Pattern and risk factors of sharp object injuries among health care workers in two tertiary hospitals, Al Taif-Kingdom of Saudi Arabia 2016–2018

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ABSTRACT

Occupational exposure of healthcare workers to blood and body fluids following skin injury constitutes a risk for transmission of blood-borne pathogens. The risk of exposure is greater as well. The present study aimed to determine the burden and risk factors of sharp object injuries in two tertiary hospitals in the Taif City KSA. Retrospective review of needle stick injury records was included from the two hospital’s staff clinics. A Total of 131 health professionals (employees) recorded as exposed to sharp object injuries from both hospitals were enrolled during period 2016–2018. The collected data was cleaned, reviewed and analyzed using Statistical Package of Social Sciences SPSS ver. 25. The result of the study revealed that, the mean age for the 131 enrolled participants was 31 ± 6.6, Male to Female Ratio was 1:3. The most affected age group was 20–30 years (55.7%). Females were more affected 98 out of 131 (74.8%) than male (33 out of 131 (25.2%). And there is increasing incidence rates of exposure from 2.89 /10.000 patient/day in 2016 to 3.42/10.000 patients’/day in 2017, with highest exposed nationalities; Filipino 42 (32.1%), Saudi 31 (23.7%), and Indians 26 (19.8%), the remaining 24.5% were from 10 mixed nationalities. The frequent affected divisions were: ER, surgical ward, operation room, ICU, Laboratory, Medical W, Medical waste facilities (19.8%, 15%, 12.2%, 9.2%, 92% respectively). The most affected HCWs categories were nurses 74(56.5%), doctor 23(17.6%) and housekeeping 18 (13.7%). And the needle prick 104(79.4%) and cut wound 15(11.5%) constitute the highest type of injuries and were during operation 23 (17.6%), waste collection 15 (11.5%), cannulation 12 (9.2%) and giving injection 12 (9.2%). The common devices caused injuries were bore hole needle 63(48.1%), suture needle **(13.7%), cannula and insulin syringe 13 (9.9%) each. This study concluded that, as from 2016/C02018, there was an increasing rate of reported accidental exposure to sharp needle injuries amongst HCWs from 3.0 to 3.4/10.000 patient/day, and the younger and nurses were mostly impacted. Workplace, distress, work types and load had influences on injuries rates and types. Fortunately, no exposure among employee with HBV, HCV and HIV seroconversion were documented.

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1. Introduction

The needle stick or sharp injuries are caused by a variety of forms such as needles, lancets, surgical scalpels, cutting needles, blood vacuum tube needles, broken vial preparation, razors, scissors, etc. The major occupational risk of morbidity and death from blood-borne pathogens among healthcare workers is percutaneous exposure to blood and body fluids all through contaminated needle stick and sharp injuries. The transmission of blood-borne pathogens can be very impressed with the needle and sharp injuries (NSSIs). According to the World Health Organization (WHO) study,
contamination with Hepatitis B Infection (HBV) or C Infection (HCV) and 2–3% of HIV infections among medical staff contribute 40% to the workplace (Assem et al., 2020). Every year, 3.5 million suffered from NSI worldwide and ~1–600,000 thousand employees in the U.S. In the healthcare worker's case, NSIs are categorized as any transcutaneous injury, penetration of a sharp object wound, or needle that may result in blood contact or other body fluid. The most common circumstances in many studies are intravenous cannulations, improper needle disposal, needle recap (Shalaw et al., 2020). After percutaneous exposure, the estimated chance of HIV/HBV/HCV transmission to Health care workers (HCWs) is 0.1% to 0.3%, 10% to 30%, 3 to 10% respectively. The risk of infection following exposure ranges from one needle type, a system visually infected with blood or not, a depth of injury (more depth, more risk), a viral load at source during exposure, to initiating first aid timely provision and post-exposure prophylaxis, etc. In addition to diseases, the long-term consequences for NSI-supporting HCWs include severe psychological morbidities such as ache, depression, post-traumatic stress disorder (PTSD), and adjustment disorder (AD). The implications include unpaid working days that impact health care directly [30]. The 1st chance of having HBV, HCV, and HIV infections from a high degree of exposure, is a 2–40%, 3–10%, and 0.2–0.5%, respectively.

