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Effectiveness of educational interventions to develop patient safety knowledge, skills, behaviours and attitudes in undergraduate nursing students: a systematic review protocol

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ABSTRACT

Introduction Patient safety is a healthcare discipline that aims to prevent and reduce patient harm, risks and errors during the provision of healthcare. Given the size of the nursing workforce in the healthcare system the inclusion of patient safety in the undergraduate nursing curriculum is necessary to enhance a safe culture in the daily work of their future careers. To this end, it is essential to apply effective teaching strategies to develop patient safety competencies. This review will aim to evaluate the effectiveness of educational interventions in developing patient safety knowledge, skills, behaviours and attitudes in undergraduate nursing students within the existing topic areas of the WHO Multi-professional Patient Safety Curriculum Guide.

Methods and analysis The databases Medline, CINAHL, Scopus, Education Research Complete, The Cochrane Central Register of Controlled Trials, LILACS, Medes and Grey literature such as ClinicalTrials.gov, Google Scholar, DART-Europe, ProQuest Dissertations, CAPES thesis and dissertations, The Virginia Henderson Global e-Repository, Mednar and Thesis Canada will be searched from July 2011 to January 2022. Two independent reviewers will conduct the search, extract the data and assess the risk of bias for the included studies, using standardised critical appraisal instruments from the Joanna Briggs Institute. The quality of the evidence will be assessed using the Grading of Recommendations, Assessment Development and Evaluation methodology. Studies will be pooled in the meta-analysis. Alternatively, the findings will be presented in narrative form, including tables and figures, to aid in data presentation.

Ethics and dissemination This study raises no ethical issues. The findings will be disseminated through presentations at professional conferences and publications in a peer-reviewed journal.

PROSPERO registration number CRD42021254965.

Strengths and limitations of this study

- The review will adhere to the Joanna Briggs Institute Methodology for Systematic Reviews of Effectiveness and Preferred Reporting Items for Systematic Reviews, to ensure a rigorous and systematic approach to searching, screening and reporting.
- Grading of Recommendations Assessment, Development and Evaluation methodology will be used to assess the quality of evidence.
- Students from other health disciplines, such as medicine and allied health professions, will not be included in this review; this may affect the results.
- Due to heterogeneity of educational interventions, there may be a limitation to perform quantitative synthesis.

INTRODUCTION

Patient safety is a global and strategic priority in health systems and is defined as 'a framework of organised activities that create cultures, processes, procedures, behaviours, technologies and environments in the healthcare that consistently and sustainably lower risks and reduce the occurrence of avoidable harm'[1](p1).

Regardless of all the efforts made in the last two decades to reduce and prevent errors, recent studies suggest that unsafe care is one of the leading causes of morbidity and mortality worldwide.[2 3] Although patient safety has a greater focus on hospital settings, it has been a systemic issue since 20%–25% of the general population has experienced harm in primary and outpatient care settings.[4 5]

Several studies have reported a broader impact of adverse events. Hospitalisations in low-income and middle-income countries cause 134 million adverse events each year, contributing to more than 2.5 million deaths annually.[6] An analysis by

the Organisation for Economic Cooperation and Development has found that 15% of all hospital costs in its member states are due to patient harm caused by adverse events.[7] Worldwide the social cost of patient harm can be valued at US$1 trillion to 2 trillion a year.[1]

To reduce the risks and the incidence of these avoidable incidents, making the error less likely and decreasing its impact, WHO considers the need for collaborative activities that create culture, behaviours, processes, procedures, technologies and environments towards patient safety.[1] Thus, it is essential to develop interventions that can incorporate patient safety topics in the training of health professionals to help them cultivate competencies for safe care.

