

Needle Stick Injury among Medical Students: Scoping Review

¹Tira Alfiani Laariya*, ²Fauzan Achmad Maliki, ¹Fitriana Mawardi, ¹Dewi Yuniasih

Email (Corresponding Author): tira.laariya@med.uad.ac.id

¹Department of Public Health, Faculty of Medicine, Ahmad Dahlan University, Indonesia

²Department of Obstetrics and Gynecology, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

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ABSTRACT

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Needle stick injury (NSI) is one of the occupational hazards in the healthcare sector. Needle stick injury refers to the accident of a percutaneous piercing wound caused by a potentially contaminated instrument with a person's body fluid. Medical students are high-risk people who contact with needles and body fluids. This study aims to assess the prevalence, incidence, knowledge, awareness, and level of NSI reporting among medical students. Systematic searches were conducted with specific keywords in 4 databases: PubMed, ScienceDirect, Scopus, and Google Scholar databases from 2018 to 2023. A total of eight articles were selected for analysis. They presented descriptively. The study revealed that the prevalence of NSI was varied, ranging from 2,7% to 8%. The incidence rate of NSI was 1,26% to 9,6%. The majority of the studies showed that the knowledge level of medical students was not satisfactory, but they had good awareness and good practice toward needle stick injury prevention. Contrarily, it was found that medical students had a low level of NSI reporting. Hence, it is important to make the medical students understand and aware of NSI, have good practice, and stick to the standardized protocol for NSI, including how to report it correctly.

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INTRODUCTION

Needle stick injury (NSI) is a percutaneous piercing wound caused by a potentially contaminated instrument with a person's body fluid. NSI are mostly caused by needles when recapping, disposing of waste, injection or suturing. Persons with NSI had a great risk of NSI-transmitted diseases, including HCV (21%), HBV (18%) and HIV (17%) ¹.

Medical students reported being exposed to blood or bodily fluids multiple times when they dealt with patients². They were needle-stick injured as a result of their lack of experience during recapping and blood withdrawal³. One out of three medical students suffered NSI during their clinical rotations in the third and fourth year ⁴. Needle stick injury among medical students was high, but more than half of them did not report it ⁵.

There were many recent preliminary studies have been conducted on NSI in medical students, but there is no scoping review yet. We conducted a scoping review to evaluate and collecting recent evidences. The aim of this study was to assess prevalence, incidence, knowledge, awareness, and level of NSI reporting among medical student from various studies.

METHODS

Literature search was conducted by searching in 4 databases. Authors performed independently search on PubMed, Science Direct, Scopus, and Google Scholar databases for literatures published between 2018 and 2023. The keywords were used: (“Needle Stick Injury” OR “NSI”) AND (“Medical Students” NOT “Nursing Students” NOT “Dental Students”). The data were collected in an extraction table, including the title of the article, author, year of publication, country in which the study was conducted, research objectives, research design, number participants and main findings. Only English literatures were included for review. Conference abstracts, brief report, review, commentary, poster and editorials were excluded in this study (Table 1).

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Quantitative study	Conference abstract
Qualitative study	Brief reports
Published between 2018-2023	Review articles
English language	Commentary
	Poster and editorial

RESULTS

A total of 40 articles were identified. There were two articles excluded after Mendeley software found the duplication, leaving 38 articles for title and abstract screening. A total of 28 articles were excluded based on screening because they did not discuss needle stick injury among medical students, leaving 10 articles. Based on the eligibility, 8 articles were finally synthesized in the study (Figure 1). All of 8 articles presented descriptively on Table 1.

