BMJ Open

Sharps injuries and splash exposures among healthcare workers in Arab countries: protocol of a systematic review and meta-analysis

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To cite: Karkaz I, Elbarazi I, Östlundh L, *et al*. Sharps injuries and splash exposures among healthcare workers in Arab countries: protocol of a systematic review and meta-analysis. *BMJ Open* 2021;**11**:e052993. doi:10.1136/bmjopen-2021-052993

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2021-052993).

Received 01 May 2021
Accepted 05 September 2021

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ABSTRACT

Introduction Sharps injuries, including needlestick injuries and splash exposures, constitute serious occupational health problems for healthcare workers, carrying the risk of bloodborne infections. However, data on such occupational incidents and their risk factors in healthcare settings are scarce and not systematically summarised in the Arab countries.

The aim of this study is to conduct a systematic review and meta-analysis to review published literature about sharps injuries and splash exposures of healthcare workers in Arab countries, with the objectives to determine the incidence and/or prevalence of these events, their identified risk factors and the applied preventive and postexposure prophylactic measures.

Methods and analysis The protocol is developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocol guidelines. A comprehensive presearch developed in January to March 2021 in the database PubMed will be followed by a systematic search of six, core medical and health science databases: PubMed, EMBASE, Scopus, CINAHL, Web of Science and Africa-Wide Information in May 2021. The search will be performed without any filters or restrictions for publication years. Covidence systematic review tool will be used for document management, blinded screening and study selection. Two reviewers will independently screen the records, extract data and conduct risk of bias assessment. Results will be synthesised narratively in summary tables, and, if findings allow, meta-analysis will be conducted on the incidence and/or prevalence of sharps injuries and splash exposures, and on the effect size of risk factors.

Ethics and dissemination The systematic review methodology does not require ethics approval due to the nature of the study design based only on published studies. The results of the systematic review will be published in a peer-reviewed journal, disseminated to stakeholders and made publicly available.

PROSPERO registration number CRD42021242416.

Strengths and limitations of this study

- The study will rigorously follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.
- The study will use transparent screening, data extraction and analysis methodology carried out by several researchers knowledgeable in conducting systematic reviews.
- Meta-analysis, including subgroup and sensitivity analysis, will be conducted if suitable results can allow for that.
- Scarcity of data and high clinical heterogeneity can be the main limitations of the study.

INTRODUCTION

A sharps injury is a penetrating stab wound from a sharp object, such as a needlestick injury.[1] It is a very common event among healthcare personnel and, together with splash exposures on mucus membranes, constitute the most efficient method for transmitting bloodborne infectious agents from patients to healthcare staff. Sharps injuries are primarily associated with occupational transmission of hepatitis B, hepatitis C and HIV, but may also play role in the spread of several other infectious agents.[2] It is a feared, although still only hypothetical, route of transmission of coronaviruses, as well.[3] Healthcare personnel are at increased risk of sharps injuries and splash exposures because of the high frequency of contacting blood and other body fluids and potentially contaminated sharp objects.[4] As a consequence of the disease burden of occupational bloodborne infections, such incidents can entail a number of different costs including the loss of employee time, the cost of tying up staff to investigate the injury, expense of laboratory testing, the cost of postexposure prophylaxis and treatment for exposed and infected workers, expenses of temporarily or permanently replacing staff, and so on.[1 2 4 5]

According to the World Health Report 2002 by WHO,[6] about two million healthcare

workers sustain percutaneous exposure to infectious diseases every year. The highest frequency of needlestick injuries has been reported among nurses, because they are the most exposed to needles and other sharp instruments during their work.[7]

There are several studies, mostly published on sharps injuries in healthcare settings from Europe and America. A comprehensive study estimated annual number of sharps injuries to be 384 000 in the USA, 100 000 in the UK, 700 000 in Germany, 29 719 in France, 28 200 in Italy and 21 815 in Spain.[6 8] There are reports about the high frequency of sharps injuries from other parts of the world, too. Nearly one out of five healthcare workers had experienced needlestick or sharps injury at least once within the past 1 year according to the results of a cross-sectional study that was conducted in 2014 in four hospitals in Southeast Ethiopia.[9] In a large-scale hospital-based survey in China, 6.3% of healthcare workers sustained sharps injury in the last month, corresponding to 1032 incidents per 1000 employees yearly.[10] The majority of injuries were caused by hollow-bore needles (63%) but only 4.3% of the incidents were reported to the infection control team. Another, yet unpublished study from China also found a high (41%) 5-year prevalence of sharps injuries among hospital personnel and a substantial (over 80%) underreporting was revealed (unpublished data).