If the source patient has been positive. Furthermore, HBV can survive under ideal conditions for up to one week and have been detected from the dropped needles. The wellbeing and productivity of health workers are impaired by high cost, health effects, mental distress, and the loss of working days by morbidity and mortality associated with occupational risks (Yazie et al., 2019). In addition to health care providers, workplace NSIs impact the quality of health care services. Health care staffs suffer extreme emotional distress, and anxiety that leads them to changes in their work and actions. Three million of the thirty-five million health care staff suffer NSIs worldwide every year with health facilities in many countries showing the highest occurrence of these injuries (Assem et al., 2020).

Various studies have suggested that while bloodborne pathogen prevalence are rare in many developed countries, there is still a high level of NSI exposure in those countries (Manocci et al., 2016; Spiegel et al., 2007). The number of occupational accidents in the general population as well as in manufacturing, construction, mining, health, and social services has risen compared with day work; night, and shift work. The shift from day to day could increase the risk of injury at work. Based on the earlier meta-analysis study by Fischer et al. (Fischer et al., 2017), night and evening shifts have resulted in a growing risk of job injury (Harmá et al., 2020). If health professionals implement a comprehensive program to address institutional, behavioral, and device-related factors that contribute to needle stick injury in health workers, NSIs can be regarded as preventable (Dilie et al., 2017). Global wide studies have been conducted and no studies from the city of Taif, Saudi Arabia, are currently available. The current study was therefore designed to evaluate incidence and risk factors for needle stick injuries in two tertiary hospitals. To evaluate pattern and risk factors associated with sharp object injuries among HCWs and care providers arising in two tertiary hospitals.

2. Materials and methods

The study was a retrospective study, that carried out during 2016–2017 in two tertiary hospitals in Taif city kingdom of Saudi Arabia. The study included all health care workers who were working in this tow hospitals and exposed to sharp injuries including doctors nurse, technicians, housekeeper, etc during study periorecr. The sample included all cases of needle stick injuries in the period of the study. The procedure in the two hospitals was: if any health care worker exposed to accidental sharp injury he or she should notify occupational health clinic where will be registered and notification and post exposure management of all occupational injuries and will be given if. In this study review of epinet and hsen electronic program on data collection and other registry records from staff clinic was used to collect data. Data validation was done. The data include socio demographic information, job categories, departments and circumstances of injuries and result of complete follow-up of cases. The data was collected in Excel sheet then transported to SPSS version 20 for analysis (Khan et al., 2019). The ethical approval was obtained for this study from Research Ethics Committee in General Directorate of Health Affairs, Taif, KSA.

3. Results

In this study, 131 individuals were recruited among them 25.2% were male and 74.8% were female. In this study, between 20 and 50 years of age, both male and female individuals were involved. The most affected age group was between 20 and 30 years of age at 55.7%, followed by 31–40 years of age at 28.2% and then 41–50 years of age at 46.6%, and finally only 2.3% above 50 years of age. The basic details were tabulated in Table 1. A total of 13 nationalities of individuals have been involved in this study. The maximum number of subjects affected was Filipino with 32.1%, followed by Saudi Arabia with 23.7% and Indians with 19.8%. The remaining 24.4% of affected individuals were from 10 mixed nationalities.

Table 2 sets out the socio-demographic profiles of impacted health care staff with sharp objects. The ER department is the largest (19.8%) hospital department followed by the surgical department (15.3%), OR (12.2%), ICU/lab (9.9%), medical department (9.2%), medical waste (5.3%), and unspecified personnel reported as others with 18.5%. Total individuals are affected by syringes (48.1%) with the device attributable to accidents followed by a suture needle (13.7%), a cannula/insulin syringe (9.9%), and a surgical device (6%). Unidentified instruments are recorded as others at 13.8%. There have been minimal incidences in the circumstances of the injury, 17.6% during operation, 11.5% during waste processing, 9.2% during cannulation and each injection, 8.4% during blood extraction, 6.1% during needle recapbing and blood surgery monitoring each, 5.3% during needle retrieval and incorrect position of needle removal, 4.6% during injecting of insulin. The 16.9% of subjects were recorded as non-identified errors.

