NSIs would be one of the priorities in the Razi teaching hospital.

## 1. Introduction

Nosocomial infections (NIs) occur 48–72 h after hospital admission, due to a person's stay in the hospital.<sup>1,2</sup> NIs is one of the most important causes of mortality, disability, hospitalization time, hospital costs and the incidence of health problems in medical centers.<sup>3</sup> Needle sticks injuries (NSIs) are one of common injuries in the teaching hospitals and medical place. NSIs commonly occur during needle recapping, drawing blood, transit disposal needle, passing needle, passed needles between personnel, needles penetrate the glove and skin, place needles in a

poorly located sharps container and failure to use appropriate personal protective equipment.<sup>4–8</sup> A major concern about nosocomial infections are between in health workers (HCWs) that can transfer allot of disease such as hepatitis B virus (HBV), hepatitis C virus (HCV) and the human immunodeficiency virus (HIV).<sup>9–13</sup> Therefore, the prevention of NIs and NSIs through identification, removal and protective activity of cases can be very effective.<sup>14</sup> The most common infections are pneumonia, Urinary Tract Infection (UTI),<sup>15</sup> Surgical Site Infections (SSIs)<sup>16</sup> and Bloodstream Infection (BSI).<sup>17</sup> In many cases, NIs cause death of patients which is increasing among hospital admissions and the treatment

\* Corresponding author. Department of Environmental Health Engineering, School of Public Health and Air Pollution and Respiratory Diseases Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

E-mail address: [javad.sam200@gmail.com](mailto:javad.sam200@gmail.com) (M.J. Mohammadi).

<https://doi.org/10.1016/j.cegh.2020.01.020>

Received 2 November 2019; Received in revised form 22 January 2020; Accepted 25 January 2020

Available online 29 January 2020

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of NIs due to resistance to a variety of pharmaceutical antibiotics can be very difficult.<sup>16,18–20</sup> NIs result in up to 4.5 billion dollar in additional HCWs expenses annually approximately two million persons each year and nearly 90000 individuals among hospitalized patients die due to this incidence.<sup>21–25</sup> Center Disease Control (CDC) reported that, in the United States among HCWs 600000 to 800000 cases of NSIs occur each year.<sup>12,26,27</sup> Within the HCWs in regard to the risk of NSIs, nurses, specialties surgery and anesthesia, residents, midwife, operating room technicians, nurse aid and workers tend to show relatively high and doctors, radiology and pediatrics relatively low rates of NSIs.<sup>28,29</sup> Based on result several studies, nurses are the most common groups Among HCWs who face NSIs injuries.<sup>30–34</sup> According to report published by WHO, NSIs was responsibility Incidence 66,000 hepatitis B, 16,000 hepatitis C, and 1000 HIV infections.<sup>35–37</sup> Reduce the risk of NIs and NSIs can include training of appropriate, increased knowledge of authorities about these infections avoiding hand-to-hand passing of sharp instruments, reduction of use of sharps device, using useful safety box, avoiding hand-to-hand passing of sharp instruments, decrease direct contact with needles and disposal greatly.<sup>5,35,38</sup> The results of different studies have shown that by spending much costs related to diagnosis and education can be decrease the rate of NIs and NSIs.<sup>39–42</sup> The rate of infection in a study by Maa et al. in was about 40%.<sup>43</sup> In another study performed in Italy in 2001, pulmonary infections were the most common NIs and the duration of hospitalization was an important factor affecting the incidence of infection.<sup>44</sup> In another study in the Hospital of Arak, Iran, the rates of surgical infections were high and in the ICU ward.<sup>45</sup> Based on the report by the National Nosocomial Infections Surveillance (NNIs) in 2006, 8833 device-related infections in adults were reported from participating health care facilities.<sup>46,47</sup> Greatest concern among HCWs are performing invasive procedures because of dangerous they may transferring BBIs.<sup>35,48,49</sup> The results our study showed that an increase in the HCWs knowledge can be reduce the rate of NIs and NSIs. This study aimed to determine the nosocomial infections (NIs) and needle stick injuries (NSIs) in Razi Hospital Ahvaz, southwest of Iran, during 2013–2014.