However, limited information exists about sharps injuries and splash exposures of healthcare workers in the Middle East and North Africa. Several studies were published on this topic from Iran and their results were summarised in a systematic review.[11] However, the information on sharps injuries and splash exposures in Arab countries is limited and it has never been systematically reviewed. The results of an anonymised questionnaire survey among healthcare workers in the United Arab Emirates showed that 19% of the respondents had sustained a sharps injury in the calendar year 2006 and 53% of these sharps injuries were caused by blood contaminated sharp objects.[12] In a 2003 Egyptian study conducted among 1485 healthcare workers, 35.6% were found to be exposed to needlestick injury during the past 3 months, with an estimated annual number of nearly five needlesticks per worker.[13]

The Arab World consists of 22 countries in the Middle East and North Africa: Algeria, Bahrain, the Comoros Islands, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, the United Arab Emirates and Yemen. Although Arab countries constitute a heterogeneous group by economic and social development and consequently by the structure and development of their healthcare systems, it is a general phenomenon that healthcare employees work in fast-paced, stressful and frequently understaffed environment, that has also been affected by the ongoing COVID-19 pandemic. They have to perform various tasks, use sharp objects and can get easily into contact with body fluids. Their risk for sustaining sharps injury or splash exposure is high and probably severely under-reported. To improve the occupational health and safety management system of this important workplace hazard, the systematic review and synthesis of the limited existing information from the region is indispensable.

Objectives

The aim of the study is to perform a systematic review by collecting and synthetising the information available in the scientific literature about occupational sharps injuries, including needlestick injuries and splash exposures occurring to healthcare workers engaged in clinical patient care in Arab countries, and to conduct meta-analysis if findings make it possible.

To achieve the aim, the following objectives will be pursued:

1. To conduct a systematic review of in extenso research articles published in peer-reviewed scientific journals in English or Arabic on occupational sharps injuries and splash exposures among healthcare workers engaged in clinical patient care in Arab countries.
2. To summarise incidence and/or prevalence of occupational sharps injuries and splash exposures among healthcare workers engaged in clinical patient care in Arab countries.
3. To identify risk factors statistically significantly associated with the occurrence of occupational sharps injuries and splash exposures.
4. To summarise the existing preventive and postexposure prophylactic measures used in the management of sharps injuries and splash exposures in healthcare settings in Arab countries.

   If findings allow for conducting meta-analysis, the following objectives will also be fulfilled:
5. To compute pooled frequency estimates for the incidence and/or prevalence of occupational sharps injuries and splash exposures among healthcare workers engaged in clinical patient care in Arab countries, with the possibility of subgroup analysis.
6. To compute pooled effect size estimates for potential risk factors of occupational sharps injuries and splash exposures, with the possibility of subgroup analysis.

METHODS AND ANALYSIS

This protocol follows the Preferred Reporting Items for Systematic Reviews and Meta-analyses Protocol (PRISMA-P) guidelines.[14] The completed PRISMA-P check list is available in online supplemental file 1. The planned start and end dates of the study are 1 May 2021 and 30 April 2022. The final review will be informed by Cochrane Handbook for Systematic Reviews of Interventions and follow the new PRISMA 2020 statement.[15 16]

Eligibility criteria

A population, exposure, comparator and outcomes (PECO) statement is developed to review information on occupational sharps injuries and splash exposures

occurring to healthcare workers engaged in clinical patient care in Arab countries.

Population

Inclusion: All workers employed in any full-time or part-time jobs, including students training, performing clinical care for patients, sterilisation or cleaning activities in inpatient or outpatient healthcare settings (referred to as healthcare workers) located in Arab countries.

Exclusion: Workers not performing clinical care, sterilisation or cleaning activities in inpatient or outpatient healthcare settings, and working in other than Arab countries.