Table 3 specifies out health care workers’ occupation exposed to sharp objects and injury. The highest number of people affected are 56.5% nurses, followed by physicians (17.6%), housekeepers...
The current study aimed to investigate the risk factors of sharp needle injuries among the health care workers in the Taif city of Saudi Arabia. This is the initial study implemented in Taif city and the study results confirmed the rate of acute injuries increased from 2.89/10,000 patient’s days in 2016 to 3.422/10,000 patient’s days in 2017. Several more publications from all over the Gulf and around the globe on this particular topic are applicable, but the information is still lacking on regional variations and related factors. In the event and reporting of these injuries, multiple aspects play a role. The first requirement for the capture of incident wounds is a strong surveillance system (, xxxx). Needle stick injuries (NSIs) or needle stick sharp injuries (NSSIs), known as sharp injuries, percutaneous wounds, and sharp exposures represent accidents of the skin that are in contact with the blood of a source patient or the body fluids, including needles, scalpel or other sharp objects (Jahan, 2005). According to recent estimates by the World Health Organization, about two million NSIs cases are reported each year but this number may be understated because many NSSI cases, especially in developing countries are not reported. However, NSIs are of concern to the public health sector because they are a major worldwide source of morbidity and death. Annual NSIs cases of HCV, HBV and HIV infections are estimated at 16,000, 66,000 and 1,000. This could lead to around 1,100 deaths or major handicaps (Saadeh et al., 2020).

Limited studies have been carried out within the kingdom and other parts of the Globe (Al Shaikh; Jahan, 2005; Saadeh et al., 2020; Walle et al., 2013; Khraisat et al., 2014; Garus-Pakowska et al., 2018). The meta-analysis studies confirmed the positive and negative associations among the needle stick injuries among the health care workers (Yazie et al., 2019; Gheslagh et al., 2018; Tarigan et al., 2015; Auta et al., 2018). The prevalence of Iranian healthcare professionals has been confirmed around 74% (Akbari et al., 2018). Similar studies have reported a 37% prevalence of NSI in England (Control CfD, 2004), and 1.43 cases per year among nurses were reported as a hepatitis C and HIV transmission rate (Elder and Paterson, 2006). Furthermore, Australia’s NSI prevalence rate was also found to be equivalent to 47,000 NSIs annually, with one in five people (Grimmond et al., 2003). In the study by Talas, et al. (Talas, 2009), which reported a rate of 49%, the NSI Prevalence rate was also reported in Turkey. However, 79.7% of NSI prevalence in South Korea was reported, the most frequent instrument leading to a needle cap of 52%. Compared to other studies, a high rate of NSIs can be found between Iranian nurses by comparing the results obtained in this study (Akbari et al., 2018).

In the hospital department, 19.8% of sharp injuries were in the emergency department, the same rate as in the previous KSA study, which is high at 21.5% followed by 15.3% of surgical wards. The most injury–causing device is the Halle Bore device. The use of blunt needles reduces the risk of perforating gloves to a relative risk of 0.46 compared to studies conducted in Iran showing no documented seroconversion exposure to HCV, HBV and HIV, the results of this study were greater in women than in men (3:1). The HBV

### Table 2

| Associated factors | Number of incidents n (%) |
|-------------------|---------------------------|
| **Hospital departments** |                         |
| ER                | 26 (19.8%)                |
| Surgical ward     | 20 (15.3%)                |
| OR                | 16 (12.2%)                |
| ICU               | 13 (9.2%)                 |
| Lab               | 11 (9.8%)                 |
| Medical ward      | 12 (9.2%)                 |
| Medical waste     | 7 (5.3%)                  |
| Others            | 24 (18.5%)                |
| **Device cause injury** |                     |
| Syringe           | 63 (48.1%)                |
| Suture needle     | 18 (13.7%)                |
| Canula            | 13 (9.9%)                 |
| Insulin syringe   | 13 (9.9%)                 |
| SURGICAL instrument | 6 (4.6%)             |
| Others            | 18 (13.8%)                |
| **Circumstances of injury** |                   |
| During operation  | 23 (17.6%)                |
| During waste collection | 15 (11.5%)            |
| Cannulation       | 12 (9.2%)                 |
| During given injection | 12 (9.2%)             |
| During blood extraction | 11 (8.4%)            |
| During blood sugar monitoring | 8 (6.1%)             |
| During needle recappping | 8 (6.1%)             |
| During needle discard | 7 (5.3%)               |
| Wrong place needle | 7 (5.3%)                 |
| During insulin injection | 6 (4.6%)             |
| Others            | 22 (16.9%)                |

### Table 3

| Staff job         | Number of incidents n (%) |
|-------------------|---------------------------|
| Nurse             | 74 (56.5%)                |
| Doctor            | 23 (17.6%)                |
| House keeper      | 18 (13.7%)                |
| TECHNICIAN        | 10 (7.7%)                 |
| Yellow man        | 13 (9.9%)                 |
| Paramedic         | 4 (3.1%)                  |
| Trainer in lab    | 2 (1.5%)                  |
| Yellow man        | 1 (0.8%)                  |
| Total             | 131 (100%)                |
vaccine coverage of 69.5% of respondents was 72.5% (Alimohamadi et al., 2020). NSI is one of the world’s largest health system safety issues among HCWs with a global prevalence of 44.5%. Though its actual cause is unclear for the different prevalence rates in regions. The lowest prevalence of needle stick injury measurements in the various WHOs in developed regions such as Europe and the United States compared with other regions in the world can be attributed to the following reasons: the difference in methodology and the number of studies included in the current research from each country, different laws, different methods and the degree of supervision. Global and regional variations in needlestick prevention policies and fewer details of accurate prevention programs and national annual supervision structures in less developed regions. The fact that there are large NSI prevention programs, the provision of training courses and specific management information for NSIs in the developed countries, incentives to register NSI cases in hospitals, the priority categories of NSIs may be responsible for reducing NSI’s prevalence among HCWs developed countries. The preventive perspective of NSIs among HCW’s should be established (Bouya et al., 2020).

There are some limitations to the current study. This is a data-limited retrospective study. The strength of this study is the data obtained from several hospitals in Taif city.

5. Conclusion

There has been a spike in the occurrence of sharp needle injuries from 2016 to 2017. The younger people and the nurses were more affected. The emergency department was the area most affected. The most injurious tool was the borehole needle. The sharp operational injury was the most commonly occurring exposure followed by waste collection. It is important to provide the safety engineering system and training staff with standard precautions and post-exposure prevention to minimize the risk of acute injuries. To reduce the incidence of severe injury in healthcare workers, future research to measure knowledge, belief, and magnitude in acute injuries and post-exposure prophylaxis is crucial. However, nurses are more prone to injuries and measures must be put in place to help protect them.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

Akbari, J., Taheri, M., Khoosravi, N., Zamani, S., Ghadami, A., 2018. Work related stress and needlestick injuries (NS): A study among Iranian nurses with/without NSI. Ergonomics Int. J. 23, 1–11.

Al Shaikh, H.A., Al Mahdi, M.M., Naik, B.R. Sharps injuries among health care workers in Al Ahsa region, Saudi Arabia. Alimohamadi, Y., Taghidin, M., Sepand, M., Kalhor, L., Abedini, F., 2020;9:47–. Prevalence of needlestick injuries among health-care workers in Iranian hospitals: An updated systematic review and meta-analysis. Arch. Trauma Res. 9:47–.

Assen, S., Wubset, M., Kifle, M., Wubayehu, T., Aregawi, B.G., 2020. Magnitude and associated factors of needle stick and sharps injuries among health care workers in Dessie City Hospitals, north east Ethiopia. BMC Nursing 19, 1–8.

Auta, A., Adewuyi, E.O., Tor-Ansuyi, A., Edor, J.P., Kure, G.T., Khanal, V., et al., 2018. Global prevalence of percutaneous injuries among healthcare workers: a systematic review and meta-analysis. Int. J. Epidemiol. 47, 1972–1980.

Bouya, S., Balouchi, A., Rafiehmanesh, H., Amirshahi, M., Dastres, M., Moghadam, M. P., et al., 2020. Global prevalence and device related causes of needle stick injuries among health care workers: a systematic review and meta-analysis. Ann. Global Health 86.

Control CID, Prevention. Overview: Risks and prevention of sharps injuries in healthcare personnel. Workbook for Designing, Implementing, and Evaluating a ‘Sharps Injury Prevention Program,” available at. 2004.

Dilie, A., Amare, D., Gualu, T., 2017. Occupational exposure to needle stick and sharp injuries and associated factors among health care workers in Awi Zone, Amhara Regional State, Northwest Ethiopia, 2016. J. Environ. Public Health 2017.

Elder, A., Paterson, C., 2006. Sharp injuries in UK health care: a review of injury rates, viral transmission and potential efficacy of safety devices. Occup. Med. 56, 566–574.

Fischer, D., Lombardi, D.A., Folkard, S., Willett, J., Christiani, D.C., 2017. Updating the “Risk Index”: A systematic review and meta-analysis of occupational injuries and work schedule characteristics. Chronobiol. Int. 34, 1423–1438.

Garus-Pakowska, A., Ulrichs, M., Gaszyńska, E., 2018. Circumstances and structure of occupational sharp injuries among healthcare workers of a selected hospital in Central Poland. Int. J. Environ. Res. Public Health 15, 1722.

Cheshlagh, R.G., Aslani, M., Shabani, F., Dalvand, S., Parizad, N., 2018. Prevalence of needlestick and sharps injuries in the healthcare workers of Iranian hospitals: an updated meta-analysis. Environ. Health Prev. Med. 23, 44.

Grimmond, T., Rings, T., Taylor, C., Creech, R., Kampen, R., Kable, W., et al., 2003. Sharp injuries reduction using Sharpsmart™ – a reusable sharps management system. J. Hosp. Infect. 54, 232–238.

Härma, M., Koskinen, A., Sallinen, M., Kolu, T., Ronponen, A., Lombardi, D.A., 2020. Characteristics of working hours and the risk of occupational injuries among hospital employees: a case–crossover study. Scand. J. Work Environ. Health.

Jahan, S., 2005. Epidemiology of needlestick injuries among health care workers in a Secondary care hospital in Saudi Arabia. Ann. Saudi Med. 25, 233–238.

Khan, L.A., Jahan, P., Hasun, Q., Rao, P., 2019. Genetic confirmation of TDZM meta-analysis variants studied in gestational diabetes mellitus in an Indian population. Diabetes Metab Syndr. 13, 688–694.

Kharisai, F.S., Juni, M.H., Rahman, A., Said, S.M., 2014. Needlestick and sharp injuries among healthcare workers in hospitals: a mini-systematic review. Int. J. Clin. Med. Res. 1, 151–160.

Mannocci, A., De Carli, G., Di Bari, V., Saulle, R., Unim, B., Nicolotti, N., et al., 2016. How much do needlestick injuries cost? A systematic review of the economic evaluations of needlestick and sharp injuries among healthcare personnel. Infection Control & Hospital Epidemiology 37, 635–646.

Saadeh, R., Khairallah, K., Abozeid, H., Al Rashdan, L., Alfaqih, M., Alkhatatbeh, O., 2020. Needle stick and sharp injuries among healthcare workers: a retrospective six-year study. Sultan Qaboos University Med. J. 20, e54.

Shalaw, F., Shakor, J., Hamedon, T., Jalal, D., Qadir, D., 2020. Prevalence of needle stick and sharp injuries among surgical specialist hospital-cardiac centre in Eribi City: A cross-sectional study. Tanbi Biomed. Res. J. 2, 38–47.

Spiegel, P.B., Bennedsen, A.R., Claass, J., Bruns, L., Patterson, N., Yiweza, D., et al., 2016. Characteristics of working hours and the risk of occupational injuries among hospital employees: a case–crossover study. Scand. J. Work Environ. Health.

Tarigan, L.H., Cifuentes, M., Quinn, M., Kriebel, D., 2015. Prevention of needle-stick injuries and hepatitis B immunisation. J. Clin. Nurs. 18, 1394–1403.

Walle, L., Abebe, E., Tsegaye, M., Franco, H., Birhanu, D., Azage, M., 2013. Factors associated with needle stick and sharp injuries among healthcare workers in Felege Hiwot Referral Hospital, Bahir Dar, Northwest Ethiopia: a facility based cross-sectional survey. Int. J. Infect. Control 9, 1–9.

Yazie, T.D., Chuña, K.A., Tebeje, M.G., 2019. Prevalence of needlestick injury among healthcare workers in Ethiopia: a systematic review and meta-analysis. Environ. Health Prev. Med. 24, 52.