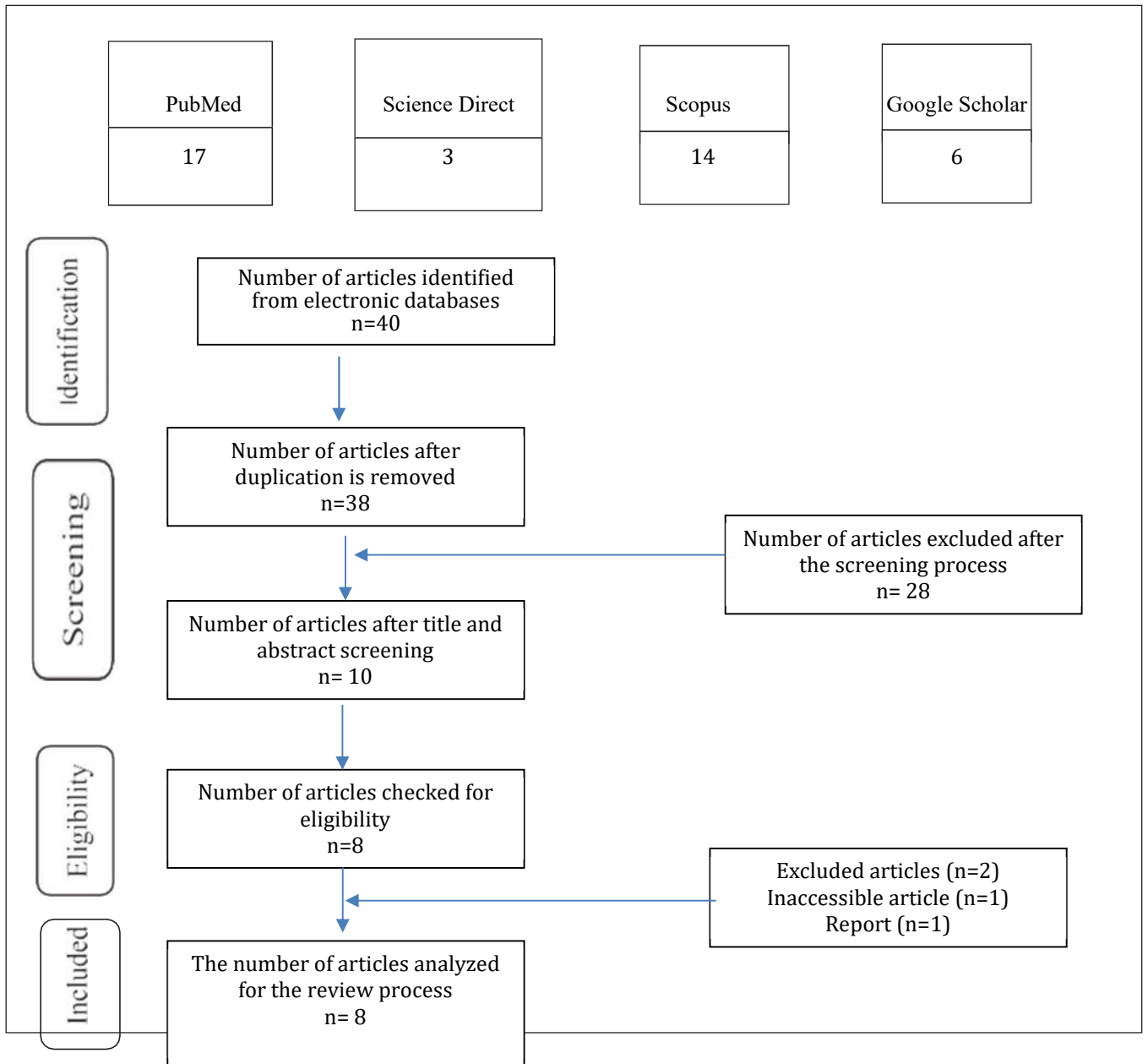


Figure 1. PRISMA flowchart of study selection process

Table 2. Summary of articles included in the review

No	Article title	Author (year)	Country of Research	Objective	Research Design	Number of Medical Students	Findings
1.	Study-Related Work And Commuting Accidents Among Students At The University Of Mainz From 12/2012 To 12/2018: Identification Of Potential Risk Groups And Implications For Prevention	Dietz P et al., (2018)	Germany	Assess type of student disciplines that might have an increased risk for having a study-related work accident and to identify what types of accidents that occurred.	Cross sectional	200	Medical students, particularly those on clinical rotation, reported being exposed to blood or bodily fluids multiple times. A single needle stick injury occurred in 19.3% of the children, both needle stick and splash exposure occurred in 40.9% of the children, and a single splash occurred in 39.8% of the 88 cases. Scrub (35.2%), bedside procedures (35.2%), arterial puncture (22.7%), lancet (13.6%), suture (5.7%), and others (8%), were the most common causes of exposure.
2.	Needlestick And Sharps Injuries At A German University Hospital: Epidemiology, Causes And Preventive Potential – A Descriptive Analysis	Kaur M et al., (2022)	Germany	analyze the prevalence of NSI) among health care workers and to identify further preventive measures	Cross sectional	30	Prevalence medical students with NSI were 5% (30 medical student had NSI among 567 health care workers). The causes of the injury were carelessness, slipped, item improperly disposed, unsafe sharp container, safety mechanism incompletely activated, cramped condition, and combination of various points.
3.	Knowledge, Attitude, And Practices Toward Hepatitis B Infection Among Healthcare Students—A Nationwide	Alaridah N et al., (2023)	Jordan	assessed the knowledge, attitudes, and practices toward HBV among Jordanian healthcare students	Cross sectional	612	Knowledge about needle stick injury was assessed; about half (48.4%) of them participants knew they should dispose of used needles and syringes into a sharp-proof

	Cross-Sectional Study In Jordan			(pharmacy, medicine, nursing, dentistry) and its associated factors			container immediately without recapping. Only one third of them knew they should not recap the needle with two hands because recapping needles is incorrect practice and can cause needle stick injury. Although, this finding showed that students had unsatisfactory knowledge and attitude scores, they had good score of practice toward HBV infection.
4.	Needlestick And Sharps Injuries In An Indonesian Tertiary Teaching Hospital From 2014 To 2017: A Cohort Study	Yunihastuti E et al., (2020)	Indonesia	to provide incidence and other epidemiological aspects of needlestick and sharp injuries (NSSIs) among Health Care Workers in a tertiary teaching hospital in Indonesia	Cohort study	23	Incidence needle stick injury among medical student was 12,6 per 1000 person. The devices causing the highest proportion of NSI were hollow- bore needles (66.8%), suture needles (14.3%) and solid needles (10.8%). Of all the incidents, 31.3% occurred during surgical procedures, 25.9% during blood collections, 14.3% during administering injection of drugs and 13.3% during waste cleaning.
5.	Is Knowledge And Awareness Of Needle Stick Injury Among Future Healthcare Providers Sufficient?	Syakirah NA et al., (2018)	Malaysia	to determine prevalence, level of knowledge, and awareness among students during their clinical years	Cross sectional	216	Prevalence NSI among medical students was 2.7% (6 incidents of 216 medical students), but none of them reported them. There was no significant difference level of knowledge, but good awareness on NSI among medical student. In the event of the injury, most of the injuries were

