INPLASY

Global Prevalence, Trend and Forecasting of Myopia in Children and Adolescents From 1990 to 2050, A comprehensive Systematic review and Meta-analysis

INPLASY202380122

doi: 10.37766/inplasy2023.8.0122

Received: 29 August 2023

Published: 29 August 2023

Liang, JH[1]; Pu, YQ[2]; Chen, JQ[3]; Liu, ML[4]; Ge, WX[5]; Jin, ZG[6]; Yang, XZ[7]; Wu, ZW[8]; Qin, QS[9]; Wang, C[10]; Huang, S[11]; Jiang, N[12]; Hu, LX[13]; Zhang, YS[14]; Gui, ZH[15]; Pu, XY[16]; Huang, SY[17]; Chen, YJ[18]

Corresponding authors:
Chen Yajun and Jinghong Liang

chenyajun68@yeah.net

liangjh78@mail2.sysu.edu.cn

Author Affiliation:
Sun Yat-sen University, School of Public Health.

ADMINISTRATIVE INFORMATION

Support - The work was supported by the National Natural Science Foundation of China (No. 82273650).

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202380122

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 August 2023 and was last updated on 29 August 2023.

INTRODUCTION

Review question / Objective Myopia is a pervasive global public health concern, particularly among the younger population. Notably, there has been a notable surge in preadolescent myopia, particularly in the context of the COVID-19 pandemic. However, the escalating prevalence of myopia remains uncertain. To estimate the prevalence and predict future prevalence of myopia in 2050, based on an extensive search strategy, we conducted a meta-analysis that took into account geographical, temporal, and other variations over an extended period among children and adolescents.

Condition being studied The study employed a population-based approach, utilizing a sample that was generally representative of children and adolescents aged 5-19 [according to World Health Organization (WHO) criteria: https://www.who.int/%5D,In mixed-age population studies, it was necessary to separate and extract the prevalence data of myopia specifically for the 5-19 year age group; The optometry method used to determine the spherical equivalent (SE) and the definition of myopia were clearly elucidated. Participants were special population were excluded (with organic or mental disorder, etc.).

METHODS

Search strategy We adapted a comprehensive search strategy accordingly for PubMed (Via in Medline), Embase, Web of Science, CBMdisc, CNKI, VIP and Wanfang, from their inception to June 23, 2023 without language resection. To conduct a comprehensive search, Medical Subject Headings (MeSH) terms were used in combination with relevant keywords and Boolean operators on the PICOS items: “Myopia”, “Children”, “Adolescents”, “Youths”, “Students”, “Epidemiology”, “ Cross-sectional study”, “Prevalence”. In order to identify the potential relevant publications, a recursive search was conducted which involved manually screening

bibliographies of relevant review, reviewing government reports, collecting the grey literature, and examining major journals such as the Ophthalmology, JAMA Ophthalmology and Ocular Surface.

Participant or population Studies recruited participants that were children or adolescents aged from 6 to 18 years old.

Intervention Not applicable.

Comparator Not applicable.

Study designs to be included Observational studies, epidemiology studies and cross-sectional studies.

Eligibility criteria Studies were eventually included in our synthesis if they met the eligibility criteria as follows: (1) the study employed a population-based approach, utilizing a sample that was generally representative of children and adolescents aged 5-19 [according to World Health Organization (WHO) criteria: https://www.who.int/%5D,In mixed-age population studies, it was necessary to separate and extract the prevalence data of myopia specifically for the 5-19 year age group; (2) the study provided a comprehensive description of the country or region under investigation; (3) specific numerical prevalence estimate of myopia was provided; (4) the optometry method used to determine the spherical equivalent (SE) and the definition of myopia were clearly elucidated; and (5) the study design was any type of cross-sectional or epidemiology study. Studies were excluded if they met the following criteria: (1) participants were special population (with organic or mental disorder, etc.); (2) studies that were not written in English, and (3) case-control studies, longitudinal studies, randomized controlled trials (RCTs).Observational studies, epidemiology studies and cross-sectional studies.

Information sources We adapted a comprehensive search strategy accordingly for PubMed (Via in Medline), Embase, Web of Science, CBMdisc, CNKI, VIP and Wanfang, from their inception to June 23, 2023 without language resection. To conduct a comprehensive search, Medical Subject Headings (MeSH) terms were used in combination with relevant keywords and Boolean operators on the PICOS items: “Myopia”, “Children”, “Adolescents”, “Youths”, “Students”, “Epidemiology”, “ Cross-sectional study”, “Prevalence”.

Main outcome(s) Prevalence of myopia was the main outcome measured as percentage point estimates with corresponding 95%CIs.