Exposure

Inclusion: Workplace accidents caused by sharp objects, including needles, or by splash of liquid potentially contaminated with body fluids, occurring in healthcare settings, and the risk factors of such accidents.

Exclusion: Accidents occurring not in healthcare settings, not caused by sharp objects or by splash of liquid potentially contaminated with body fluids.

Comparator

There will be no comparator for the main outcome of the review as it is the incidence/prevalence of occupational sharps injuries and splash exposures among healthcare workers in Arab countries. Also, there will be no comparator for the additional outcome of preventive and postexposure prophylactic measures used in the management of sharps injuries and splash exposures in healthcare settings in Arab countries.

The comparator for the additional outcome of risk factors of sharp injuries and splash exposures will be healthcare workers who have not sustained sharps injury or splash exposure.

Outcome

Injuries in the form of penetrating stab wounds on any sites of the body, and splash exposures, sustained by healthcare workers during an occupational accident caused by sharp objects, primarily needles, used in the work process or being present in the workplace, or by splash of liquids potentially contaminated with body fluids during the work process. The main outcome of the review will be the incidence and/or prevalence of occupational sharps, including needlestick, injuries and splash exposures among healthcare workers in Arab countries. Additional outcomes will be risk factors identified by statistical analysis to be significantly correlated to the occurrence of occupational sharps injuries and splash exposures in healthcare settings, and their effect size; and preventive and postexposure prophylactic measures used in the management of sharps injuries and splash exposures in healthcare settings in Arab countries.

Types of studies

Observational occupational epidemiological studies will be used that apply collection of individual data to determine the incidence and/or prevalence (cohort and cross-sectional studies) and identify risk factors (cohort and case-control studies) of occupational sharps injuries and splash exposures among healthcare workers in Arab countries. Other descriptive observational study designs (ecological, case series, case report) will also be included to review the preventive and postexposure prophylactic measures.

Information sources

PubMed (NML), Scopus (Elsevier), Web of Science (Core Collection), EMBASE (Elsevier), CHNAHL (EBSCO) and Africa-Wide Information (EBSCO) electronic databases will be systematically searched to identify eligible studies published in peer-reviewed scientific journals.

Search strategy

A comprehensive, systematic search for literature will be conducted in May 2021 by a medical librarian specialised in systematic reviews (LÖ). Preliminary search term combinations have been identified and tested based on the PECO statement and inclusion and exclusion criteria outlined above. Presearches in PubMed was performed in January–March 2021 (LÖ). PubMed's MeSH was used to support a systematic inclusion of the search terms and their variations. Subject experts (BÁ, IK and IE) reviewed the final search term selection. The search string developed in PubMed will later be translated from English to Arabic and applied in all selected databases without geographical or publication year restrictions. We will use a combination of the search fields 'Title/Abstract' and MeSH (alternatively Thesaurus or Subject Headings) for the best possible information retrieval. A search field coveting 'Title', 'Abstract' and 'Keywords' will be used in the absence of an MeSH, Thesaurus or Subject Headings.

The presearch in PubMed can be found in online supplemental file 2. Reproducible search strings with result and notes for all databases included in the review will be appended to the final study. Deduplication and screening details will be reported in a PRISMA flow-diagram. A complete search update of all databases will be performed before the final analysis and hand screening of the references lists in the included studies conducted.

Study records

Data management

The citations of the search results will be imported into the systematic review software Covidence for management and blinded screening of all records identified in the literature search.[17] The modules for automatic deduplication, title/abstract and full text screening and blinded conflict resolving will support our work.

Selection process

The screening and selection process will be documented in a PRISMA flow diagram.[14] After automatic duplication removal in Covidence, the unique studies retrieved will be screened in two stages by two independent reviewers (IK and IE) based on the predetermined inclusion and

exclusion criteria. In the first stage, title and abstract of publications will be screened. In the second stage, the full texts of publications selected during the first stage will be considered for inclusion also by two independent reviewers (IK and IE). Reason for exclusion will be documented in a PRISMA flow diagram. Discrepancies between the judgements of the two reviewers regarding the eligibility of studies and reason for exclusion will be resolved in the software by a third reviewer (BÁ). The screening and conflict resolving modules in Covidence is blinded.