## 2. Materials and methods

### 2.1. Methods

The present study was a descriptive and cross-sectional study that

was performed on a all the patients who were hospitalized with signs and symptoms of infection after 48 h of hospitalization and 600 HCWs in Razi teaching hospital with approximately 220 beds, in the south-west of Iran during 2013–2014. Data's was taken from Razi Hospital. Criteria for the diagnosis of NIs and NSIs were based on the Center for Disease Control (CDC), National Nosocomial Infections Surveillance (NNSIS), reported and observation.<sup>50–53</sup> In the present study, based on the NIs and NSIs type, the control supervisors reported cases of NIs and NSIs, wards in which the NIs and NSIs occurred and the sampling methods and after consultation with the infectious diseases specialist of the hospital. NIs Sampling was performed a random from patients with infections including CBC, urine, chest x-ray and blood culture. NIs and NSIs data collection about the patients' site of infection, ward of hospitalization, type of NIs and about Category of HCWs information (residents, doctors, nurses, midwife, operating room technicians, nurse aid, workers), ward, their activity information (needle recapping, suturing, transit disposal needle, passing needle, passed needles between personnel, needles penetrate the glove and skin) were collected.

### 2.2. Description of study area

Ahvaz city, the capital of Khuzestan Province, with a population of approximately 1 million and an area of 8152 square kilometers, is located between 48° and 49°29' east of the Greenwich meridian and, 31° and 45' minutes north of the equator.<sup>54–58</sup> Razi Hospital is a tertiary-care hospital with 220 beds, and is located in the center of Ahvaz. The location of the study area is shown in Fig. 1.

### 2.3. Statistical analysis

The coded data were entered in SPSS software version 16. Data analyses were performed using descriptive statistics (frequency, mean and standard deviation for each variable).

## 3. Results

The Number of NIs and NSIs in different wards of the hospital are presented in Table 1. The predominant NIs distribution in OBGYN (Obstetrics and Gynecological), Orthopedic, ICU (Intensive Care Unit), general surgery, infectious diseases, internal medicine and CCU (Coronary Care Unit) ward were during 2013–2014. The highest rate of NSIs

