Study Protocol Systematic Review

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Global, national and regional prevalence, and associated factors of ocular trauma

A protocol for systematic review and meta-analysis

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Abstract

Background: Ocular trauma is a common eye disease and one of the main causes of blindness. There is a dearth of data on a summary and meta-analysis on the global epidemiology of the disease. Therefore, this systematic review protocol aims to propose the first systematic review and meta-analysis to synthesize existing evidence on the global prevalence and associated factors of ocular trauma worldwide.

Methods: A systematic search will be performed according to the following databases: PubMed, Web of Science, Chinese National Knowledge Infrastructure (CNKI), Weipu, and Wanfang. Cross-sectional, case-control, and cohort studies reporting on the prevalence and risk factors of ocular trauma will be included. The primary outcome will be the prevalence in global, regional, and national ocular trauma. Study searching, data extraction, and quality evaluation will be performed by 2 reviewers, independently. Appropriate meta-analysis will then be used to pool studies. STATA software package v 12.0 (Stata Corporation, College Station, TX) and R (version 3.4.1; R Foundation for Statistical Computing, Vienna, Austria) software will be used for all statistical analyses.

Results: This study will provide a high-quality synthesis to examine the prevalence and associated factors of ocular trauma worldwide. Furthermore, current study will project disease estimates in the next 50 years.

Conclusion: This systematic review and meta-analysis will provide first evidence to evaluate the burden of ocular trauma in the general population.

Ethics and dissemination: This systematic review and meta-analysis of randomized controlled trials does not require ethical recognition, and the results of this paper will be published in an open access, internationally influential academic journal.

Trial registration number: CRD42020189166

Abbreviations: CNKI = Chinese National Knowledge Infrastructure, PRISMA = preferred reporting items for systematic reviews and meta-analysis.

Keywords: ocular trauma, prevalence, risk factors, systematic review

XB, SX, and YS have contributed equally to this work.

Ethics approval and consent to participate: Not applicable.

Consent for publication: Not applicable.

The authors declare that they have no competing interests.

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The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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1. Introduction

Ocular trauma is one of the most important causes of ocular morbidity and visual impairments. According to previous reports, ocular trauma is usually the third and fourth cause of binocular and monocular blindness, respectively. There are an estimated 55 million eye injuries occurring annually, of which 19 million have vision loss or blindness.[1,2] Severe ocular trauma can lead to permanent visual impairment, as well as corneal, lens, or retinal complications.[3] Generally, ocular trauma always occurs in childhoods, who are during critical period of growth, the health care impact can be significant.

Previously, prevalence rates of ocular trauma ranged from 14.4% up to 21.1% in Western countries, and people living these area with young age, male sex, and lower socioeconomic status, poor education levels, or engaged in labor-intensive occupations mostly have a high risk of ocular trauma.[4–6] While in Asia, some population-based studies reported that the prevalence of ocular trauma was 4.4% in Singapore Chinese population, 3.6% in Chinese population in Beijing, and 2.1% in Handan, respectively.[3,7,8] In Singapore, there is no association between occupation and ocular trauma.[7] Herein, the prevalence and risk factors of ocular trauma vary from region to region, and the global evidence of these estimates on ocular trauma is rare.

Furthermore, we will perform a systematic review and meta-analysis to provide knowledge of the prevalence, and risk factors of ocular trauma informing public health and allow development of strategies to reduce the socioeconomic burden of ocular trauma worldwide.

2. Methods

This review is performed in accordance with the preferred reporting items for systematic review and meta-analysis (PRISMA) protocols guidelines.[9]

Furthermore, this protocol is registered on the International Prospective Register of Systematic Reviews numbered CRD42020189166.

The PRISMA for protocol checklist was shown in Table 1.