Considerable importance should be given to nursing students, given the size of the nursing workforce in the most varied healthcare settings as well as their key position in the provision and coordination of care, and participation in organisational, quality, and safety structures with optimisation of patient outcomes.[8–10]

Owing to these critical roles, undergraduate nursing education must develop future nurses' knowledge, skills, behaviours and attitudes that can help their adherence to patient safety principles[11] and improve the quality of healthcare systems.[12 13]

Various initiatives have been established to support the development of these core dimensions and inform faculty resources designed to teach patient safety. In 2005, the Quality and Safety Education for Nurses project, proposed targets for quality and safety knowledge, skills and attitudes to be developed for undergraduate nursing programmes.[14 15] In 2011, the WHO published the Patient Safety Curriculum Guide: Multi-professional Edition which provided a comprehensive curriculum designed to create a solid foundation of knowledge and skills to enable future healthcare professionals to present safe attitudes and behaviours in different healthcare settings.[16] In addition, it addressed pedagogical principles and teaching strategies to contribute to implementing the subject and promoting meaningful student learning.[16] More recently, in 2017, the Patient Safety Competency Framework for Nursing Students was developed in Australia to provide key patient safety competencies statements and significant knowledge and skills to nursing courses.[17]

Many nursing prelicensure education programmes use these frameworks. Despite the increasing interest in the necessary knowledge, skills, attitudes and behaviours surrounding patient safety, a considerable amount of literature has indicated that teaching patient safety is still inconsistent in nursing education.[2 18–20] Furthermore, there is a lack of consensus on how patient safety contents should be effectively taught to preregistration nursing students and what teaching methods would be employed.[21–24]

A preliminary search of the Cochrane Database of Systematic Reviews, Joanna Briggs Institute (JBI) Database of Systematic Reviews and Implementation Reports, PROSPERO and MEDLINE, revealed the existence of two systematic reviews published on this topic.[25 26]

The rapid review published by Bianchi *et al*[25] has investigated the clinical learning environments that facilitate nursing students' development of patient safety competencies. However, it did not include teaching strategies in classroom environments that could enable these competencies; additionally, grey literature was not searched.

A recent review by Lee *et al*[26] aimed to identify tested patient safety interventions that are helpful in teaching nursing students. However, this study has some methodological limitations. The authors did not publish a protocol, search for reference lists or grey literature, and only articles in English were included. In addition, they did not evaluate the quality of the body of evidence. Because the authors had only explored the core concepts of patient safety, only four articles investigating nursing students have been published. Hence, they further included studies of pre-licensure nursing students, in addition to students from other disciplines.

Given these limitations, we present a protocol for a systematic review that aims to evaluate the effectiveness of educational interventions delivered in both clinical and university settings that can develop patient safety knowledge, skills, behaviours and attitudes in undergraduate nursing students. To have a wider picture of the effects of the teaching methods, we will include studies that have explored the teaching of any patient safety content within the existing topic areas of the WHO Multi-professional Patient Safety Curriculum Guide.[16] The guide provides the most relevant evidence on the development and implementation of global patient safety education initiatives carried out by undergraduate healthcare students.

METHODS AND ANALYSIS

The protocol for this review was developed under the JBI Methodology for Systematic Reviews of Effectiveness[27] and Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA).[28]

If amendments to this protocol are required, these will be recorded in PROSPERO with a description of the change and its rationale.

Review question

How effective are educational interventions at developing patient safety knowledge, skills, behaviours and attitudes in undergraduate nursing students?

Inclusion criteria

The inclusion and exclusion criteria of the studies to be included in the review are detailed using the P:

Table 1 Description of inclusion and exclusion criteria

Criterion	Definition	Rationale
Papers include sufficient empirical data.	It is not a review, commentary, letter, editorial and conference paper or research report without the full text.	Primary studies with full data minimise the risk of bias and provide sufficient information for data extraction and quality assessment.
Participants include undergraduate nursing students.	Nursing students of any age or gender undertaking a full or part-time programme of study. All years of study will be included and, when applicable, all fields of nursing. It does not involve nursing associate students and mixed health students, even if it includes nursing students.	Undergraduate nursing students are the target population of this review.
Study involves an educational intervention.	Study reports an educational intervention offered to participants using any teaching methods[16] It is not a study involving new strategies without an educational intervention.	Explicit educational interventions are the focus of this review.
Educational intervention includes patient safety as a core content.	Educational intervention includes any patient safety content within the topic areas of the WHO Multi-professional Patient Safety Curriculum Guide:[16] Topic 1: What is patient safety? Topic 2: Why applying human factors is important for patient safety. Topic 3: Understanding systems and the effect of complexity on patient care. Topic 4: Being an effective team player. Topic 5: Learning from errors to prevent harm. Topic 6: Understanding and managing clinical risk. Topic 7: Using quality improvement methods to improve care. Topic 8: Engaging with patients and carers. Topic 9: Infection prevention and control. Topic 10: Patient safety and invasive procedures. Topic 11: Improving medication safety. It is not a study that assesses the development of specific knowledge, skills, attitudes, and behaviours that does not have the primary focus on patient safety.	Educational interventions teaching patient safety contents within the WHO Multi-Professional Patient Safety Curriculum Guide are the focus of this review.
Study includes an evaluation of the educational intervention	Intervention is evaluated with regards to at least one of the following outcomes: knowledge, skills, attitudes and behaviours related to patient safety[16 17 31] It is not a purely descriptive study.	Allows comparative analysis of the effectiveness of interventions where possible.

Population; I: Indicator/Intervention; C: Comparator; O: Outcome(s); S: Study design framework[29 30] (table 1).

Population

This review will include undergraduate nursing students of any age or gender undertaking a full or part-time programme of study. All years of study will be included in the review and, when applicable, all fields of nursing.

Interventions

This review will consider studies that evaluate any educational intervention aimed at teaching patient safety contents within the existing topic areas of the WHO Multi-professional Patient Safety Curriculum Guide.[16] This may employ the following teaching methods, but are not limited to, lectures, clinical placements, online activities, problem-based learning, simulations/skills

laboratories, tutorials, workshops, group discussions and other strategies.[16]

The intervention may take place in a tertiary education environment, clinical setting or both. No limitations will be applied to the programme duration or intensity.

Comparator

This review will include studies that compare educational interventions with alternative or different interventions or the absence of educational interventions.

Outcomes

This review will consider studies that described and evaluated at least one of the following outcomes: nursing students' knowledge, skills, attitudes and behaviours related to patient safety.[16 17 31]

Study design

This review will consider experimental and quasi-experimental study designs, including randomised controlled trials, non-randomised controlled trials, before-and-after studies and interrupted time-series studies. Additionally, analytical observational studies, including prospective and retrospective cohort studies, case–control studies, and analytical cross-sectional studies, will be considered for inclusion.

Search strategy

A three-step search strategy will be applied to locate published and unpublished studies.[32]

An initial limited search of MEDLINE (PubMed) and CINAHL (EBSCOhost) was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the papers were used to develop a full search strategy for MEDLINE (PubMed) (see online supplemental material appendix 1—Search Strategies). A second search, including all identified keywords and index terms, will be adapted for each included information source. Third, the reference lists of all studies selected for critical appraisal will be screened for additional studies. Studies published in English, Spanish and Portuguese will be included because they are the languages of the systematic review team. If there is an English translation available, studies in other languages will be included.

Studies published from July 2011 to January 2022 will be included. The rationale for the date of July 2011 was when the WHO National Patient Safety Curriculum Guide: a multi-professional edition[16] was published.

The databases to be searched include MEDLINE (PubMed), CINAHL (EBSCOhost), Scopus (Elsevier), Education Research Complete (EBSCOhost), The Cochrane Central Register of Controlled Trials (CENTRAL), Latin American and Caribbean Health Sciences Literature (LILACS) and Medes (Spain).

Sources of unpublished studies and grey literature to be searched will include ClinicalTrials.gov, Google Scholar, DART-Europe, ProQuest Dissertations and Theses, Coordination for the Improvement of Higher Education Personnel—Brazil (CAPES thesis and dissertations), The Virginia Henderson Global e-Repository, Mednar and Thesis Canada.