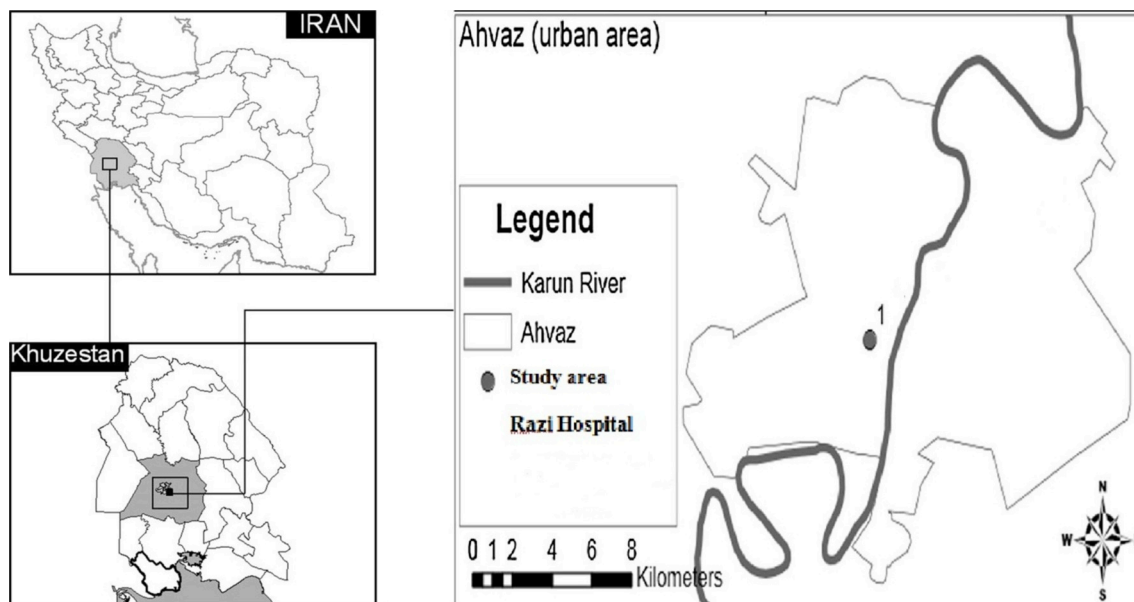


Fig. 1. Location of the study area Razi Hospital, in the south west of Ahvaz city.

**Table 1**  
Distribution of occupational NSIs in the hospital wards during 2013–2014.

Hospital ward	Number of NIs 2013	Number of NIs 2014	Number of NSIs 2013	Number of NSIs 2014
General surgery	6 (3.89%)	25 (13.22%)	7 (24.13%)	10 (24.39%)
internal medicine	2 (1.29%)	9 (4.76%)	4 (13.79%)	–
Infectious diseases	27 (17.53%)	35 (18.51%)	2 (6.89%)	2 (4.87%)
ICU	33 (21.42%)	52 (27.51%)	4 (13.79%)	8 (19.51%)
OBGYN	51 (33.11%)	50 (26.45%)	8 (27.58%)	7 (17.07%)
CCU	1 (0.65%)	–	–	–
Operating room	–	–	2 (6.89%)	3 (7.31%)
Orthopedic	34 (22.07%)	18 (9.52%)	2 (6.89%)	3 (7.31%)
Emergency	–	–	–	8 (19.51%)
Total	154 (100%)	189 (100%)	29 (100%)	41 (100%)

Abbreviations: OBGYN: obstetrics and gynecological; ICU: Intensive care unit; CCU: Coronary Care Unit.

was observed in OBGYN [8 (27.58%)] and general surgery [10 (24.39%)] wards during 2013 and 2014, respectively (Table 1).

Fig. 2 shows the number of NIs and NSIs versus different wards during 2013–2014. Number of cases NIs was estimated which were 154 and 189 in 2013 until 2014, respectively. Also, based on Fig. 2 number of cases NSIs was estimated which were 29 and 41 during 2013–2014.

The Number and Distributions of NSIs exposure among HCWs were estimated in Table 2. The results indicated that nurses to be at highest risk of NSSIs among other HCWs groups (n = 24, 34.28%) during 2013–2014. Totally, the incidence of NSIs was 70 cases in Razi teaching hospital (Table 2). Based on result Table 2 the numbers of NSIs between residents, doctors, nurses, midwife, operating room technicians, nurse aid and workers were 7(10%), 1(1.42%), 24(34.28%), 6(8.57%), 15(21.42%), 11(15.71%), respectively.

Totally, the incidence of NIs was in 2013 (0.975) and 2014 (1.8) percent in Razi teaching hospital. SSIs were the most frequent category of infection (54.55%), followed by blood stream infections (BSIs) (19.48%), pneumonia (18.18%) and UTI (7.8%) during 2013 (Fig. 3). Also Fig. 3 show that during 2014 the UTI, as compared to other types of infection, were the most frequent category of infection.

The predominant activities at time of NSIs are presented in Fig. 4. Totally, the 70 respondents who had experienced NSIs in this center during 2013–2014, (n = 25) were recapping needle, passing needle (n = 9), suturing (n = 12), handling needle on tray (n = 15), transit disposal needle devices (n = 4) and disassembling needle devices (n = 5), respectively.