2.1. Search strange

The electronic databases including PubMed, Web of Science, Chinese National Knowledge Infrastructure (CNKI), Weipu, and Wanfang will be searched. The search strategy will be first developed in Medline using Mesh subject headings combined with free-text terms around the 3 search components "ocular trauma," "eye injury," and "Prevalence" (Table 2), and then adapted for use in the other databases. Studies published in English or Chinese through June 1, 2020 will be included. In addition, further studies will be retrieved through manual references' listing of included studies and relevant reviews and consultation with experts in the field. Eligible studies will be imported and managed in the EndNote Reference Manager, version X6 (Thomson Reuters, Philadelphia, PA). Two independent reviewers will review the including studies by screening the titles and abstracts. Then, they will review the full texts of the selected studies to determine the final included reports according to pre-defined inclusion criteria. The authors will also independently collect the study characteristics in a Microsoft Excel and do the quality assessments. Any disagreement will be resolved by discussion with a third author. The study selection process is presented in PRISMA flow diagram (Fig. 1).

2.2. Inclusion criteria

Cross-sectional, case-control, or cohort population-based studies regarding to the ocular trauma.

2.3. Exclusion criteria

Duplicates, reviews, or abstracts.

Studies without sufficient data (sample size and number of events).

Types of outcome measures.

The proportion of people with ocular trauma and pooled risk factors of the disease; further, global, regional, and national estimates of ocular trauma in next 50 years.

2.4. Data collection and analysis

Two review authors will independently extract data. Any discrepancies will be resolved by discussion. The extracted data will include the following: the first author; publication year; study design; country of origin; sample size; diagnostic criteria for ocular trauma; age and sex of participants; the cause of injury; and other information regarding sociodemographic, lifestyle factors, and medical history. For multinational studies, the data will be separated into individual countries. When it may not be possible to separate the data by country level, the study will be presented as one with the largest sample size.

The quality assessment of included studies will be conducted according to the Joanna Briggs Institute tool,[10] which is a 9-item tool. Each item will be scored as 0 for "No" or "Unclear" and 1 for "Yes." The total score of including studies will be calculated by the sum of points. Two reviewers will evaluate the quality independently and any-discrepancy will be solved by discussion of a third review investigator.

2.5. Assessment of heterogeneity

Statistical heterogeneity will be evaluated by I^2 statistic and the Chi-square test. $I^2 > 50\%$ or $P < .1$ will be considered as significant heterogeneity. Then we will perform subgroup analysis to explore possible sources of significant heterogeneity.

2.6. Assessment of reporting bias

Asymmetric funnel plot and Egger test will be performed to assess publication bias. If there is significant publication bias, the findings should be taken into caution.

2.7. Data synthesis

Data synthesis will be performed by using STATA software package v 12.0 (Stata Corporation, College Station, TX) and R (version 3.4.1; R Foundation for Statistical Computing, Vienna, Austria) software. A forest plot with random or fixed-effects model will be performed for quantitative synthesis. If there is significant heterogeneity, the random-effects model will be used while the fixed-effects model if not.

2.8. Subgroup analysis

We will perform the following subgroup analysis:

Subtypes of ocular trauma;
Population (children or adolescents);
Region (regional or national);

Table 1

PRISMA 2009 checklist.

Section/topic	No.	Checklist item	Reported on page no.
Title			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
Abstract			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
Methods			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were prespecified.	
Results			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: simple summary data for each intervention group, effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
Discussion			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
Funding			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097. For more information, visit: www.prisma-statement.org.