							happened during recapping needles and also non-recapping needles. Most of the injuries were due to hollow bore needle (83,3%). All of medical students who had NSI did not report the incidents.
6.	Travel Preparation And Health Risks In Dutch And Belgian Medical Students During An Elective In Low- Or Middle-Income Countries: A Prospective Self-Reporting Cohort Study	Vlot JA et al., (2020)	Dutch and Belgian	to determine prevalence of health risk and NSI among medical students	Cohort study	479	Prevalence NSI among medical students was 6,9% (33 incidents of 479 medical students). NSI happened during suturing, needle recapping, phlebotomy or assisting surgery.
7.	The State Of Needlestick Training For Undergraduate Medical Students At Canadian Universities	Shireff L et al., (2019)	Canada	to assess the prevalence of formal training of needlestick safety and reporting procedures	Cross sectional	34	The study showed that majority of respondents (53%) reported a lack of training on safe needle handling, but they knew of protocol for reporting needlestick injuries.
8.	Occupational Exposure To Potentially Infectious Biological Material Among Physicians, Dentists, And Nurses At A University	Reis LA et al., (2019) ⁶	Brazil	to evaluate the prevalence and incidence of NSI, the level of knowledge, compliance to standard precautions, perception, and biosafety training among dentists, physicians, nurses, and dental and medical students	Cohort study	114	The prevalence of accidents with biological material was 8% in medical students. The incidence rate was 9,6 %. Although, the levels of knowledge and compliance to standard precautions were good, they had low perception of NSI burden dan lack of biosafety training.

DISCUSSION

The present scoping review was conducted to synthesize recent publications about NSI among medical students. According to our findings, medical students were the number two

discipline with the highest incidence of accidents, primarily needle stick injuries, among other faculties. ⁷. Prevalence of NSIs in medical students was low, ranging from 2,7% to 8% ^{6,8-10}. The incidence rate of NSI was 1,26% in Indonesia and 9,6% in Brazil. These numbers were varied between studies might be caused by number of participants and location of the study. These findings reflect of epidemiology of NSI in medical students that might led to NSI's transmittable disease. They provide an alarming sign of accident that can occur in medical schools and teaching hospitals.

We believed that good knowledge, awareness, and practice can lead a better outcome. Medical students in Brazil had good knowledge and compliance to standard procedure of NSI ⁶. Although medical students in Jordan and Malaysia had unsatisfactory knowledge of needle stick injury, the had good awareness and practice of prevention of NSI and hepatitis B infection ^{8,11}.

The majority causes of NSI were related to hollow bore needles (66.8%), solid needles (10.8%), suture needles (14.3%), and scalpels (7%). Syringe needles, catheter stylets, insulin needles, butterfly wings, electromyography needles, and endodontic needles are examples of hollow bore needle types¹². In the event of the injury, most of the injuries were encountered during recapping needles (57%), injection (31%), disposing needle to sharp bin (9%) and transfer of blood to container (3%)⁸.

Our review showed that medical students lack of adequate training on safe needle handling, NSI protocol include reporting, and biosafety training ^{6,13}. All of medical students in Malaysia who had NSI before, did not reporting the accidents ⁸. Not reporting or late reporting in medical students may prevent them from receiving early prophylaxis or treatment. Therefore, there is a need for the standardized implementation of safe needle handling and NSI reporting procedure ¹³. Various prevention programs can be adopted based on these findings to decrease the incidence of NSI. Protocols should be made available to all healthcare profession include medical students and should be clear enough to facilitate and encourage reporting of NSI ¹⁴.

This study was a scoping review that discussed other studies' finding. There was no appraisal of the article's quality. The studies are still minimal, so not many articles were included in the review. Most of the studied articles had low number of participants, did not discuss in detail of NSI's epidemiology in medical students, and reasons of low level on NSI reporting.

CONCLUSION

Needle stick injury (NSI) is common occupational accident that can happen on medical students who exposed to needle and person's body fluid. The study revealed that prevalence of

NSI among medical students was varied, ranging from 2,7% to 8%. The incidence of NSI was ranging from 1,26% to 9,6%. Majority of the studies showed that knowledge's level of medical students had low score, but they had good awareness of needle stick injury. Most of the medical students who had NSI did not report it. Hence, it is important to make the medical students aware of NSI burden, training of safe needle technique, understand NSI protocol, including how to reporting, and to train them on that.

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