Study selection

Following the search, all identified citations will be collated and uploaded to EndNote online (Clarivate Analytics, Pennsylvania, USA), and duplicates will be removed.

Following a pilot test, titles and abstracts will be screened by two independent reviewers for assessment of the inclusion criteria for the review. Potentially relevant studies will be retrieved in full, and their citation details will be imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI; JBI, Adelaide, Australia).[33]

The full text of the selected citations will be assessed in detail against the inclusion criteria by two independent reviewers. The reasons for excluding full-text studies that did not meet the inclusion criteria will be recorded and reported in the systematic review. Any disagreements between the reviewers at each stage of the study selection process will be resolved through discussion or by a third reviewer.

The search results, study selection and inclusion process will be reported in full in the final systematic review and presented in PRISMA flow diagram.[28]

Assessment of methodological quality

Two independent reviewers will critically appraise eligible studies at the study level for methodological quality in the review using standardised critical appraisal instruments from JBI for experimental, quasi-experimental and observational studies (see online supplemental material appendix 2—Critical Appraisal Tools).[27] Authors of papers will be contacted to request missing or additional data for clarification, where required.

Any disagreements that arise will be resolved through discussion or with a third reviewer.

Regardless of methodological quality, all studies will undergo data extraction and synthesis (where possible). A table accompanying a narrative will report the results of critical appraisal.

Data extraction

Data will be extracted from studies included in the review by two independent reviewers using an adapted version of the JBI data extraction tool,[27] including specific information related to the characteristics of the intervention (see online supplemental material appendix 3–Extraction Tool). The data extract will also include specific details about the study author(s), country, characteristics of higher education institution, setting of the intervention, characteristics of participants (including year and field of study), study design, description of the intervention (including the type of educational method and duration of the intervention), outcomes of significance to the review question assessed (knowledge, skills, attitudes

and behaviours), follow-up time, main results, limitations and additional data when required. As recommended by Redd *et al*[34] the description and information on the reliability and validity of instruments used to evaluate the intervention will also be extracted.

Data synthesis

Literature has suggested that it is challenging to synthesise data from educational interventions owing to heterogeneities in interventions and studies methodologies.[34 35] Therefore, data will be initially assessed for similarity or extent of variation in outcome measures, measurement scales and type of interventions before determining whether it is appropriate to enter into a meta-analysis. If it is considered suitable, data will be entered into a meta-analysis using JBI SUMARI.

Effect sizes will be expressed as either odds ratios (for dichotomous data) or weighted (or standardised) final postintervention mean differences (for continuous data), and their 95% CIs will be calculated for analysis. If meta-analysis can be conducted, heterogeneity will be assessed statistically using the standard χ^2 and I^2 tests. Statistical analyses will be performed using a random effects model[36] to allow generalisation.

To investigate potential sources of heterogeneity, subgroup analyses will be performed based on the year of the study, the field of nursing if applicable, intervention delivery (teaching method), the content of the intervention (patient safety topics), and the time frame of the intervention. Sensitivity analyses will be conducted to test decisions made regarding the effectiveness of interventions.

A funnel plot will be generated using RevMan V.5.3 (Copenhagen: The Nordic Cochrane Centre, Cochrane) to assess publication bias if ten or more studies are included in the meta-analysis. Statistical tests for funnel plot asymmetry (Egger test) will be performed where appropriate.

If there is significant variation in the data and statistical pooling is not possible, the findings will be presented in narrative form, including tables and figures to enhance data presentation.[37]

Assessing certainty of findings

The Grading of Recommendations, Assessment Development and Evaluation (GRADE) approach for grading the certainty of evidence will be followed,[38] and a summary of findings will be created using GRADEpro GDT V.5 (McMaster University, ON, Canada).