Data management The citation management process involved using EndNote X9 software to download and organize all sources (Thompson ISI Research Soft, Clarivate Analytics, Philadelphia, USA). Duplicate items were removed and three investigators independently reviewed the titles, abstracts, and full texts of publications based on pre-determined criteria to exclude irrelevant studies. Eligible citations were cross-checked to ensure accuracy.

Quality assessment / Risk of bias analysis The Joanna Briggs Institute (JBI) critical appraisal tool was utilized to evaluate all the included studies based on nine items, which were divided into four elements: Yes (the item met the requirement), No (the item did not meet the requirement), NA (there is no this item), and Unclear (it is unclear whether the item met the requirement). A total JBI score was generated based on the number of Yes, with the total score ranging from 0 to 9, representing the quality of the included study. The Grades of Recommendations Assessment, Development and Evaluation (GRADE) system was applied to rate the quality of the eligible studies. Observational studies were initially rated as low-quality evidence, which were downgraded based on five items (study limitations, imprecision, inconsistency, indirectness, and publication bias) accordingly. The items of study were rated as three levels: no downgrade, downgrade one level (serious), or downgrade two levels (very serious). Following the above assessment, the quality of each study was ultimately rated at four levels of evidence (high, medium, low, or very low). The assessment of GRADE was conducted independently by 2 researchers in duplicate.

Strategy of data synthesis Four authors independently extracted the pivotal information using a pre-designed and pre-tested comprehensive extraction form which derived from the data extraction template followed the Cochrane Consumers and Communication Review Group. The following key items of the included studies were specifically extracted: first author, year of publication, origin, total sample size, number of myopia patients, gender data (if any), and criteria for myopia. The Joanna Briggs Institute (JBI) critical appraisal tool was utilized to evaluate all the included studies based on nine items, which were divided into four elements: Yes (the item met the requirement), No (the item did not meet the requirement), NA (there is no this item), and Unclear (it is unclear whether the item met the

requirement). A total JBI score was generated based on the number of Yes, with the total score ranging from 0 to 9, representing the quality of the included study. The Grades of Recommendations Assessment, Development and Evaluation (GRADE) system was applied to rate the quality of the eligible studies. Observational studies were initially rated as low-quality evidence, which were downgraded based on five items (study limitations, imprecision, inconsistency, indirectness, and publication bias) accordingly. The items of study were rated as three levels: no downgrade, downgrade one level (serious), or downgrade two levels (very serious). Following the above assessment, the quality of each study was ultimately rated at four levels of evidence (high, medium, low, or very low). The assessment of GRADE was conducted independently by 2 researchers in duplicate.

Subgroup analysis For evaluating any significant variations among the studies included or to account for the considerable heterogeneity, we conducted multiple subgroup analyses, which are outlined below: Gender (Boys vs. Girls), Literature resources (Chinese vs. English), Grade (Primary vs. Secondary vs. High), Age groups (Children vs. Adolescents), Census (Urban vs. Country), Sample size (< 1,000, 1,000-3,000, > 3,000), Publication years (1990-2000, 2001-2010, 2011-2019, 2020-2023), Boys to girls ratio (<1 vs. ?1), Region1 (Developed countries vs. Developing/ Undeveloped countries), Region3 (Asia vs. Europe vs. America vs. Africa vs. Oceania).

Sensitivity analysis To examine the relationship between various sample characteristics and the occurrence of childhood myopia, the univariable meta-regression analyses was performed. It is generally advised to have at least 10 data points for each variable in the analysis. We evaluated the potential for publication bias with the help of adjusted-comparison funnel plots and Egger's statistical test.

Country(ies) involved China.

Keywords Global prevalence, Trend, Myopia, Children and adolescents, Systematic Review and Meta-analysis.

Contributions of each author

Author 1 - Jinghong Liang.
Email: liangjh78@mail2.sysu.edu.cn
Author 2 - Yingqi Pu.
Author 3 - Jiaqi Chen.
Author 4 - Meiling Liu.
Author 5 - Wenxin Ge.
Author 6 - Zhengge Jin.
Author 7 - Xiuzhi Yang.
Author 8 - Zhuowen Wu.
Author 9 - Qingsong Qin.
Author 10 - Cong Wang.
Author 11 - Shan Huang.
Author 12 - Nan Jiang.
Author 13 - Lixin Hu.
Author 14 - Yushan Zhang.
Author 15 - Zhaohuan Gui.
Author 16 - Xueya Pu.
Author 17 - Shaoyi Huang.
Author 18 - Yajun Chen.