**Table 2**  
The Number and Distributions of NSIs exposure among HCWs.

Category of HCWs	Needle Stick Injuries (2013)	Needle Stick Injuries (2014)	Total number and percent NSSIs among HCWs (2013–2014)
Residents	3 (10.34%)	4 (9.75%)	7 (10%)
Doctors	1 (3.44%)	–	1 (1.42%)
Nurses	9 (31.03%)	15 (36.58%)	24 (34.28%)
Midwife	4 (13.79%)	2 (4.87%)	6 (8.57%)
Operating room Technicians	2 (2.53%)	4 (9.75%)	6 (8.57%)
Nurse aid	6 (20.68%)	9 (21.95%)	15 (21.42%)
Workers	4 (13.79%)	7 (17.07%)	11 (15.71%)
Total	29 (100%)	41 (100%)	70 (100%)

#### 4. Discussion

In recent years, NIs and NSIs have been considered a serious threat to the quality of life and health of patients and HCWs. Razi Hospital is a 220-bed, tertiary hospital in the southwest of Iran. In this study, we summarized cases of NIs and NSIs among patients and HCWs groups.

Based on the results of this research, the number of cases of NIs was 154 and 189 during 2013 and 2014, respectively, and the incidence was 0.975% in 2013 and 1.8% in 2014, which was lower compared to rates of referenced NIs in the guideline book. In a study performed by Qader et al., prevalence rate of NIs has been reported about 36%.<sup>59</sup> Luzzati et al. has reported an incidence of NIs of about 30%.<sup>44</sup> There are some possible reasons contributing to the low prevalence of NIs in our study, including lack of a reporting system for NIs and using less invasive modes of treatment for patients.

According to the results of our study, SSIs were the most common type of infection in our hospital. In a similar work, Pellizzer's et al. in Italy reported that urinary tract (28.4%), surgical sites (20.3%), and bloodstream (19.3%) were the most frequent sites of infection.<sup>60</sup> Based on the study by Javanbakht et al. in Mashhad and Appelgren, SSIs were the most common type of infection.<sup>61,62</sup> Qader et al.<sup>59</sup> and Luzzati et al.<sup>44</sup> reported in their studies that pneumonia was the most common type of infection. These differences may be due to the number of patients studied, place of study, and genetic susceptibility.

As the results show, the highest rate of NSIs was observed in OBGYN [8 (27.58%)]and general surgery [10 (24.39%)] wards during 2013 and 2014, respectively. Pili et al. in their study showed that the NSIs in most cases occurred in the ICU and CCU wards, 24.7% and 12.4%, respectively.<sup>63</sup> In a similar work, Afrasiabi's in Yasuj reported that 39.3% of operating room personnel had coetaneous injury, representing the highest rate.<sup>64</sup> In Ardebil, the maximum rate of NSIs was in cardiology

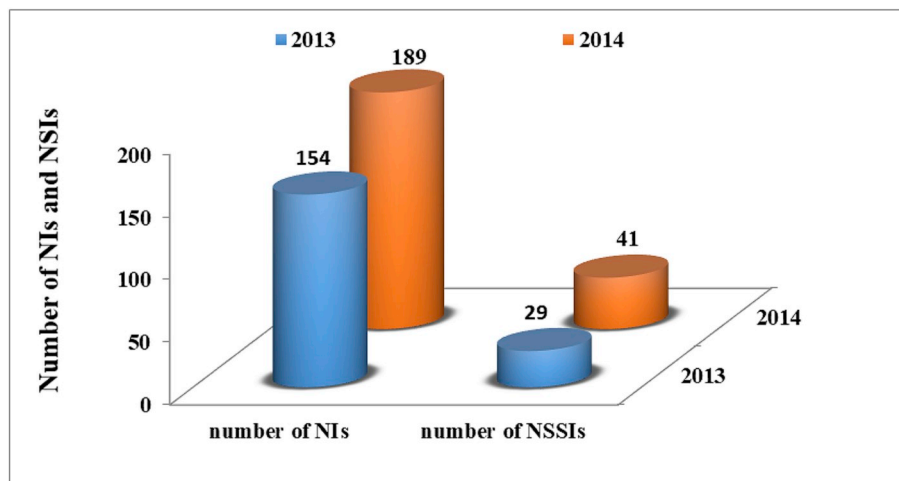


Fig. 2. Numbers of NIs and NSIs versus Razi teaching hospital during 2013–2014.