The Summary of Findings will present the following information where appropriate: absolute risks for the treatment and control, estimates of relative risk and a ranking of the quality of the evidence based on the risk of bias, directness, heterogeneity, precision and risk of publication bias of the review results. The outcomes reported in the Summary of Findings will be knowledge, skills, attitudes and behaviours of undergraduate nursing students related to patient safety.

Patient and public involvement

There will be no patient or public involvement in the conduct or dissemination of the results of this study.

ETHICS AND DISSEMINATION

This review does not require ethical approval because the primary population data will not be collected. This protocol complies with PRISMA guidelines. The findings will be disseminated at professional conference presentations and publications in preprint and peer-reviewed open access journals.

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Appendix 1

Search Strategies

Database	#	Search Strategy
1) Medline (PubMed)		(((student, nursing[MeSH Terms]) OR (((((("nursing students"[Text Word]) OR ("pupil nurses"[Text Word])) OR ("undergraduate nurses"[Text Word])) OR ("baccalaureate nurses"[Text Word])) OR ("student nurses"[Text Word])) OR ("undergraduate student nurses"[Text Word])) OR (pre licensure nurses[Text Word]))) AND (("education"[MeSH Terms]) OR (((((("education"[Text Word]) OR ("educational activities"[Text Word])) OR (training program*[Text Word])) OR ("learning"[Text Word])) OR ("teaching"[Text Word])) OR (teaching strateg*[Text Word])) OR ("teaching methods"[Text Word])))) AND (("patient safety"[MeSH Terms]) OR ((("patient safety"[Text Word]) OR ("patient safety competency"[Text Word])) OR ("error"[Text Word])) OR ("incident"[Text Word]))) Filters: English, Portuguese, Spanish, from 2011/7 - 2022/1
2) CINAHL and Education Research Complete (via EBSCOhost)	**#1**	((MM "Students, Nursing") OR (MH "Students, Nursing, Baccalaureate")) OR TX "nursing students" OR TX "pupil nurses" OR TX "undergraduate nurses" OR TX "baccalaureate nurses" OR TX "student nurses" OR TX "undergraduate student nurses"
	#2	((MM "Education") OR (MH "Education, Nursing, Graduate")) OR TX "education" OR TX "educational activities" OR TX training program* OR TX "learning" OR TX "teaching" OR TX teaching strateg*
	#3	((MM "Patient Safety") OR (MH "Health Care Errors")) OR TX "patient safety competency" OR TX error* OR TX "incident"
	#4	#1 AND #2 AND #3 Limiters - Published Date: 20110701-20220131 Narrow by Language: - Spanish, Portuguese, English
3) Scopus (Elsevier)		(TITLE-ABS-KEY({nursing students} OR {nursing pupils} OR {undergraduate nurses} OR {baccalaureate nurses} OR {student nurses} OR {undergraduate student nurses} OR {pre-licensure nurses}) AND TITLE-ABS-KEY({patient safety}) AND ALL({education} OR {learning} OR {teaching})) AND PUBYEAR > 2010 AND (LIMIT-TO (LANGUAGE,"English") OR LIMIT-TO (LANGUAGE,"Portuguese") OR LIMIT-TO (LANGUAGE,"Spanish"))
4) Cochrane (Central)	**#1**	MeSH descriptor: [Students, Nursing] explode all trees
	#2	(nursing students) OR (pupil nurses) OR (undergraduate nurses) OR (baccalaureate nurses) OR (student nurses) OR (undergraduate student nurses) OR (pre-licensure nurses)
	#3	#1 OR #2
	#4	MeSH descriptor: [Education] explode all trees
	#5	MeSH descriptor: [Education, Nursing] explode all trees
	#6	#4 OR #5
	#7	(education) OR (educational activities) OR (training program) OR (learning) OR (teaching) OR (teaching strategy) OR (teaching methods)
	#8	#6 OR #7
	#9	MeSH descriptor: [Patient Safety] explode all trees
	#10	(patient safety) OR (patient safety competency) OR (error) OR (incident)
	#11	#9 OR #10
	#12	#3 AND #8 AND #11 with Publication Year from 2011 to 2022
5) Lilacs		(mh:("Seguridad del Paciente")) AND (estudante* OR student OR estudiante) AND (educacao OR ensino OR aprendizagem) AND (enfermagem OR nursing OR enfermeria) AND (db:("LILACS"))