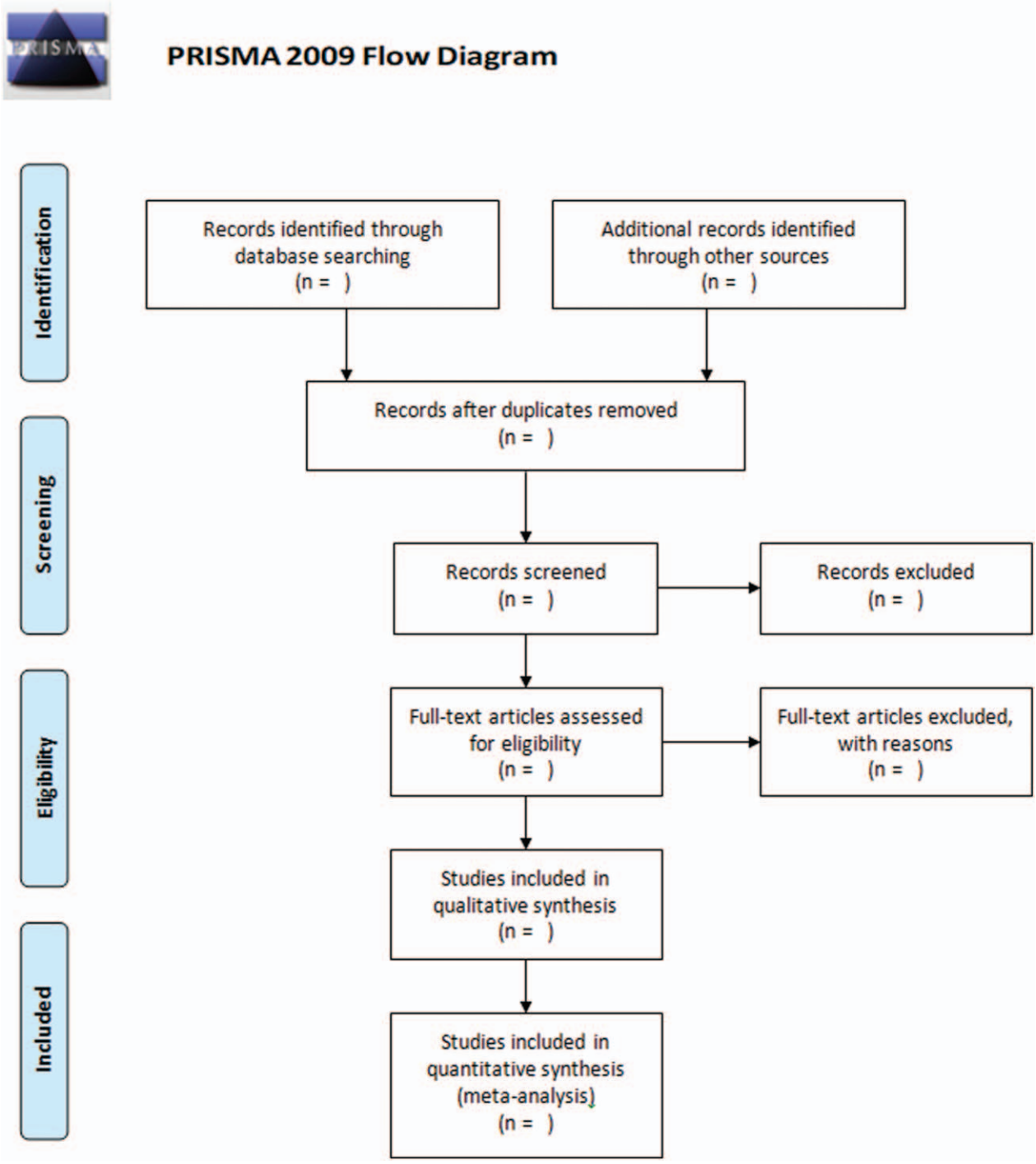

Figure 1. The study selection process according to PRISMA flow diagram. PRISMA = preferred reporting items for systematic reviews and meta-analysis.

Publication date;
Finally, we will evaluate the quality of evidence using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system.[11]

3. Discussion

To the best of our knowledge, this is the first systematic review and meta-analysis to estimate the global prevalence and risk factors of ocular trauma worldwide. Our findings will provide evidence to describe the prevalence of ocular trauma worldwide, and help public health stakeholders make more efficient strategies to prevent the disease.