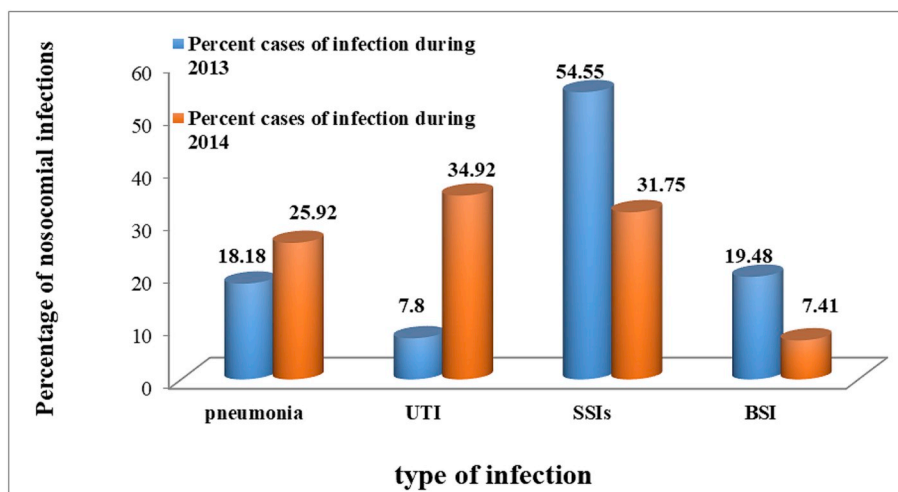


Fig. 3. Percentage of NIs based on type of infection, Razi Hospital during 2013–2014.

(64.7%), ICU (57.9%) and emergency (61.9%) wards, respectively.<sup>63</sup> In several studies, Zolldann et al.,<sup>65</sup> Unal et al.,<sup>66</sup> Jeong et al.,<sup>67</sup> and Kaoutar et al.,<sup>68</sup> to summarize, showed that ICU ward had the highest rate of NI as compared to other wards.

According to Table 2, the number of NSIs between residents, doctors, nurses, midwives, operating room technicians, nurse aids and workers were 7(10%), 1(1.42%), 24(34.28%), 6(8.57%), 6(8.57%), 15(21.42%), and 11 (15.71%), respectively, during 2013–2014. Jaybhaye et al., in their study, showed that nurses had the highest rate of NSIs as compared to other HCWs.<sup>38</sup> Several other studies had also shown high occurrence of NSIs among nurses.<sup>69–71</sup> In a similar work by Smith et al. in a Japanese teaching hospital during 2006, nurses with 46% were the most frequent cases of NSIs.<sup>72</sup> Our results indicated that nurses were at the highest risk of NSIs compared to other HCW groups (n = 24, 34.28%) during 2013–2014. This observation is in agreement with the findings of Gholami et al.<sup>73</sup> and Martins et al.<sup>74</sup> However, the incidence of NSIs reported by nurses in our survey was considerably lower than those in Askarian's study in the Fars province of Iran (49.6%),<sup>75</sup> Smith's study in Japan (46%)<sup>72</sup> and Smith's study in Korea (79.7%).<sup>76</sup> Another study reported that doctors were the most frequent NSIs (64.7%), followed by waste workers (25.5%) and nurses (7.8%).<sup>77</sup> In a similar work, Rais et al. in Karachi reported that nurses (28.4%) and doctors (21.6%) were the most frequent cases of NSIs.<sup>78</sup> This can be explained by the fact that nurses administer most of the injections and

are involved in most of the procedures that require the use of needles.

In the present study, the 70 respondents who had experienced NSIs in this center, (n = 25, 35.71%) were recapping needle, handling needle on tray (n = 15, 21.42%), suturing (n = 12, 17.14%), passing needle (n = 9, 12.85%), transiting disposal needle devices (n = 4, 5.71%) and disassembling needle devices (n = 5, 7.14%). Fredrich,<sup>79</sup> Jahan<sup>80</sup> and Cheng<sup>81</sup> showed that recapping of used syringes is responsible for 13%, 29%, and 28% of injuries, respectively. According to results of the study by Saleh at Asirin Central Hospital, Saudi Arabia, needle recapping (26.4%), careless disposal of sharp instruments (16.9%), and blood extraction (11.5%) were responsible for more than 50% of NSIs.<sup>82</sup> Based on the results of several studies, the main reason for the high frequency of NSIs was needle recapping after its use.<sup>6,7,29</sup>

### 5. Conclusion

This study was conducted to estimate the NIs and NSIs in Razi Hospital Ahvaz, southwest of Iran, during 2013–2014. In conclusion, it should be mentioned that the incidence rate of NIs and NSIs among patients and HCWs in this hospital was low, medical and hygiene interventions such as wearing sterile gloves, hand washing, avoid recapping, especially for the health-related personnel, careful monitoring of surveillance system, education on health, regular reporting NSIs, continuous supervision, having a NSIs protocol, correct use of

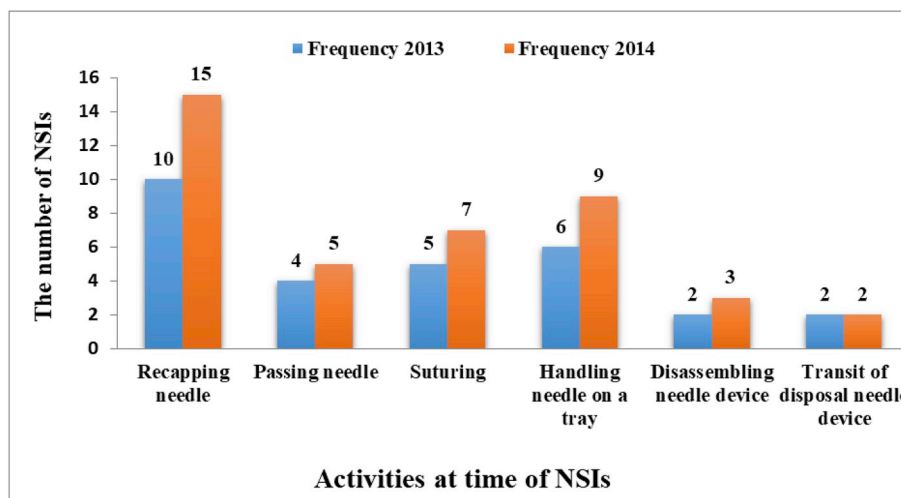


Fig. 4. The number of NSIs at time Activities, Razi Hospital during 2013–2014.

disposable equipment, controlled use of antibiotics, precise care of surgical wounds, keeping infected patients away from other patients, appropriate nutrition and sufficient number of nurses are the most important to be considered to reduce NIs and NSIs and their adverse effects. In summary, we believe this information is useful not only for us but for others involved in the care of residents in long-term care facilities inasmuch as there are little published data on yearly NIs and NSIs rates among patients and HCWs.

### Funding/support

The authors would like to thank Razi Teaching Hospital, Clinical Research Development Center for the technical support and providing the facilities. This work was financially supported by grant: (94s145) from Vice-Chancellor for research Affairs of Ahvaz Jundishapur University of Medical Sciences, Iran.

### Declaration of competing interest

There are no conflicts of interests among the authors.

### Acknowledgements

The authors would like to thank student Research Committee, Ahvaz Jundishapur University of Medical Sciences for providing financial supported by the grant: (94s145) of this research.

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