6) Medes		((("estudiantes de enfermería"[todos]) AND "enseñanza"[todos]) AND "seguridad del paciente"[todos]) https://medes.com/Public/Home.aspx
7) Clinical Trials.gov		condition or disease: patient safety other terms: nursing students intervention treatment: education https://www.clinicaltrials.gov/
8) Google Scholar		"patient safety" AND "education" and "nursing undergraduates" OR "student nurses" OR "nursing students" AND filetype: PDF OR RTF OR DOC OR TXT OR html
9) Dart-Europe		nursing students AND education AND patient safety https://www.dart-europe.org/basic-search.php
10) Proquest Dissertations		ft("nursing students" OR "undergraduate nursing student" OR "pupil nurse" OR "student nurse") AND ft("education" OR "training" OR "teaching" OR teaching program* OR "teaching methods") AND ft("patient safety" OR "patient safety competency") Additional limits - Date: From July 2011 to January 2022 Language: English, Portuguese, Spanish
11) CAPES thesis and dissertations		"estudantes de enfermagem" AND "educação" OR "ensino" OR "aprendizagem" AND "segurança do paciente" https://catalogodeteses.capes.gov.br/catalogo-teses/
12) The Virginia Henderson Global e-Repository		"nursing students" OR "undergraduate nursing student" OR "pupil nurse" OR "student nurse" AND "education" OR "training" OR "teaching" OR teaching program* OR "teaching methods" AND "patient safety" OR "patient safety competency" https://sigma.nursingrepository.org/discover#showfilters
13) Mednar		nursing students OR undergraduate nursing student OR pupil nurse OR student nurse AND education OR teaching OR teaching methods AND patient safety https://mednar.com/mednar/desktop/en/search.html?pane=advanced
14) Thesis Canada		nursing students OR student nurse AND education OR teaching AND patient safety https://www.bac-lac.gc.ca/eng/services/theses/Pages/search.aspx

Appendix 2

Critical Appraisal Tools

JBI CRITICAL APPRAISAL CHECKLIST FOR RANDOMIZED CONTROLLED TRIALS

Reviewer_____
Date_____

Author_____Year_____ Record Number_____

		Yes	No	Unclear	NA
1.	Was true randomization used for assignment of participants to treatment groups?	□	□	□	□
2.	Was allocation to treatment groups concealed?	□	□	□	□
3.	Were treatment groups similar at the baseline?	□	□	□	□
4.	Were participants blind to treatment assignment?	□	□	□	□
5.	Were those delivering treatment blind to treatment assignment?	□	□	□	□
6.	Were outcomes assessors blind to treatment assignment?	□	□	□	□
7.	Were treatment groups treated identically other than the intervention of interest?	□	□	□	□
8.	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	□	□	□	□
9.	Were participants analyzed in the groups to which they were randomized?	□	□	□	□
10.	Were outcomes measured in the same way for treatment groups?	□	□	□	□
11.	Were outcomes measured in a reliable way?	□	□	□	□
12.	Was appropriate statistical analysis used?	□	□	□	□
13.	Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	□	□	□	□

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

JBI CRITICAL APPRAISAL CHECKLIST FOR QUASI-EXPERIMENTAL STUDIES

Reviewer_____
Date_____

Author_____ Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	□	□	□	□
2. Were the participants included in any comparisons similar?	□	□	□	□
3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	□	□	□	□
4. Was there a control group?	□	□	□	□
5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?	□	□	□	□
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	□	□	□	□
7. Were the outcomes of participants included in any comparisons measured in the same way?	□	□	□	□
8. Were outcomes measured in a reliable way?	□	□	□	□
9. Was appropriate statistical analysis used?	□	□	□	□