Data collection process

Two reviewers (IK and IE) will independently extract data using a data extraction sheet developed in Excel 2019 for this study and pilot tested before use. Discrepancies will be resolved and extracted data validated through discussions with other reviewers (BÁ, MSP, RHA-R) until convergence and agreement is reached.

Data items

At a minimum, information will be extracted on publication characteristics (title, name of the first author, year of publication, DOI), study design (study type, risk factors, period of data collection, type of measurement of exposure and outcome, statistical analysis performed and adjustment to confounders), study population (demographic and occupational characteristics), results (incidence/prevalence of sharps injuries and splash exposures, crude and adjusted effect estimates of association identified as risk factors, preventive and postexposure prophylactic measures), and conflict of interest (declaration, funding).

Risk of bias in individual studies

The risk of bias in the included studies will be assessed using a modified version of the Navigation Guide Risk of Bias (RoB) tool that is tailored specifically to systematic reviews of occupational health studies.[18] The Navigation Guide RoB tool assesses risk of bias in the following domains: selection bias, ascertainment bias, accuracy of exposure and outcome assessment, confounding, incomplete data and selective reporting, conflict of interest and other biases, which will be completed with domains from the RoB-SPEO tool that was developed for the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury project to assess risk of bias in studies estimating the prevalence of exposure to occupational risk factors.[19] Two reviewers (MSP and RHA-R) will independently assess the risk of bias in the included studies. Discrepancies between the judgements of the two reviewers regarding risk of bias of studies will be resolved by a third reviewer (BÁ).

Data synthesis

First, study findings will be synthesised narratively in summary tables regarding the main (incidence and prevalence of occupational sharps injuries and splash exposures) and the additional outcomes (risk factors and preventive and postexposure prophylactic measures).

If findings allow, meta-analysis will be conducted on the incidence and prevalence of occupational sharps injuries and splash exposures, and on potential risk factors. If we find two or more studies with eligible estimates on outcome frequency and/or on risk factor effect, two reviewers will independently investigate the clinical heterogeneity of the studies. If frequency and/or effect estimates are found clinically homogeneous, then studies will be combined into one pooled frequency and/or effect estimate. Statistical heterogeneity of the studies will be tested using the I^2 statistic.[20] If two or more clinically homogenous studies are found to be sufficiently statistically homogenous to be combined in a meta-analysis, the frequency and/or effect estimates will be pooled in a quantitative meta-analysis, using the inverse variance method with a random-effects model to account for cross-study heterogeneity.[18] The meta-analysis will be conducted in RevMan software.[21] The pooled estimates will be presented in forest plots.

Analysis of subgroups or subsets

If there is evidence for differences in frequency and/or effect estimates by population (country, sex, age, job, healthcare sector or by a combination of these variables), subgroup analyses by the relevant variable or combination of variables, will be conducted. Sensitivity analyses will be performed including studies judged to be of 'low' or 'probably low' risk of bias and judged to be of 'low' or 'probably low' risk of bias from conflict of interest.

Quality of cumulative evidence

A minimum of four reviewers will assess the quality of evidence for the entire body of evidence using the Navigation Guide quality of evidence assessment tool that is based on the GRADE approach and modified to be applicable in the fields of occupational and environmental health.[22–24]

Patient and public involvement

No patient or members of the public will be included in this study.

ETHICS AND DISSEMINATION

Due to the nature of this study as a systematic review, ethics approval is not necessary as no patient or members of the public will be included in the study.

The results of this review will be published in a peer-reviewed journal and will be made publicly available in electronic format. In addition, if the findings of the review warrant a change in the practice of sharps injury and splash exposure management, a summary report will be disseminated to leading healthcare and occupational health policy makers in the East Mediterranean Region of the WHO and in the United Arab Emirates.

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Contributors BÁ, IK, IE, MSP, RHA-R, MS-H and LÖ were involved in conceptualisation and protocol development. BÁ, LÖ, IK and IE have developed the search strategy. Literature search will be conducted by LÖ and IK. Screening will be performed by IK and IE, with BÁ resolving conflicts. IK and IE will extract data, which will be validated by BÁ, MSP and RHA-R.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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