The strengthen of our study includes this will be a comprehensive, well-designed systematic review, and meta-analysis. However, there are still some limitations of this study. First, ocular trauma is always self-reported, and may be liable to recall bias especially for minor injuries. This is the case in many rural settings where the diagnosis rate is low. Another limitation is the quality of including studies likely affects the reliability of the final findings. Given the limited reports available for population-

Table 2

Search strategy.

	Search terms
PubMed	(("Eye Injuries"[Mesh] OR Eye Injur* OR Eye Trauma* OR Ocular Injur* OR Ocular Trauma*) AND (Prevalence OR Proportion OR Morbidity) OR "Eye Injuries/epidemiology"[Mesh]) AND "Humans"[Mesh] AND Case-control AND (Population-based OR Cross-sectional OR "Observation Study" OR "Observational Study" OR "Observational Research" OR "Observation Research" OR Cohort) (("Eye Injuries"[Mesh] OR Eye Injur* OR Eye Trauma* OR Ocular Injur* OR Ocular Trauma*) AND (Prevalence OR Proportion OR Morbidity) OR "Eye Injuries/epidemiology"[Mesh]) AND "Humans"[Mesh] AND Case-control AND (Population-based OR Cross-sectional OR "Observation Study" OR "Observational Study" OR "Observational Research" OR "Observation Research" OR Cohort) (("Eye Injuries"[Mesh] OR Eye Injur* OR Eye Trauma* OR Ocular Injur* OR Ocular Trauma*) AND (Risk Factor* OR Associated Factor* OR Pathogenic Factor) OR "Eye Injuries/etiology"[Mesh]) AND "Humans"[Mesh] AND Case-control AND (Population-based OR Cross-sectional OR "Observation Study" OR "Observational Study" OR "Observational Research" OR "Observation Research" OR Cohort)
Web of Science	TS=(Eye Injur* OR Eye Trauma* OR Ocular Injur* OR Ocular Trauma*) AND TS=(Prevalence OR Proportion OR Morbidity) AND; TS=(Case-control OR Population-based OR Cross-sectional OR "Observation Study" OR "Observational Study" OR "Observational Research" OR "Observation Research" OR Cohort) TS=(Eye Injur* OR Eye Trauma* OR Ocular Injur* OR Ocular Trauma*) AND TS=(Risk Factor* OR Associated Factor* OR Pathogenic Factor) AND TS=(Case-control OR Population-based OR Cross-sectional OR "Observation Study" OR "Observational Study" OR "Observational Research" OR "Observation Research" OR Cohort)
Chinese National Knowledge Infrastructure (CNKI)	SU=("ocular injury" + "ocular trauma") AND SU=(prevalence + incidence + morbidity); SU=("ocular injury" + "ocular trauma") AND SU=(pathogenic factor + risk factor + associated factor)
Weipu	M=("ocular injury" + "ocular trauma") AND R=(prevalence + incidence + morbidity); SU=("ocular injury" + "ocular trauma") AND M=(pathogenic factor + risk factor + associated factor)
Wanfang	S:("ocular injury" + "ocular trauma") AND S:(prevalence + incidence + morbidity); S:("ocular injury" + "ocular trauma") AND S:(pathogenic factor + risk factor + associated factor)

based studies, epidemiological evidenced information should guide who should be prioritized for investigating.

Author contributions

Conceptualization: Lei Liu, Yuedong Hu.
Data curation: Shuang Xu, Yuli Song, Yuye Wang, Lei Liu.
Formal analysis: Lei Liu.
Investigation: Xiaoyan Bian, Lei Liu, Yuedong Hu.
Methodology: Shuang Xu.
Supervision: Lei Liu.
Writing – original draft: Xiaoyan Bian, Bin Zhao, Yifan Zhong, Lei Liu, Yuli Song, Yuedong Hu.
Writing – review & editing: Xiaoyan Bian, Lei Liu, Yuedong Hu, Yuli Song.

Correction

When originally published, Dr. Yuedong Hu's name appeared incorrectly as Yudong Hu. This has been corrected.

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