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

JBI CRITICAL APPRAISAL CHECKLIST FOR CASE SERIES

Reviewer_____
Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
• Were there clear criteria for inclusion in the case series?	□	□	□	□
• Was the condition measured in a standard, reliable way for all participants included in the case series?	□	□	□	□
• Were valid methods used for identification of the condition for all participants included in the case series?	□	□	□	□
• Did the case series have consecutive inclusion of participants?	□	□	□	□
• Did the case series have complete inclusion of participants?	□	□	□	□
• Was there clear reporting of the demographics of the participants in the study?	□	□	□	□
• Was there clear reporting of clinical information of the participants?	□	□	□	□
• Were the outcomes or follow up results of cases clearly reported?	□	□	□	□
• Was there clear reporting of the presenting site(s)/clinic(s) demographic information?	□	□	□	□
• Was statistical analysis appropriate?	□	□	□	□

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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JBI CRITICAL APPRAISAL CHECKLIST FOR COHORT STUDIES

Reviewer_____
Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Were the two groups similar and recruited from the same population?	□	□	□	□
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	□	□	□	□
3. Was the exposure measured in a valid and reliable way?	□	□	□	□
4. Were confounding factors identified?	□	□	□	□
5. Were strategies to deal with confounding factors stated?	□	□	□	□
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	□	□	□	□
7. Were the outcomes measured in a valid and reliable way?	□	□	□	□
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	□	□	□	□
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	□	□	□	□
10. Were strategies to address incomplete follow up utilized?	□	□	□	□
11. Was appropriate statistical analysis used?	□	□	□	□

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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JBI CRITICAL APPRAISAL CHECKLIST FOR CASE CONTROL STUDIES

Reviewer_____
Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?	□	□	□	□
2. Were cases and controls matched appropriately?	□	□	□	□
3. Were the same criteria used for identification of cases and controls?	□	□	□	□
4. Was exposure measured in a standard, valid and reliable way?	□	□	□	□
5. Was exposure measured in the same way for cases and controls?	□	□	□	□
6. Were confounding factors identified?	□	□	□	□
7. Were strategies to deal with confounding factors stated?	□	□	□	□
8. Were outcomes assessed in a standard, valid and reliable way for cases and controls?	□	□	□	□
9. Was the exposure period of interest long enough to be meaningful?	□	□	□	□
10. Was appropriate statistical analysis used?	□	□	□	□

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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JBI CRITICAL APPRAISAL CHECKLIST FOR ANALYTICAL CROSS SECTIONAL STUDIES

Reviewer_____
Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Were the criteria for inclusion in the sample clearly defined?	□	□	□	□
2. Were the study subjects and the setting described in detail?	□	□	□	□
3. Was the exposure measured in a valid and reliable way?	□	□	□	□
4. Were objective, standard criteria used for measurement of the condition?	□	□	□	□
5. Were confounding factors identified?	□	□	□	□
6. Were strategies to deal with confounding factors stated?	□	□	□	□
7. Were the outcomes measured in a valid and reliable way?	□	□	□	□
8. Was appropriate statistical analysis used?	□	□	□	□

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

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_____
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Appendix 3
Extraction Tool

Extraction Tool
Study refence (Author/year) and Study ID
Country: **Type of Higher Education Institution:** Public ( ) Private ( ) Other ( )
Setting of the intervention delivery: University ( ) Clinical Setting ( ) Both Combined ( )
Description of the intervention: Type of educational method (s): Duration of the intervention:
Group description: Intervention: Control:
Sample Size: Intervention: Control:
Outcomes of interest assessed: Knowledge ( ) Skills ( ) Attitudes ( ) Behaviours ( )
Name and description of instrument for outcome assessment: Reliability: Validity:
Follow-up time:
Main Results:
Limitations: