

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjopen.bmj.com).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Prevalence of active trachoma among 1-9 years of age children in Ethiopia: a systematic review and meta-analysis

Journal:	BMJ Open
Manuscript ID	bmjopen-2023-079623
Article Type:	Original research
Date Submitted by the Author:	08-Sep-2023
Complete List of Authors:	Asgedom, Yordanos; Wolaita Sodo University, Epidemiology; Wolaita Sodo University Melaku , Tsegaye; Jimma University, Institute of Health Gebrekidan, Amanuel; Wolaita Sodo University, School of Public Health Meskele , Mengistu ; Wolaita Sodo University, School of Public Health Azeze, Gedeon; Hawassa University, Midwifery Alemu, Afework; Wolaita Sodo University, medicine Efa, Amelework; SNNPR, Medicine Haile, Kirubel; Wolaita Sodo University, Nursing Kassie, Gizachew ; Wolaita Sodo University
Keywords:	Systematic Review, Meta-Analysis, EPIDEMIOLOGY, Infection control < INFECTIOUS DISEASES, Public health < INFECTIOUS DISEASES, Paediatric ophthalmology < OPHTHALMOLOGY
	·

SCHOLARONE™ Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text

- systematic review and meta-analysis
- Yordanos Sisay^{1*}, Tsegaye Melaku² Amanuel Yosef³, Mengistu Meskele⁴, Gedeon
- Asnake 5, Afework Alemu 6, Amelework Gonfa 7, Kirubel Eshetu 8, Gizachew Ambaw 1
- ^{1,9} Department of Epidemiology, Wolaita Sodo University, SNNPR, Ethiopia
- Institute of Health, Jimma University, Oromia, Ethiopia
- ^{3, 4} Schools of Public Health, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing and Midwifery, Hawassa University, Sidama, Ethiopia
- 6,7 School of Medicine, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing, Wolaita Sodo University, SNNPR, Ethiopia
- *Correspondence:
- Corresponding Author
- yordusisay@gmail.com/yordanos.sisay@wsu.edu.et
- Keywords: Trachoma, Children, Systematic review, Meta-analysis, Ethiopia

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text and

Abstract

- **Objective:** To determine the pooled prevalence of active trachoma among 1-9 years of
- children in Ethiopia.
- Design: A systematic review and meta-analysis was employed in accordance with the
- 25 Preferred Reporting Items for Systematic Reviews.
- Data sources: Medline/PubMed, Scopus, web of science, African journal of online (AJOL)
- 27 and Google scholar databases were systematically explored to find studies published in
- English until July 2023.
- 29 Eligibility criteria: The following criteria: (1) Condition (Co): Studies examined the
- prevalence of trachoma among children (1-9) years old; (2) Context (Co): Studies
- conducted in Ethiopia; (3) Population (Pop): Studies that were done among children (1-9
- years); (4) Study type: Observational studies; (5) Language: Studies published in English.
- 33 Data extraction and synthesis: The data was extracted using a Microsoft Excel
- spreadsheet. Random effect model was used to estimate the pooled prevalence of active
- trachoma among 1-9 years of age children. Cochrane Q-test and I² statistics were used
- across studies to assess heterogeneity. To identify possible publication bias Egger's test
- was performed.
 - **Primary outcome:** Prevalence of active trachoma.
- **Results:** Overall, a total of forty-two articles with 235,005 study participants were included
- in the final analysis. The estimated pooled prevalence of active trachoma using random
- effect model was 24% (95% CI: 20-27%). The sub-group analysis by region revealed the
- 42 highest prevalence of trachoma was 36% (95% CI: 13-58%) in Tigray region and
- publication year revealed the prevalence of trachoma is decreasing from 32% to 19% after
- 44 2015.
- **Conclusion:** In this review, the pooled prevalence of active trachoma was found to be
- 46 high in Ethiopia compared to World health Organization (WHO) threshold level. This
- 47 underscores the need for increased focus on high-risk age groups to decrease trachoma
- and to achieve elimination of trachoma from the country by 2030.

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from

Protected by copyright, including for uses related to text

mining, Al training, and similar technologies

http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de

Strength and Limitations of this study

- It follows the recommended updated PRISMA guidelines
- We also rigorously searched the literature in different databases and identified eligible studies.
- Limitations of this review which will be considered while interpreting the result. The first one is we were forced to compare our findings with those of primary studies in some parts of the discussion because of a lack of adequate systematic reviews and meta-analyses.
- This review have not assessed for associated factors.

Word count: 3285

Introduction

Globally, trachoma is the leading cause of blindness. Trachoma has been named one of 20 neglected tropical diseases (NTD) by the World Health Organization (WHO) [1, 2]. Children are the primary reservoirs of infection. Children aged 1 to 9 years are more likely to have an active trachoma [3]. Due to their tendency for close contact with others, children

are frequently infected with Chlamydia trachomatis [4].

The poorest of the poor are primarily affected by trachoma [5]. The WHO 2021 report shows that trachoma is responsible for 1.9 million people with blindness and visual impairment, moreover, approximately 125 million people live in trachoma-endemic areas worldwide [1]. Around 3.8 million cases of blinding trachoma and 27.8 million cases of active trachoma have been reported in Africa which is one of the most affected continents [6]. Ethiopia has the world's highest trachoma burden, with 76.2 million people living in endemic areas at risk of contracting the disease. Among Ethiopian children active trachoma is ranged from 10.3% [7] to 74.3% [8] . For children aged 1-9 years living in endemic areas the prevalence of Trachomatous inflammation-follicular (TF) <5% is the elimination target set by WHO(3), However, the prevalence in Ethiopian children is higher than the target. If TF is > =5% among children aged 1-9 years SAFE strategy which includes Antibiotics, Face washing, and Environmental Improvement (A, F, and E) is recommended [9]. Globally an estimated US\$ 8 billion in annual product loss is attributed to this disease [1].

Direct personal contact such as shared towels, flies, clothes, and fingers that interact with the infected person's eyes or nose is known for transmission of trachoma infection. The scarcity of safe drinking water access and sanitation systems has spread Chlamydia trachomatis infections. Corneal scarring and eyelid deformities can occur after inflammation and recurrent infections subsequently, if not treated and eyelid inversion (Entropion) and the lashes turn inward (trichiasis) occur as late complications. Irreversible blindness can result in trichiasis and permanent damage to the cornea [1].

Eliminating trachoma by 2020 through the implementation SAFE strategy (surgery for inturned eyelashes, antibiotics to clear the infection, and facial cleanliness and environmental improvement to reduce infection transmission) was set by the WHO and

other concerned organizations^[1]. Ethiopia intended to eliminate trachoma through the SAFE strategy by implementing a national trachoma action plan in 2012 and implementing a second master plan for 2016 to 2020 ^[10, 11]. Despite significant development, trachoma elimination was not met by December 2020 and it was pushed back to 2030 to align with the Sustainable Development Goals (SDGs) ^[1].

- Despite the fact that numerous fragmented studies have been conducted in Ethiopian children (1-9 years) to assess the prevalence of trachoma, comprehensive updated nationwide data on the prevalence is lacking. As a result, this study aimed to deliver a summary of the prevalence of trachoma infection among children, and geographical locations, and to assess the ongoing preventive and control measures impact in the country.
- Furthermore, the government and other concerned bodies may contribute by focusing on preventive measures such as improving access to water and sanitation specifically in areas of trachoma infection high prevalence.
- Research Question: What is the pooled prevalence of trachoma infection among children (1-9yrs) old in Ethiopia?

Methods

Reporting

- We performed our analyses according to the Preferred Reporting Items for Systematic
- Reviews and Meta-Analyses (PRISMA) statement [12]. The article screening was based on
- the PRISMA 2020 statement, and the selection process has been shown using a PRISMA
- 122 -P flow diagram. The finding is presented using the standard PRISMA checklist
- (Supplemental Table 1). The review protocol is not registered in PROSPERO.

Search Strategy and study identification

- To estimate the prevalence of trachoma among children (1-9) years old in Ethiopia a
- systematic review and meta-analysis were performed. After an initial exploration of Google
- 127 Scholar, MEDLINE, and SCOPUS with limited parameters, a follow-up search was

conducted using all identified keywords and index terms across several databases including MEDLINE, PubMed, SCOPUS, Web of Science, and African journal online(AJOL). All studies conducted on trachoma Prevalence among children in Ethiopia were retrieved. The search included all articles published until July 31, 2023. English-language studies were only searched. Medical subject heading (MeSH) (((("Magnitude") OR "prevalence" OR "burden") AND "Trachoma") OR "Eye infection" OR "Trachomatous intense" OR "Trachomatous Follicular")) AND Ethiopia) were used in various combinations as the primary search keywords (Supplemental Table 2). During the systematic review and meta-analysis, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [12]. **Eligibility Criteria**

- We used condition, context, and population (CoCoPop) framework for the search and meta-analysis of eligibility criteria.
 - **Inclusion Criteria**
- The following criteria were used to include studies in this systematic review and meta-analysis.
 - Condition (Co): We include studies examined the prevalence of trachoma among children (1-9) years old.
 - Context (Co): Studies conducted in Ethiopia were included.
- Population (Pop): Studies that were done among children (1-9 years).
 - Study type: Observational studies
- Language: Studies published in English were included
- **Exclusion criteria**
- We excluded studies other than children (1-9 years) as well as with different outcome of interest, qualitative studies, case reports, case series, review paper, conference
- proceedings and abstracts.

This study aimed to gather and analyze data from various studies conducted in Ethiopia to determine the pooled prevalence of Trachoma among children (1-9 years). We used a systematic approach to identify the relevant studies and extract data from them. Then we employ Stastical methods to combine the data from different studies to estimate the overall pooled prevalence of Trachoma among children (1-9 years) in Ethiopia. Prevalence of trachoma defined here as trachomatous inflammation follicular or Trachomatous inflammation intense among children was the major outcome of this review.

Data extraction and quality assessment

The Endnote citation manager (Version X8, for Windows, Thomson Reuters, Philadelphia, PA, USA) was used to import the retrieved studies and then duplicates were removed. Two independent reviewers screened all the articles for eligibility criteria. Reviewers began by screening the abstracts and titles, followed by full-text screening. The quality of the articles was assessed by using Newcastle-Ottawa Quality Assessment Scale (adapted for crosssectional studies) [13]. Disagreements were resolved by a third investigator. The articles were critically appraised by the following criteria from the tool: Representativeness of the sample (1 score maximum), sample size (1 score maximum), non-respondent (1 score maximum), ascertainment of exposure (2 score maximum), Comparability of outcome based on study design (2 score maximum), outcome assessment (2 score maximum) and Statistical analysis (1 score maximum). All the included studies assessed through the tool with a score of ≥5 were included in this systematic review and meta-analysis (Supplemental Table 3). After quality rating no study was dismissed. Two investigators used a standardized extraction format prepared in Microsoft Excel. The excel spreadsheet includes the name of the first author, publication year, study design, region, study area, gender, sample size, number of cases and trachoma prevalence.

Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies

Statistical Analysis

Data was extracted in Microsoft Excel format and analyzed using STATA software version 16.0 (Stata Corp LLC, Texas, USA). We used forest plots to report the estimated pooled prevalence of the study with confidence interval (CI) to provide a visual summary of the data. Effect sizes were expressed as a proportion with 95% CI around the summary estimate. The data was first presented using narrative synthesis of the included studies. We assumed no, low, medium, and high heterogeneity across studies if the I² values were 0%, 25%, 50%, and 75%, respectively. A meta-analysis using a random effects model was performed to analyze the pooled prevalence with 95% confidence intervals (CI) since significant heterogeneity was detected between studies. The heterogeneity of each outcome measure was assessed using both X² and 1² statistics to determine dispersion. Meta-regression analysis was performed to investigate the source of heterogeneity. A Funnel plot and Egger's regression test was conducted to assess publication bias. In addition, a leave one-out sensitivity analysis to evaluate small study effect by excluding each study one at a time, the analysis was performed to assess the effect of each study on the pooled prevalence of trachoma and subgroup analysis was performed to ensure consistency of pooled results. Statistical significance was considered at p< 0.05.

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text and

Search results

Our searching strategy initially identified 453 Articles and 340 duplicates were excluded by using the endnotes citation manager. Finally, 68 Studies were further excluded after reviewing the title and abstract and then 45 articles full text was reviewed for necessary criteria. Excluding three articles as they were not reported outcomes of interest; finally, 42 studies that fulfilled the inclusion criteria were considered for the final analysis to estimate the overall pooled prevalence of trachoma among children (1-9 years) in Ethiopia. (Figure 1) illustrates the process of the literature review, screening, and eligibility assessment of the study articles.

Included studies characteristics

A total of forty-two cross-sectional studies (235,006 children) were included in this systematic review and meta-analysis. The spanned publication period was from 2005 to 2023. The sample size of the included studies ranges from 178 [14] to 62869[15]. With regard to study sites, sixteen of the primary studies included from Amhara region [2, 15-29], nine from SNNPR region [30-38] and six studies included from Oromia [14, 39-41], three from Tigray [42-44] respectively. However, one study each reported from Afar[45], Somali[46], Harari[47], Diredawa [8], Gambela [48], BenshangulGumuz [49], and nationwide [50] (Table 1).

Table 1: Sumn children in Ethi			ВМЈ С)pen			136/bmjopen-20:	
Table 1: Sumn children in Ethi	nary of 42 inc opia, 2023.	luded studie	s on the poo	led prevale	ence of tr	achoma	amolag 1-9 y	ears of age
Author's	Publication year	Region	Study Area	Sample	Male(n)	Female (n)	of (n) n 11 July 2024. Down o Engagine ment so to te	Prevalence %
Abashawl et.al ^[48]	2016	Gambela	Region-wide	3238	NA	NA	24. Dov	17.2
Adamu et.al ^[49]	2016	Benishangul Gumuz	Region-wide	7417	3212	4205	loaded Su <u>f</u> erie	8.3
Adera et.al ^[30]	2016	SNNP	Region-wide	41,155	NA	NA	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	28.3
Admassu et.al ^[31]	2013	SNNP	Guragie	768	386	382	http://br (BES)5.	22.8
Admasu et.al ^[32]	2015	SNNP	Dawro	267	113	154	mjopen.bmj.com	22.9
Alambo et.al ^[38]	2018	SNNP	Areka	586	317	269	S222ic	37.9
Alemayehu et.al ^[51]	2015	Amhara	Dera	671	351	320	m/ on Ju d s∰ilar	15.6
Alemayehu et.al [33]	2005	SNNP	Guragie	2788	NA	NA	June 10, ar techn	56.5
Anteneh et.al ^[16]	2016	Amhara	Gazegibela	601	268	333	0 915 925	52.4
Asres et.al ^[17]	2016	Amhara	Gondar	586	285	301	71 Age	12.1
Assefa et.al ^[47]	2017	Harari	Harari	1722	804	918	22 Bibliograp	1.3
Belsti et.al ^[52]	2021	Southwest	Lare	610	283	327	132graphi	21.6

			BMJ Open					136/bmjopen-2023		
Bero et.al ^[39]	2016	Oromia	Regionwide	41642	NA	NA	9ht, 9cl	23.4		
Brhane et.al ^[50]	2007	Nationwide	Nationwide	9289	NA	NA	-079623 opn 1:	40.1		
Duale et.al ^[46]	2018	Somali	Region-wide	23620	11462	12158	l.≱uly Mans	15		
Ejigu et.al ^[53]	2013	Southwest	Kersa	305	154	151	2024. Downloaded from http://bmjopen.bmj eignemen@Superteur (ABES) related to text and data nining.	25.2		
Emerson et.al ^[18]	2008	Amhara	Region wide	5485	NA	NA	ownloa en@Sur to text	32.7		
Ferede et.al ^[19]	2017	Amhara	Dembia	681	NA	NA	aded fro	18.2		
Gedefaw et.al ^[20]	2013	Amhara	Dangila	409	215	194	om http (ABES ta⊈nini	12		
Genet et.al [21]	2022	Amhara	Dangila	704	337	367	nga-Al	6.1		
Golovaty et.al ^[22]	2009	Amhara	Ankober	507	219	288	pen.bn	53.9		
Kassahun et.al ^[41]	2012	Oromia	Мојо	431	NA	NA	mj.com/ on June 10, 2 5 9, ∰d sin∰ar te⊛no	22.5		
Kedir et.al ^[34]	2020	SNNP	Silte	561	279	282	on Jun 55 im∰ar 1	29.4		
Kemal et.al ^[40]	2019	Oromia	Medawalebu	406	215	191	ne 10, 2025 teფეიისიფვ	22		
Kessete et.al ^[29]	2021	Amhara	Metema	752	352	400	2025 at /	11.8		
Ketema et.al ^[23]	2012	Amhara	Baso Liben	792	391	401	at Agence E	24.1		
Mehari et.al [35]	2014	SNNP	Guragie	735	366	369	47 agrap	6.4		

f 36		BMJ Open 2 Oromia Arsi Negele 178 93 85 39 776 21.91 SNNP Zala 611 286 325 24 on 1						
Mekonnen et.al ^[14]	2022	Oromia	Arsi Negele	178	93	85	2023-0796	21.91
Mengistu et.al ^[36]	2016	SNNP	Zala	611	286	325	523 on 1	36.7
Mesfin et.al ^[42]	2006	Tigray	Regionwide	1526	NA	NA	July Ons	59.2
Mesfin et.al ^[2]	2005	Amhara	Ebinet	1244	601	643	2024. Downloaded from http://bmjopeighemen@Superieur (AGES) .© related to text and data-mining-Al tr	42.4
Mohammed et.al [®]	2005	Diredawa	Goro	826	438	388	ownloa enecsul to text	33.7
Negash et.al ^[45]	2018	Afar	Regionwide	6339	NA	NA	aded fro	9.6
Nigussie et.al ^[24]	2015	Amhara	Gonji Kolella	618	353	265	om http (AGES ata-mini	23.1
Nigusu et.al ^[25]	2022	Amhara	Tarimaber	736	380	356	ing 16	15.8
Oswald et.al ^[15]	2017	Amhara	Region wide	62869	NA	NA	transport	9.6
Reda et.al ^[43]	2020	Tigray	Deguatemben	502	257	245	2 80 €	21.5
Sadik et.al ^[44]	2016	Tigray	Regionwide	10023	NA	NA	in 2676	26.7
Shiferaw et.al ^[26]	2013	Amhara	Makisegnit	420	209	211	une 10, 2025 ;	23.8
Shimelash et.al ^[27]	2022	Amhara	Debretabor	394	70	324	025 at /	9.9
Tadesse et.al ^[28]	2017	Amhara	Wollo	1358	638	720	293ence	21.6
Woldekidan et.al ^[37]	2019	SNNP	Lemo	574	NA	NA	87 Bibliogra	15.2

The pooled prevalence estimates of trachoma among children in Ethiopia

The pooled prevalence of trachoma among children (1-9 years) in Ethiopia was identified in 42 studies, from a total of 235,006 children, 45,711 children were infected with trachoma. Stastically significant heterogeneity was observed ($I_{=}^{2}$ 99.8%); p<0.0001). There we used random effect model to estimate the pooled prevalence of trachoma among children (1-9 years) which was 24.01 %(95% CI: 20.67-27.40%) (Figure 2).

Subgroup analysis

To identify the potential source of heterogeneity, a subgroup analysis was executed based on study area (region) and publication year. Based on the subgroup analysis by study are (region) of Ethiopia the highest prevalence of trachoma was reported in Tigray region 35.81 (95% CI: 13.84-57.78) and followed by SNNP where 28.98 (20.14-37.82). According to subgroup analysis by publication year the pooled prevalence of trachoma among children was significantly different 32.53% (95%CI: 24.32-40.76) and 19.93% (95% CI: 16.35-23.51) before 2015 and since 2015 (Table 2).

Table 2: Subgroup-analysis on the pooled prevalence of trachoma infection among children (1-9 years) in Ethiopia, 2023

	Number of studies	Prevalence (95%CI)	l ²	P-value	<u> </u>
Regions				·	
Amhara	16	23.02(16.7,29.31)	59.5	0.001	
SNNPR	10	28.58 (20.14,37.82)	99.5	0.001	
Oromia	6	23.36(22.96,23.75)	0.00	0.107	
Tigray	3	35.81(13.84,57.78)	59.7	0.100	
Others	7	15.29(7.33,23.26)	59.9	0.600	
Over all	42	24.01(20.61,27.40)		59.8	0.0
Publication	year	6			
>= 2015	28	19.71(16.27,23.15)	99.8	0.001	
<2015	14	32.53(24.31,40.76)	99.5	0.001	
Over all	42	24.01(20.61,27.40)		59.8	0.00
The funnel p statistically s publications (Supplemen studies inclu	supported by Egger's to in a large inverted fun tal Figure 1). The Egg	ed to assess potential public est. The symmetrical distributed indicated the absence per tests revealed no public pooled prevalence of track	oution of the of a publication bias	ne included cation bias among the	
Meta-Reg	pression				

Publication bias assessment

Meta-Regression

region and sample size were considered. The analysis revealed a significant correlation between the pooled prevalence of trachoma among children (1-9 years) and publication year (P<0.001) but no significant correlation with sample size and region (**Supplemental Table 4**).

Sensitivity analysis

By excluding each study individually, a leave-out-one sensitivity analysis was used to determine the effect of a single study on pooled prevalence of trachoma among children (1-9 years) in Ethiopia. Our finding revealed no single study had a significant impact on the pooled prevalence of trachoma among children (1-9 years) in Ethiopia (Figure 3).

Discussion

- The purpose of this systematic review and meta-analysis is to append national data on
- the prevalence of trachoma infection among Ethiopian children to eliminate the disease.
- 274 Although different studies from different regions have been published in the country, the
- data on trachoma infections have to be organized and updated every time. Therefore,
- updating the information has the potential to inform and help develop different strategies
- by targeting highly endemic areas.

lacks MDA and targeted SAFE strategy [60].

The pooled overall prevalence of Trachoma (24.01 %) observed in the current review is comparable with a study from Colombia ^[54], but higher than the study done in the Democratic Republic of Congo (2.5%) ^[55], Nigeria (0.4%) ^[56], Uganda (0.3%) ^[57], Brazil (6.65%) ^[58], Kenya (15.7%) ^[59]. This prevalence is lower than studies from South Sudan (70.5%) ^[60] and Guinea (41.8%) ^[61]. The disparity among the findings might be due to environmental factors such as the level of participants' hygiene, sanitation, Access to functional latrines, and clear water supply, and recent studies were included in our review that reported ongoing Sustainable water, sanitation, and hygiene (WASH) program and Mass drug administration (MDA) with Azithromycin which might reduce trachoma prevalence among children in Ethiopia, unlike the South Sudan study which

The Subgroup analysis of this review also shows a statistically significant (p=0.01) difference among regions. Trachoma was highly prevalent in Tigray (35.81%) and SNNP (28.98) followed by Oromia (23.06) and Amhara regions (23.02). Trachoma infection is related to inadequate hygiene, low standard of living, inadequate access to water, and inadequate access to sanitation use. In the Tigray region trachoma prevalence is high which might also be related to extreme climatic events which favor a decline in water availability during dry periods which affects personal hygiene. Another reason for the difference is attributed to baseline and intervention disparity in the communities. MDA with Azithromycin once yearly is needed based on review finding (24%) and Ethiopia is known to require intervention based on WHO 2021 report(1).

Though the decline is not statistically significant (p=0.30) our result from this review revealed studies conducted between 2005-2014 and 2015-2022 show decrement on the prevalence of trachoma from 32 to 19%. The expansion of MDA and WASH programs might be attributed to the decrease in the prevalence. This is review has an implication revealing the national burden of trachoma infection among children, who are a special population accounted for one third of the national population. Moreover, this large magnitude of trachoma infection show significant gap in the implementation of devised WHO and national elimination strategies. Last but not least, from research perspective we recommend to conduct operational studies on the topic.

Conclusions

An effort has been made to eliminate, trachoma infection is still highly prevalent across the Ethiopian regions. Even though the decline is not statistically significant we saw decreased trachoma prevalence in Ethiopian children. Trachoma is highly prevalent in Tigray followed by SNNP. Despite the effort made by the country to eliminate Trachoma infection, According to WHO risk classification, it remains a public health problem in the country. The output of this review will offer valuable data to the Ministry of Health, policymakers, and concerned bodies which work on eliminating trachoma infection in the country. Trachoma infection is highly prevalent based on this review and it

- Neglected tropical diseases in Ethiopia.
- 319 List of Abbreviations CI: Confidence interval; NTD: Neglected tropical disease;
- PRISMA: Preferred reporting items for systematic review and meta-analysis; SAFE:
- 321 Surgery for Trichiasis, Antibiotics, Face Washing and Environmental improvement
- strategy; SDG: Sustainable development goal; SNNPR: South Nation and Nationalities
- people; WHO: World Health Organization.
- Acknowledgment: We are indebted to all the researchers whose studies were included
- in this study.

- 326 Contributors: Conceptualization: YSA, TMK, GAK; Data curation: YSA, TMK, GAK,
- MMK, AYG; Investigation: YSA, AAL, AGE; Methodology: YSA, TMK, GAK, KEH;
- Software: YSA, GAK, TMK; Validation: YSA, MMK, GAK, AYG; Writing: YSA, TMK,
- 329 GAK; Writing review and editing: All the authors read and approve the manuscript.
- Funding: No specific funding for this work has been received by the authors
- 331 Competing interest: The review was conducted without any personal or financial
- relationship that could lead to conflict.
- Patient and Public involvement: The public/patient was not involved in the design,
- conduct, reporting, or dissemination plans of this review.
- Patient consent for publication: Not applicable
- **Ethical approval:** Not applicable
- Data Availability: All associated data and supporting information are included in this
- 338 systematic review and meta-analysis.

Reference

- 341 1. Organization) WWH. Trachoma. Factsheet Switherland, Geneva 2022.
- 342 2. Mesfin A. Assessing the prevalence of active trachoma among young children in relation
- to the implementation of SAFE strategy in Ebinat and East Belesa Woreda, Northwest Ethiopia:
- Addis Ababa University; 2005.
- 345 3. Solomon AW, Organization WH, Initiative IT. Trachoma control: a guide for programme
- managers: World Health Organization; 2006.

- Center C. Women and trachoma: Achieving gender equity in the implementation of SAFE. The Carter Center. 2009.
- Habtamu E, Wondie T, Aweke S, Tadesse Z, Zerihun M, Zewdie Z, et al. Trachoma and relative poverty: a case-control study. PLoS neglected tropical diseases. 2015;9(11):e0004228.
- Smith JL, Flueckiger RM, Hooper PJ, Polack S, Cromwell EA, Palmer SL, et al. The geographical distribution and burden of trachoma in Africa. PLoS neglected tropical diseases. 2013;7(8):e2359.
- Basha GW, Woya AA, Tekile AK. Prevalence and risk factors of active trachoma among primary school children of Amhara Region, Northwest Ethiopia. Indian Journal of Ophthalmology. 2020;68(5):750.
- Mohamed H, Weldegebreal F, Mohammed J, Gemechu A. Trachoma and Associated Factors among School Age Children 4-9 Years in Dire Dawa Administration, Eastern Ethiopia. East African Journal of Health and Biomedical Sciences. 2019;3(2):45-54.
- Organization WH. WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2018. Weekly epidemiological record. 2019;94(29):317-28.
- (MOH) FMoH. Second edition of Neglected Tropical Diseases Master Plan 2015/2016. 10. Addis Ababa, Ethiopia 2016.
 - Abebe TA, Tucho GT. The impact of access to water supply and sanitation on the prevalence of active trachoma in Ethiopia: A systematic review and meta-analysis. PLoS Neglected Tropical Diseases. 2021;15(9):e0009644.
- Page MJ, McKenzie JE, Bossuvt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International journal of surgery. 2021;88:105906.
- Modesti P, Reboldi G, Cappuccio F. Newcastle-Ottawa Quality Assessment Scale (adapted for cross sectional studies). PLoS One. 2016;11(1):e0147601.
 - Mekonnen J, Kassim J, Ahmed M, Gebeyehu N. Prevalence of active trachoma and associated factors among children 1–9 years old at Arsi Negele Town, West Arsi Zone, Oromia Regional State, Southern Ethiopia. Plos one. 2022;17(10):e0273808.
 - Oswald WE, Stewart AE, Kramer MR, Endeshaw T, Zerihun M, Melak B, et al. Active trachoma and community use of sanitation, Ethiopia. Bulletin of the World Health Organization. 2017;95(4):250.
- Anteneh ZA, Getu WY. Prevalence of active trachoma and associated risk factors among children in Gazegibela district of Wagehemra Zone, Amhara region, Ethiopia: community-based cross-sectional study. Tropical diseases, travel medicine and vaccines. 2016;2(1):1-7.
- Asres M, Endeshaw M, Yeshambaw M, Muluken A. Prevalence and risk factors of active trachoma among children in Gondar Zuria District North Gondar, Ethiopia. Prev Med. 2016;1(1):5.
- Emerson PM, Ngondi J, Biru E, Graves PM, Ejigsemahu Y, Gebre T, et al. Integrating an 18. NTD with one of "the big three": combined malaria and trachoma survey in Amhara Region of Ethiopia. PLoS neglected tropical diseases. 2008;2(3):e197.
- Ferede AT, Dadi AF, Tariku A, Adane AA. Prevalence and determinants of active trachoma among preschool-aged children in Dembia District, Northwest Ethiopia. Infectious diseases of poverty. 2017;6(1):1-7.

- 394 21. Genet A, Dagnew Z, Melkie G, Keleb A, Motbainor A, Mebrat A, et al. Prevalence of active trachoma and its associated factors among 1–9 years of age children from model and non-model kebeles in Dangila district, northwest Ethiopia. Plos one. 2022;17(6):e0268441.
- 397 22. Golovaty I, Jones L, Gelaye B, Tilahun M, Belete H, Kumie A, et al. Access to water 398 source, latrine facilities and other risk factors of active trachoma in Ankober, Ethiopia. PLoS 399 One. 2009;4(8):e6702.
- 400 23. Ketema K, Tiruneh M, Woldeyohannes D, Muluye D. Active trachoma and associated 401 risk factors among children in Baso Liben District of East Gojjam, Ethiopia. BMC public health. 402 2012;12(1):1-7.
- 403 24. Nigusie A, Berhe R, Gedefaw M. Prevalence and associated factors of active trachoma 404 among childeren aged 1–9 years in rural communities of Gonji Kolella district, West Gojjam 405 zone, North West Ethiopia. BMC research notes. 2015;8(1):1-9.
- 406 25. NIGUSU B. PREVALENCE OF CLINICALLY ACTIVE TRACHOMA AND 407 ASSOCIATED FACTORS AMONG ONE-TO-NINE-YEAR-OLD CHILDREN IN 408 TARMABER DISTRICT, AMHARA REGION, ETHIOPIA 2022.
- Shiferaw D, Moges HG. Risk factors for active trachoma among children aged 1-9 years
 in Maksegnit town, Gondar Zuria District, Northwest Ethiopia. Risk. 2013;2(3):202-6.
- 27. Shimelash A, Alemayehu M, Dagne H, Mihiretie G, Lamore Y, Tegegne E, et al.
 Prevalence of active trachoma and associated factors among school age children in Debre Tabor
- Town, Northwest Ethiopia, 2019: a community based cross-sectional study. Italian Journal of Pediatrics. 2022;48(1):1-9.
- 415 28. Tadesse B, Worku A, Kumie A, Yimer SA. The burden of and risk factors for active 416 trachoma in the North and South Wollo Zones of Amhara Region, Ethiopia: a cross-sectional 417 study. Infectious diseases of poverty. 2017;6(1):1-12.
- 418 29. Ayelgn K, Guadu T, Getachew A. Low prevalence of active trachoma and associated 419 factors among children aged 1–9 years in rural communities of Metema District, Northwest
- Ethiopia: a community based cross-sectional study. Italian Journal of Pediatrics. 2021;47(1):1-8.
- 421 30. Adera TH, Macleod C, Endriyas M, Dejene M, Willis R, Chu BK, et al. Prevalence of and risk factors for trachoma in Southern Nations, Nationalities, and Peoples' Region, Ethiopia:
- results of 40 population-based prevalence surveys carried out with the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2016;23(sup1):84-93.
- 425 31. Admassu F, Bayu S, Bejiga A, Amare B. Active trachoma two years after three rounds of 426 azithromycin mass treatment in Cheha district Gurage zone, Southern Ethiopia. BMC pediatrics. 427 2013;13:1-5.
- 428 32. Admasu W, Hurissa B, Benti A. Prevalence of trachoma and associated risk factors 429 among Yello elementary school students. Loma Woreda, Dawro zone, Ethiopia J Nurs Care. 430 2015;1:2167.
- 431 33. Alemayehu W, Melese M, Fredlander E, Worku A, Courtright P. Active trachoma in children in central Ethiopia: association with altitude. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2005;99(11):840-3.
- 434 34. Kedir S, Lemnuro K, Yesse M, Abdella B, Muze M, Mustefa A, et al. Prevalence and 435 Factors Associated with Active Trachoma among Children 1-9 years of Age in the Catchment

Population of Tora Primary Hospital, Silte zone, Southern Ethiopia, 2020. The Open Ophthalmology Journal. 2021;15(1).

35. Mehari ZA. Pattern of childhood ocular morbidity in rural eye hospital, Central Ethiopia.

BMC ophthalmology. 2014;14(1):1-6. Mengistu K, Shegaze M, Woldemichael K, Gesesew H, Markos Y. Prevalence and factors associated with trachoma among children aged 1-9 years in Zala district, Gamo Gofa Zone, Southern Ethiopia. Clinical Ophthalmology. 2016:1663-70.

- WoldeKidan E, Daka D, Legesse D, Laelago T, Betebo B. Prevalence of active trachoma 37. and associated factors among children aged 1 to 9 years in rural communities of Lemo district, southern Ethiopia: community based cross sectional study. BMC infectious diseases. 2019;19:1-8. Alambo MM, Lake EA, Bitew Workie S, Wassie AY. Prevalence of active trachoma and 38.
- associated factors in Areka Town, south Ethiopia, 2018. Interdisciplinary Perspectives on Infectious Diseases, 2020;2020. Bero B, Macleod C, Alemayehu W, Gadisa S, Abajobir A, Adamu Y, et al. Prevalence of
- and risk factors for trachoma in Oromia regional state of Ethiopia: results of 79 population-based prevalence surveys conducted with the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(6):392-405.
- Kassim K, Kassim J, Aman R, Abduku M, Tegegne M, Sahiledengle B. Prevalence of active trachoma and associated risk factors among children of the pastoralist population in Madda Walabu rural district, Southeast Ethiopia: a community-based cross-sectional study. BMC infectious diseases. 2019;19(1):1-7.
- Yalew KN, Mekonnen MG, Jemaneh AA. Trachoma and its determinants in Mojo and 41. Lume districts of Ethiopia. The Pan African Medical Journal. 2012;13(Suppl 1).
- Mesfin MM, de la Camera J, Tareke IG, Amanual G, Araya T, Kedir AM. A communitybased trachoma survey: prevalence and risk factors in the Tigray region of northern Ethiopia. Ophthalmic epidemiology. 2006;13(3):173-81.
 - Reda G, Yemane D, Gebreyesus A. Prevalence and associated factors of active trachoma among 1–9 years old children in Deguatemben, Tigray, Ethiopia, 2018: community crosssectional study. BMC ophthalmology. 2020;20(1):1-9.
 - Sherief ST, Macleod C, Gigar G, Godefay H, Abraha A, Dejene M, et al. The prevalence of trachoma in Tigray Region, Northern Ethiopia: results of 11 population-based prevalence surveys completed as part of the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):94-9.
 - Negash K, Macleod C, Adamu Y, Ahmed M, Ibrahim M, Ali M, et al. Prevalence of 45. trachoma in the Afar Region of Ethiopia: results of seven population-based surveys from the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2018;25(sup1):3-10.
 - Duale AB, Negussu Ayele N, Macleod CK, Kello AB, Eshetu Gezachew Z, Binegdie A, 46. et al. Epidemiology of trachoma and its implications for implementing the "SAFE" strategy in Somali Region, Ethiopia: results of 14 population-based prevalence surveys. Ophthalmic epidemiology. 2018;25(sup1):25-32.
 - Assefa N, Roba AA, Abdosh T, Kemal J, Demissie E. Prevalence and factors associated with trachoma among primary school children in Harari region, eastern Ethiopia. Ophthalmology Research: An International Journal. 2017;7(3):OR. 37212.
 - Abashawl A, Macleod C, Riang J, Mossisa F, Dejene M, Willis R, et al. Prevalence of trachoma in Gambella Region, Ethiopia: results of three population-based prevalence surveys

- 484 49. Adamu Y, Macleod C, Adamu L, Fikru W, Kidu B, Abashawl A, et al. Prevalence of trachoma in Benishangul Gumuz Region, Ethiopia: results of seven population-based surveys from the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):70-6.
- 487 50. Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedri A, et al. National survey 488 on blindness, low vision and trachoma in Ethiopia: Methods and study clusters profile. Ethiopian 489 Journal of Health Development. 2007;21(3):185-203.
- 490 51. Alemayehu M, Koye DN, Tariku A, Yimam K. Prevalence of active trachoma and its 491 associated factors among rural and urban children in Dera Woreda, Northwest Ethiopia: a 492 comparative cross-sectional study. Biomed research international. 2015;2015.
- 493 52. Belsti Y, Fekadu SA, Assem AS. Active trachoma prevalence and its associated factors 494 among children aged 1-9 years in rural residents of Lare District, Southwest Ethiopia. 495 International Journal of Ophthalmology. 2021;14(11):1756.
- 53. Ejigu M, Kariuki MM, Ilako DR, Gelaw Y. Rapid trachoma assessment in kersa district, Southwest Ethiopia. Ethiopian journal of health sciences. 2013;23(1):1-9.
- 54. Miller HA, López de Mesa CB, Talero SL, Meza Cárdenas M, Ramírez SP, Moreno-Montoya J, et al. Prevalence of trachoma and associated factors in the rural area of the department of Vaupés, Colombia. Plos one. 2020;15(5):e0229297.
- 55. Kilangalanga J, Ndjemba JM, Uvon PA, Kibangala FM, Mwandulo J-LSB, Mavula N, et al. Trachoma in the Democratic Republic of the Congo: results of 46 baseline prevalence surveys conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2018;25(sup1):192-200.
- 505 56. Alada JJ, Mpyet C, Florea VV, Boisson S, Willis R, Bakhtiari A, et al. Prevalence of Trachoma in Kogi State, Nigeria: results of four local government area-level surveys from the global trachoma mapping project. Ophthalmic epidemiology. 2018;25(sup1):33-40.
- 508 57. Baayenda G, Mugume F, Turyaguma P, Tukahebwa EM, Binagwa B, Onapa A, et al. 509 Completing Baseline Mapping of Trachoma in Uganda: Results of 14 Population-Based 510 Prevalence Surveys Conducted in 2014 and 2018. Ophthalmic epidemiology. 511 2018;25(sup1):162-70.
- 512 58. Brito CMGd, Medeiros ZMd, Barbosa CC, Montarroyos UR, Ferraz C, Vieira MdT, et al.
 513 Prevalence of trachoma in Pernambuco State, Brazil (2014-2015). Revista do Instituto de
 514 Medicina Tropical de São Paulo. 2021;63.
- 59. Nasieku L, Mutai J, Muthami L, Karanja S. Determinants of active trachoma among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County, Kenya. African Journal of Health Sciences. 2017;30(2):77-86.
- 518 60. Edwards T, Smith J, Sturrock HJ, Kur LW, Sabasio A, Finn TP, et al. Prevalence of 519 trachoma in Unity State, South Sudan: results from a large-scale population-based survey and 520 potential implications for further surveys. PLoS neglected tropical diseases. 2012;6(4):e1585.
- 521 61. Géopogui A, Badila CF, Baldé MS, Nieba C, Lamah L, Reid SD, et al. Baseline trachoma 522 prevalence in Guinea: Results of national trachoma mapping in 31 health districts. PLoS 523 neglected tropical diseases. 2018;12(6):e0006585.

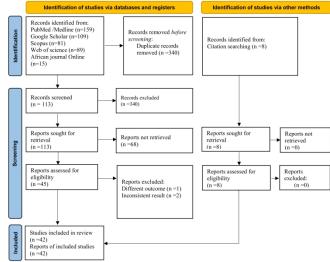


Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on pooled prevalence of trachoma infection among 1-9 years of any children in Ethioxic 2022

Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

297x210mm (300 x 300 DPI)

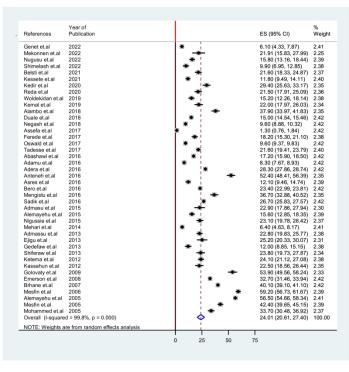


Figure 2 Forest plot depicting pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023

Figure 2 Forest plot depicting pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

215x279mm (300 x 300 DPI)

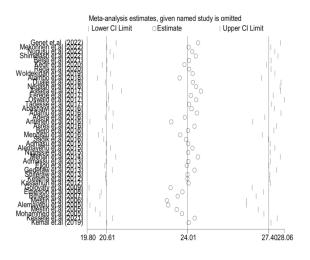


Figure 3. Leave-one sensitivity analysis on the studies included in pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023

Figure 3 Leave one sensitivity analysis on the studies included in the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

215x279mm (300 x 300 DPI)



Supplemental Table 1: PRISMA 2020 Checklist

		BMJ Open	Page 26 of 3
Sup	pleme	BMJ Open ental Table 1: PRISMA 2020 Checklist pht. 36/bmjopen-2023	
Section and Topic	Item #	Checklist item	Location where item is reported
7 TITLE		ing t	
Title	1	Identify the report as a systematic review.	1
ABSTRACT	<u> </u>	S III	
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION		See the PRISMA 2020 for Abstracts checklist. Describe the rationale for the review in the context of existing knowledge. Provide an explicit statement of the objective(s) or question(s) the review addresses.	
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	3-4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	6
METHODS		유두의	7
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	/
7 Information 8 sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consultation studies. Specify the date when each source was last searched or consulted.	6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each post whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	7
7 8	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how makey reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process	7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	15
3 Synthesis 4 methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study tersention characteristics and comparing against the planned groups for each synthesis (item #5)).	8
5	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	7
†	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	7
8 9	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was per med, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	9
0 1	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analys, meta-regression).	15
2	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	16
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	15
5		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	



46 47

PRISMA 2020 Checklist

		BMJ Open BMJ Open	Page 28 of
PRIS	MA 2	BMJ Open Cted by copyright, O20 Checklist	
Section and Topic	Item #	includ. 23	Location where item is reported
RESULTS		ing or	·
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the review, ideally using a flow diagram.	10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they we	10
Study characteristics	17	Cite each included study and present its characteristics.	10
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	8
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	8
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	8
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary and measures of statistical heterogeneity. If comparing groups, describe the directed months and measures of statistical heterogeneity. If comparing groups, describe the directed months and measures of statistical heterogeneity. If comparing groups, describe the directed months are sufficiently and measures of statistical heterogeneity.	9
}	20c	Present results of all investigations of possible causes of heterogeneity among study results.	9
}	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	16
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	9
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	9
DISCUSSION		an C	
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	17
	23b	Discuss any limitations of the evidence included in the review.	18
	23c	Discuss any limitations of the review processes used.	18
	23d	Discuss implications of the results for practice, policy, and future research.	18
OTHER INFORMA		Provide registration information for the review including register name and registration number, or state that the track was not registered	18
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	11
	24b 24c	Indicate where the review protocol can be accessed, or state that a protocol was not prepared. Describe and explain any amendments to information provided at registration or in the protocol.	11
	25	Describe and explain any amendments to information provided at registration of in the protocol. Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	13
Support			13
Competing interests	26	Declare any competing interests of review authors.	1.5
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data used for all analyses; analytic code; any other materials used in the review.	13

44 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systemat reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml
For more information, visit:

Page 29 o	of 36	BMJ Open	,	136/bmjo
Supple Ethiop	ement ia, 20	tal Table 2: Full searching strategy by databases for the pooled p 23		ht. 23-
5 6 7 8	Medlin	ne searching strategy	•	079623 on 11
9	1	exp trachoma infections		July Ens
10 11	2	Trachoma		2024.
12 13	3	(Trachoma or trachoma infections).tw.		emer to
14 15	4	(Trachoma and children (prev* or magn*)).tw.		o text
16	5	(Trachoma * or trachoma infections * or children).tw.		nloaded Superied
17 18	6	Or/1-5		from data
19 20	7	Prevalence		n http://bmjopen ABES) .
21 22	8	(Trachoma infections * or children's*).tw.	!	· //bm.j.
23 24	9	Or/7-8		train
25	10	Ethiopia, sub-Saharan, Africa		
26 27	11	(East* Africa* or "Horn of Africa*" or ethiopia* or Addis Ababa* or		com/
28 29		Afar* or Semera* or Amhara* or Bahir Dar* or Benishangul-		
30 31		Gumuz* or Asosa* or Dire Dawa* or Gambela* or Harar* or		r tec
32		Oromia* or Somali* or Jijiga* or Hawassa* or Tigray* or Meke'ele*		0, 2025
33 34		or "Southern Nations Nationalities and peoples region" or	•	ne 10, 2025 at
35 36		SNNPR).tw.		Age
37	12	Or/10-11		nce E
38 39	13	6 and 9 and 12		iiblio
40 41				Bibliographique
42 43				ique
44 45		For peer review only - http://bmjopen.bmj.com/site	e/about/guidelines.xhtml	<u>a</u>
46			J	
47				

136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de l Enseignement Superieur (ABES) . cted by copyright, including for uses related to text and data mining, Al training, and similar technologies.

Web of Science searching strategy

1 AND 2

1	((Trachoma or Active Trachoma or Trachoma Infection) AND ((Prevalence
	* or Children*) OR (Trachoma/1 (prev* or children*)))
2	(east* Africa* or "Horn of Africa*" or ethiopia* or Addis Ababa* or Afar* or
	Semera* or Amhara* or Bahir Dar* or Benishangul-Gumuz* or Asosa* or
	Dire Dawa* or Gambela* or Harar* or Oromia* or Somali* or Jijiga* or
	Hawassa* or Tigray* or Meke'ele* or "Southern Nations Nationalities and
	peoples region" or snnpr))
3	1 AND 2;
	Limited by language (English) and countries/territories (to Ethiopia)

136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de l Enseignement Superieur (ABES) . cted by copyright, including for uses related to text and data mining, Al training, and similar technologies.

Scopus searching strategy

1	ALL ((Trachoma* OR Active Trachoma* OR Trachoma Infections) OR
	(Trachoma W/1 (Preva* OR Children*)) OR Trachoma OR Active
	Trachoma OR "Trachoma infection")
2	ALL (Prevalence* OR "Children*")
3	ALL (ethiopia OR addis ababa OR oromiya OR afar OR tigray OR
	amhara OR afar OR harar OR benshangul gumz OR Somali OR OR
	gambella OR dire dawa OR "southern nations nationalities and peoples
	region OR snnpr)
4	1 AND 2 AND 3; Limited to country, Ethiopia AND Subject area
	medicine/sociology/psychology AND English

BMJ Open

Page 32 of the by Copyright Supplemental Table 3: Methodological quality assessment of included studies using the Newcastle Study assessment scale

Comparability Outcome 5 8

Study	Selection				Comparability	Outcom	9623 or	
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	Representativene ss of the sample	Sample size	Non respo ndent s	Asce rtain ment of the expo sure (max imu m scor e=2)	The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled((maximum score=2))	Asses sment of the outco me(ma ximum score= 2)	it it n.அ yely 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence at Baseignement Superieur (ABES) . நி புக்க related to text and data mining, Al training, and similar technologies.	Total(10)
Abashawi et.al [49] 25 26	1	0	0	1	0	2	ກ.bmj.co ກຸ່ປຸງອີ, and	6
Adamu et.al[50]	1	1	1	1	1	2	n∕ on Jur d <u>si</u> milar t	8
30 Adera et.al[31] 32 33	1	0	1	1	1	2	ne 10, 202	7
Admassu et.al[32] 35 36	1	0	1	2	1	2	25 at Age	8
38 39	1	0	1	0	1	2	nce Bibli	7
Alambo et.al [39] 41 42	1	0	1	1	1	2	Bibliographique de l	7
Alemayehu et.al [52] 45 46	1 Fo	1 r peer review only	1 - http://bm	1 jopen.bm	1 ij.com/site/about/guideli	2 nes.xhtml	1 de l	8

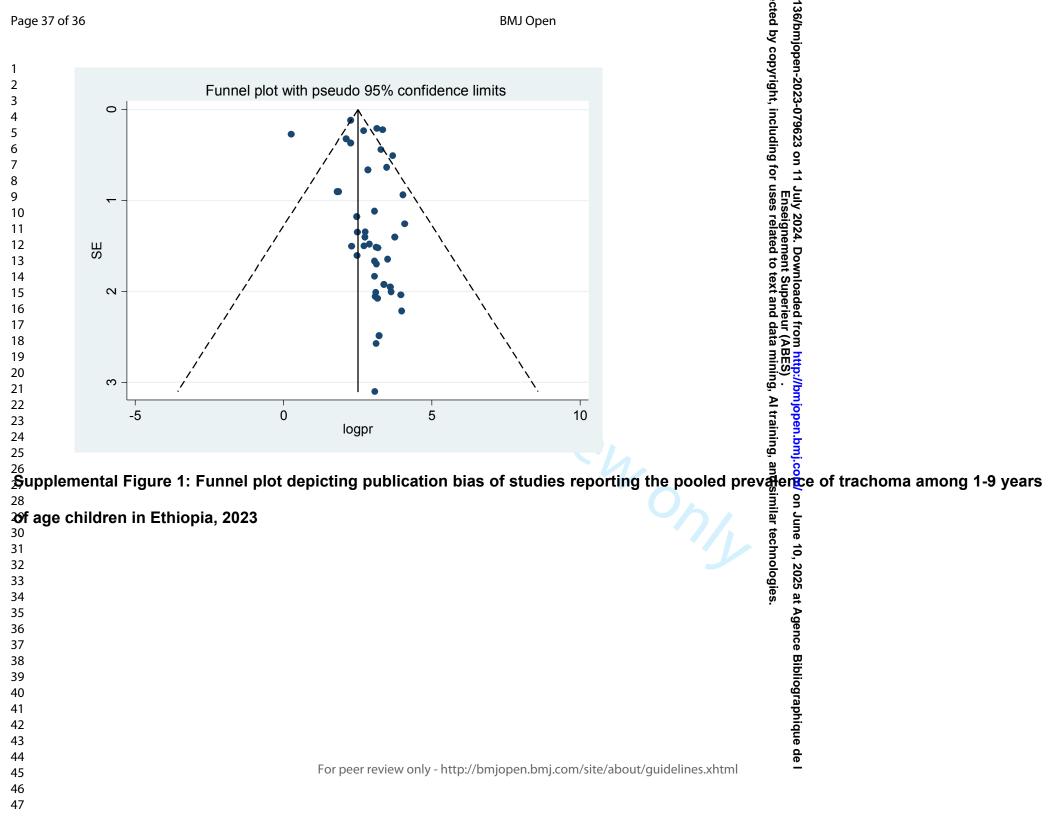
Page 33 of 36				RM1 Obe	en		<u>q</u> <u>p</u>	
Alemayehu et.al [34]	1	1	1	1	1	2	njopen-2	9
Anteneh et.al[17]	1	0	1	1	0	2	/bmjopen-2023-079623 on 11 d ხჯვიpyright, includ <u>ing</u> for	7
%Asres et.al[18]	1	1	1	1	1	2	23 on 11	8
%Assefa et.al[48]	1	1	0	1	1	2	July 2024 Enseign	7
B elsti et.al[53]	1	5,	1	1	1	2	July 2024. Downloaded from http://b Enseignement Superieur (ABES) . ાક્es related to text ત્રુnd data mining,	8
Bero et.al [40]	1	0	1	1	1	2	aded froi perieur (t त्वाd dat	8
18 Agrhane et.al[51] 20 21	1	1	17/-	1	1	2	n http://b ABES) . aூining,	9
21 Duale et.al [47] 23 24	1	1	1	1	1	2		8
Æjigu et.al[<u>54</u>] 26 27	1	1	1	1	1 1	2	mjopen.bmj.com/ on June Al training, and similar te	8
29 30	1	0	1	1	1	2		7
#erede et.al[20]	1	0	1	2	1	2	10, 2025 ഫ്രologi	8
36 37	1	0	1	0	1	2		7
37 Genet et.al [22] 39 40	1	0	1	1	1	2	e Bibliog	7
Golovaty et.al [23] 42 43	1	1	1	1	1	2	gence Bibliographique de I	8
44 45	Fo	r peer review only	- http://bm	ijopen.bm	nj.com/site/about/guideli	nes.xhtml	del	

BMI	Open	
כועוט	Open	

				ВМЈ Оре	en		136/bn	
Kassahun et.al[42]	1	1	1	1	1	2	mjopen-2023 თჯ-Çopyright	9
2 Kedir et.al[35]	1	0	1	1	0	2		7
Kemal et.al [41]	1	1	1	1	1	2	for 11	8
Kessete et.al [30]	1	1	0	1	1	2	July 2024 Enseigne uses relat	7
Ketema et.al[24]	1	0	1	1	1	2	2024. Downloaded fron eignement Superieur (<i>t</i> relat <u>ed</u> to text <u>a</u> nd data	7
Mehari et.al [36]	1	0	1	2	1	2	aded fror perieur (t and dat	8
18 Mekonnen et.al[15] 20 21	1	0	1/	1	0	2	http://b \BES) . Amining,	7
Mengistu et.al[37] 23 24	1	1	1	1	1	2	mjopen.ŀ ĄĮ traini	8
14esfin et.al [43] 26 27	1	1	0	1	1 1	2	omj.com/	7
Mesfin et.al[2] 29 30	1	1	1	1	1	2	on June i	8
Mohammed et.al[8]	1	0	1	1	1	2	10, 2025 : ხეologie	8
Negash et.al [46]	1	1	1	1	1	2	at Agenc	9
37 Nigussie et.al[25] 39 40	1	1	1	1	1	2	4 (9	8
Nigusu et.al [26] 42 43	1	1	1	1	1	2	Bibliographique	8
44 45	Fo	r peer review only	- http://bm	njopen.bn	nj.com/site/about/guideli	nes.xhtml	de l	

		BMJ Oper	า	on the pool gd prevalence of trac
ental Table 4: Univari	ate meta-regress	ion of factors related t	o the heterogeneity	on the pool gd prevalence of trac
ears of age children	in Ethiopia, 2023	3		:n-2023 ɔyright,
Variables	Coefficient	95% CI	P-value	
Year of Publication	-1.83	-2.54 to -1.10	0.00	.079623 or including
Region	1.23	-1.19-3.66	0.30	
Sample Size	000	00 to 0.00	0.49	July 2
				11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Age Enseignement Superieur (ABES) . or uses related to text and data mining, Al training, and similar technologies.





BMJ Open

Prevalence of active trachoma among 1-9 years of age children in Ethiopia: a systematic review and meta-analysis

Journal:	BMJ Open				
Manuscript ID	bmjopen-2023-079623.R1				
Article Type:	Original research				
Date Submitted by the Author:	20-Mar-2024				
Complete List of Authors:	Asgedom, Yordanos; Wolaita Sodo University, Epidemiology; Wolaita Sodo University Melaku , Tsegaye; Jimma University, Institute of Health Gebrekidan, Amanuel; Wolaita Sodo University, School of Public Health Meskele , Mengistu ; Wolaita Sodo University, School of Public Health Asnake, Gedeon; Hawassa University, Midwifery Alemu, Afework; Wolaita Sodo University, medicine Efa, Amelework; SNNPR, Medicine Haile, Kirubel; Wolaita Sodo University, Nursing Kassie, Gizachew ; Wolaita Sodo University				
Primary Subject Heading :	Ophthalmology				
Secondary Subject Heading:	Infectious diseases				
Keywords:	Systematic Review, Meta-Analysis, EPIDEMIOLOGY, Infection control < INFECTIOUS DISEASES, Public health < INFECTIOUS DISEASES, Paediatric ophthalmology < OPHTHALMOLOGY				

SCHOLARONE™ Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text

- Prevalence of active trachoma among 1-9 years of age children in Ethiopia: a
- systematic review and meta-analysis
- Yordanos Sisay^{1*}, Tsegaye Melaku² Amanuel Yosef³, Mengistu Meskele⁴, Gedeon
- Asnake 5, Afework Alemu 6, Amelework Gonfa 7, Kirubel Eshetu 8, Gizachew Ambaw 1
- ^{1,9} Department of Epidemiology, Wolaita Sodo University, SNNPR, Ethiopia
- Institute of Health, Jimma University, Oromia, Ethiopia
- ^{3, 4} Schools of Public Health, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing and Midwifery, Hawassa University, Sidama, Ethiopia
- 6,7 School of Medicine, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing, Wolaita Sodo University, SNNPR, Ethiopia
- *Correspondence:
- Corresponding Author
- yordusisay@gmail.com/yordanos.sisay@wsu.edu.et
- Keywords: Trachoma, Children, Systematic review, Meta-analysis, Ethiopia

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to

Abstract

- **Objective:** To determine the pooled prevalence of active trachoma among 1-9 years of
- children in Ethiopia.
- **Design:** A systematic review and meta-analysis was employed in accordance with the
- 25 Preferred Reporting Items for Systematic Reviews.
- Data sources: Medline/PubMed, Scopus, web of science, African journal of online (AJOL)
- 27 and Google scholar databases were systematically explored to find studies published in
- English until July 2023.
- 29 Eligibility criteria: The following criteria: (1) Condition (Co): Studies examined the
- prevalence of trachoma among children (1-9) years old; (2) Context (Co): Studies
- conducted in Ethiopia; (3) Population (Pop): Studies that were done among children (1-9
- years); (4) Study type: Observational studies; (5) Language: Studies published in English.
- 33 Data extraction and synthesis: The data was extracted using a Microsoft Excel
- 34 spreadsheet. DerSimonian-Laird Random effect model was used to estimate the pooled
- prevalence of active trachoma among 1-9 years of age children. Cochrane Q-test and I²
- 36 statistics were used across studies to assess heterogeneity. To identify possible
- publication bias Egger's test was performed.
- **Primary outcome:** Prevalence of active trachoma.
- **Results:** Overall, a total of forty-two articles with 235,005 study participants were included
- in the final analysis. The estimated pooled prevalence of active trachoma using random
- effect model was 24% (95% CI: 20-27%). The sub-group analysis by region revealed the
- 42 highest prevalence of trachoma was 36% (95% CI: 13-58%) in Tigray region and
- publication year revealed the prevalence of trachoma is decreasing from 32% to 19% after
- 44 2015.
- **Conclusion:** In this review, the pooled prevalence of active trachoma was found to be
- 46 high in Ethiopia compared to World health Organization (WHO) threshold level. This
- 47 underscores the need for increased focus on high-risk age groups to decrease trachoma
- and to achieve elimination of trachoma from the country by 2030.

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de

ata mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

Strength and Limitations of this study

- It follows the recommended updated PRISMA guidelines
- We also rigorously searched the literature in different databases and identified eligible studies.
- One limitation of this systematic review and meta-analysis is that it only includes cross-sectional studies that report the proportion of trachoma cases.
- This review have not assessed for associated factors.

Word count: 3285

Introduction

Globally, trachoma is the leading infectious cause of blindness. Trachoma has been named one of 20 neglected tropical diseases (NTD) by the World Health Organization (WHO) [1, 2]. Children are the primary reservoirs of infection. Children aged 1 to 9 years are more likely to have an active trachoma [3]. Due to their tendency for close contact with others, children are frequently infected with *Chlamydia trachomatis* [4].

The poorest of the poor are primarily affected by trachoma [5]. The WHO 2021 report shows that trachoma is responsible for 1.9 million people with blindness and visual impairment, moreover, approximately 125 million people live in trachoma-endemic areas worldwide[1]. Around 3.8 million cases of blinding trachoma and 27.8 million cases of active trachoma have been reported in Africa which is one of the most affected continents [6]. Ethiopia has the world's highest trachoma burden, with 76.2 million people living in endemic areas at risk of contracting the disease. Among Ethiopian children active trachoma is ranged from 10.3%[7] to 74.3% [8] . For children aged 1-9 years living in endemic areas the prevalence of Trachomatous inflammation-follicular (TF) <5% is the elimination target set by WHO(3), However, the prevalence in Ethiopian children is higher than the target. If TF is > =5% among children aged 1-9 years SAFE strategy which includes Antibiotics, Face washing, and Environmental Improvement (A, F, and E) is recommended [9]. Globally an estimated US\$ 8 billion in annual product loss is attributed to this disease [1].

Direct personal contact such as shared towels, flies, clothes, and fingers that interact with the infected person's eyes or nose is known for transmission of trachoma infection. The scarcity of safe drinking water access and sanitation systems has spread Chlamydia trachomatis infections. Corneal scarring and eyelid deformities can occur after inflammation and recurrent infections subsequently, if not treated and eyelid inversion (Entropion) and the lashes turn inward (trichiasis) occur as late complications. Trichiasis and permanent damage to the cornea frequently results in irreversible blindness [1].

Eliminating trachoma by 2020 through the implementation SAFE strategy (surgery for inturned eyelashes, antibiotics to clear the infection, and facial cleanliness and environmental improvement to reduce infection transmission) was set by the WHO and

other concerned organizations[1]. Ethiopia intended to eliminate trachoma through the SAFE strategy by implementing a national trachoma action plan in 2012 and implementing a second master plan for 2016 to 2020 [10, 11]. Despite significant development, trachoma elimination was not met by December 2020 and it was pushed back to 2030 to align with the Sustainable Development Goals (SDGs) [1].

Despite the fact that numerous studies have been conducted in Ethiopian children (1-9 years) to assess the prevalence of trachoma and systematic review and meta-analysis in 2019 [12]; Our reason for undergoing this systematic review and meta-analysis is many studies have been published since then and our study aimed to address specific Stastical limitations in the previous studies. As a result, this study aimed to deliver a comprehensive updated nationwide prevalence of trachoma infection among children, and geographical locations, and to assess the ongoing preventive and control measures impact in the country.

- Furthermore, the government and other concerned bodies may contribute by focusing on preventive measures such as improving access to water and sanitation specifically in areas of trachoma infection high prevalence.
- Research Question: What is the pooled prevalence of trachoma infection among children (1-9yrs) old in Ethiopia?

Methods

Reporting

We performed our analyses according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [13]. The article screening was based on the PRISMA 2020 statement, and the selection process has been shown using a PRISMA -P flow diagram. The finding is presented using the standard PRISMA checklist (Supplemental Table 1). The review protocol is not registered in PROSPERO.

Search Strategy and study identification

To estimate the prevalence of trachoma among children (1-9) years old in Ethiopia a systematic review and meta-analysis were performed. After an initial exploration of Google Scholar, MEDLINE, and SCOPUS with limited parameters, a follow-up search was conducted using all identified keywords and index terms across several databases including MEDLINE, PubMed, SCOPUS, Web of Science, and African journal online(AJOL). All studies conducted on trachoma Prevalence among children in Ethiopia were retrieved. The search included all articles published from database inception to July 31, 2023. English-language studies were only searched. Medical subject heading (MeSH) (((("Magnitude") OR "prevalence" OR "burden") AND "Trachoma") OR "Eye infection" OR "Trachomatous intense" OR "Trachomatous Follicular")) AND Ethiopia) were used in various combinations as the primary search keywords (Supplemental Table 2). During the systematic review and meta-analysis, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [13].

Eligibility Criteria

- We used condition, context, and population (CoCoPop) framework for the search and meta-analysis of eligibility criteria.
 - **Inclusion Criteria**
- The following criteria were used to include studies in this systematic review and metaanalysis.
 - Condition (Co): We include studies examined the prevalence of trachoma among children (1-9) years old.
 - Context (Co): Studies conducted in Ethiopia were included.
 - Population (Pop): Studies that were done among children (1-9 years).
 - Study type: Observational studies
 - Language: Studies published in English were included

We excluded studies other than children (1-9 years) as well as with different outcome of interest, qualitative studies, case reports, case series, review paper, conference proceedings and abstracts.

Outcome measurement

This study aimed to gather and analyze data from various studies conducted in Ethiopia to determine the pooled prevalence of Trachoma among children (1-9 years). We used a systematic approach to identify the relevant studies and extract data from them. Then we employ Stastical methods to combine the data from different studies to estimate the overall pooled prevalence of Trachoma among children (1-9 years) in Ethiopia. Prevalence of trachoma defined here as trachomatous inflammation follicular or Trachomatous inflammation intense among children was the major outcome of this review. We calculated the prevalence of trachoma in children by adjusting for the proportion of each age group (1-year increments) with active trachoma (TF) based on the local population distribution of 1-9 year-olds from the latest census data.

Data extraction and quality assessment

The Endnote citation manager (Version X8, for Windows, Thomson Reuters, Philadelphia, PA, USA) was used to import the retrieved studies and then duplicates were removed. Two independent reviewers screened all the articles for eligibility criteria. Reviewers began by screening the abstracts and titles, followed by full-text screening. The quality of the articles was assessed by using Newcastle-Ottawa Quality Assessment Scale (adapted for cross-sectional studies) [14]. Disagreements were resolved by a third investigator. The articles were critically appraised by the following criteria from the tool: Representativeness of the sample (1 score maximum), sample size (1 score maximum), non-respondent (1 score maximum), ascertainment of exposure (2 score maximum), Comparability of outcome based on study design (2 score maximum), outcome assessment (2 score maximum) and Statistical analysis (1 score maximum). All the included studies assessed through the tool with a score of ≥5 were included in this systematic review and meta-analysis (Supplemental Table 3). After quality rating no study was dismissed. During our quality assessment nineteen studies score eight, seventeen studies score seven, five studies

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

score nine and one study score six out of ten. Overall, the distribution of scores in your quality assessment indicates that the majority of studies were of good to high quality, with only a few studies showing lower scores. Two investigators used a standardized extraction format prepared in Microsoft Excel. The excel spreadsheet includes the name of the first author, publication year, study design, region, study area, gender, sample size, number of cases and trachoma prevalence.



Data was extracted in Microsoft Excel format and analyzed using STATA software version 16.0 (Stata Corp LLC, Texas, USA). We used forest plots to report the estimated pooled prevalence of the study with confidence interval (CI) to provide a visual summary of the data. Effect sizes were expressed as a proportion with 95% CI around the summary estimate. The data was first presented using narrative synthesis of the included studies. We assumed no, low, medium, and high heterogeneity across studies if the I² values were 0%, 25%, 50%, and 75%, respectively. A meta-analysis using a random effects model was performed to analyze the pooled prevalence with 95% confidence intervals (CI) since significant heterogeneity was detected between studies. The heterogeneity of each outcome measure was assessed using both X² and 1² statistics to determine dispersion. Meta-regression analysis was performed to investigate the source of heterogeneity. A Funnel plot and Egger's regression test was conducted to assess publication bias. In addition, a leave one-out sensitivity analysis to evaluate small study effect by excluding each study one at a time, the analysis was performed to assess the effect of each study on the pooled prevalence of trachoma and subgroup analysis was performed to ensure consistency of pooled results. Statistical significance was considered at p< 0.05.

Patient and public involvement

The public/patient was not involved in the design, conduct, reporting, or dissemination plans of this review.

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text and

Results

Search results

Our searching strategy initially identified 453 Articles and 340 duplicates were excluded by using the endnotes citation manager. Finally, 68 Studies were further excluded after reviewing the title and abstract and then 45 articles full text was reviewed for necessary criteria. Excluding three articles as they were not reported outcomes of interest; finally, 42 studies that fulfilled the inclusion criteria were considered for the final analysis to estimate the overall pooled prevalence of trachoma among children (1-9 years) in Ethiopia. (Figure 1) illustrates the process of the literature review, screening, and eligibility assessment of the study articles.

Included studies characteristics

A total of forty-two cross-sectional studies (235,006 children) were included in this systematic review and meta-analysis (**Supplemental Table 5**). The spanned publication period was from 2005 to 2023. The sample size of the included studies ranges from 178 [15] to 62869[16]. With regard to study sites, sixteen of the primary studies included from Amhara region [2, 16-30], nine from SNNPR region [31-39] and six studies included from Oromia [15, 40-42], three from Tigray [43-45] respectively. However, one study each reported from Afar[46], Somali[47], Harari[48], Diredawa [8], Gambela [49], BenshangulGumuz [50], and nationwide [51] (Table 1).

Table 1: Summary of 42 included studies on the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023.

	Publication						9 n or 11	
Author's	year	Region	Study Area	Sample	Male(n)	Female (n)	Mac of Cases(n)	Prevalence %
Abashawl et.al[49]	2016	Gambela	Region-wide	3238	NA	NA	202 sejgi s ræis	17.2
Adamu et.al[<u>50</u>]	2016	Benishangul Gumuz	Region-wide	7417	3212	4205	2024. Downloaded from http://b eignement/Superieur (ARES) (ਫ਼ੀਬਾਲੀ ਨਿਧਦxt and ਸ਼ੁਬਰਕਾnining	8.3
Adera et.al[31]	2016	SNNP	Region-wide	41,155	NA	NA	own totes	28.3
Admassu et.al[32]	2013	SNNP	Guragie	768	386	382	pade uperi	22.8
Admasu et.al[33]	2015	SNNP	Dawro	267	113	154	d fro eur (22.9
Alambo et.al[39]	2018	SNNP	Areka	586	317	269	22.25 25.25	37.9
Alemayehu et.al[<u>52</u>]	2015	Amhara	Dera	671	351	320	ip://b S) nifig	15.6
Alemayehu et.al [34]	2005	SNNP	Guragie	2788	NA	NA	1 3 3 3 3 3 3 3 3 3 3	56.5
Anteneh et.al[17]	2016	Amhara	Gazegibela	601	268	333		52.4
Asres et.al[18]	2016	Amhara	Gondar	586	285	301	en.bmj.com/	12.1
Assefa et.al[48]	2017	Harari	Harari	1722	804	918		1.3
Belsti et.al[<u>53</u>]	2021	Southwest	Lare	610	283	327	on Ju	21.6
Bero et.al[40]	2016	Oromia	Regionwide	41642	NA	NA	90 44 e 1	23.4
Brhane et.al[51]	2007	Nationwide	Nationwide	9289	NA	NA	10, 2025 a	40.1
Duale et.al[47]	2018	Somali	Region-wide	23620	11462	12158	025 a	15
Ejigu et.al[<u>54</u>]	2013	Southwest	Kersa	305	154	151	77 Ag	25.2
Emerson et.al[19]	2008	Amhara	Region wide	5485	NA	NA	1794 C	32.7
Ferede et.al[20]	2017	Amhara	Dembia	681	NA	NA	121 🗒	18.2
Gedefaw et.al[21]	2013	Amhara	Dangila	409	215	194	49 Ograp	12

⁻ 37			ВМЈ О	pen			36/bmj ted by	
							136/bmjopen-2023-079623 on 1 cted by copyright, ક્ષિcluર્સીing∯o	
Genet et.al [22]	2022	Amhara	Dangila	704	337	367	23-07 1t, Pac	6.1
Golovaty et.al[<u>23</u>]	2009	Amhara	Ankober	507	219	288	9623 2015	53.9
(assahun et.al[<u>42</u>]	2012	Oromia	Mojo	431	NA	NA	on 1	22.5
(edir et.al[<u>35]</u>	2020	SNNP	Silte	561	279	282	 	29.4
emal et.al[41]	2019	Oromia	Medawalebu	406	215	191	y 20; seig	22
(essete et.al[<u>30</u>]	2021	Amhara	Metema	752	352	400	24. D	11.8
(etema et.al[24]	2012	Amhara	Baso Liben	792	391	401	July 2024. Downloaded from http://t "Enseignement Superieur (ABES), . uses ælated tottektand aatanningg	24.1
lehari et.al [<u>36</u>]	2014	SNNP	Guragie	735	366	369	loade Super	6.4
lekonnen et.al[<u>15</u>]	2022	Oromia	Arsi Negele	178	93	85	ed from the second seco	21.91
lengistu et.al[<u>37]</u>	2016	SNNP	Zala	611	286	325	A ABL	36.7
lesfin et.al[<u>43</u>]	2006	Tigray	Regionwide	1526	NA	NA	ings://	59.2
lesfin et.al[2]	2005	Amhara	Ebinet	1244	601	643	3≥ 7 3 .	42.4
Iohammed et.al[<u>8</u>]	2005	Diredawa	Goro	826	438	388	mjopen.bmj.com/	33.7
legash et.al[<u>46]</u>	2018	Afar	Regionwide	6339	NA	NA		9.6
ligussie et.al[25]	2015	Amhara	Gonji Kolella	618	353	265	200 200	23.1
ligusu et.al[<u>26</u>]	2022	Amhara	Tarimaber	736	380	356	on June 1	15.8
Oswald et.al[<u>16</u>]	2017	Amhara	Region wide	62869	NA	NA	a une	9.6
Reda et.al[44]	2020	Tigray	Deguatemben	502	257	245	10, 2025 http://www.new.new.new.new.new.new.new.new.new.	21.5
Sadik et.al[45]	2016	Tigray	Regionwide	10023	NA	NA	025 a	26.7
Shiferaw et.al[27]	2013	Amhara	Makisegnit	420	209	211	100 Age	23.8
Shimelash et.al[28]	2022	Amhara	Debretabor	394	70	324	39 Ce	9.9
adesse et.al[29]	2017	Amhara	Wollo	1358	638	720	293 💆	21.6
Voldekidan et.al[38]	2019	SNNP	Lemo	574	NA	NA	87 87 e e e	15.2

The pooled prevalence estimates of trachoma among children in Ethiopia

The pooled prevalence of trachoma among children (1-9 years) in Ethiopia was identified in 42 studies, from a total of 235,006 children, 45,711 children were infected with trachoma. Stastically significant heterogeneity was observed ($I_{=}^{2}$ 99.8%); p<0.0001). There we used random effect model to estimate the pooled prevalence of trachoma among children (1-9 years) which was 24.01 %(95% CI: 20.67-27.40%) (Figure 2).

Subgroup analysis

To identify the potential source of heterogeneity, a subgroup analysis was executed based on study area (region) and publication year. Based on the subgroup analysis by study are (region) of Ethiopia the highest prevalence of trachoma was reported in Tigray region 35.81 (95% CI: 13.84-57.78) and followed by SNNP where 28.98 (20.14-37.82). According to subgroup analysis by publication year the pooled prevalence of trachoma among children was significantly different 32.53% (95%CI: 24.32-40.76) and 19.93% (95% CI: 16.35-23.51) before 2015 and since 2015 (Table 2).

Table 2: Subgroup-analysis on the pooled prevalence of trachoma infection among children (1-9 years) in Ethiopia, 2023

Subgroups	Number of studies	Prevalence (95%CI)	l ²	P-value	<u>}</u>
Regions					
Amhara	16	23.02(16.7,29.31)	59.5	0.001	
SNNPR	10	28.58 (20.14,37.82)	99.5	0.001	
Oromia	6	23.36(22.96,23.75)	0.00	0.107	
Tigray	3	35.81(13.84,57.78)	59.7	0.100	
Others	7	15.29(7.33,23.26)	59.9	0.600	
Over all	42	24.01(20.61,27.40)		59.8	0.0
Publication	year	6			
>= 2015	28	19.71(16.27,23.15)	99.8	0.001	
<2015	14	32.53(24.31,40.76)	99.5	0.001	
Over all	42	24.01(20.61,27.40)		59.8	0.00
The funnel p statistically s publications (Supplemen studies inclu	supported by Egger's to in a large inverted fun tal Figure 1). The Egg	ed to assess potential public est. The symmetrical distrik anel indicated the absence per tests revealed no public pooled prevalence of trach	oution of the of a publication bias	e included cation bias among the	
Meta-Rec	ression				

Publication bias assessment

Meta-Regression

region and sample size were considered. The analysis revealed a significant correlation between the pooled prevalence of trachoma among children (1-9 years) and publication year (P<0.001) but no significant correlation with sample size and region (Supplemental Table 4).

Sensitivity analysis

By excluding each study individually, a leave-out-one sensitivity analysis was used to determine the effect of a single study on pooled prevalence of trachoma among children (1-9 years) in Ethiopia. Our finding revealed no single study had a significant impact on the pooled prevalence of trachoma among children (1-9 years) in Ethiopia (Figure 3).

Discussion

- The purpose of this systematic review and meta-analysis is to append national data on the prevalence of trachoma infection among Ethiopian children to eliminate the disease. Although different studies from different regions have been published in the country, the data on trachoma infections have to be organized and updated every time. Therefore, updating the information has the potential to inform and help develop different strategies by targeting highly endemic areas.
 - The pooled overall prevalence of Trachoma (24.01 %) observed in the current review is comparable with a study from Colombia [55], but higher than the study done in the Democratic Republic of Congo [56], Nigeria [57], Uganda [58], Brazil [59], Kenya [60]. This prevalence is lower than studies from South Sudan [61] and Guinea [62]. The disparity among the findings might be due to environmental factors such as the level of participants' hygiene, sanitation, Access to functional latrines, and clear water supply, and recent studies were included in our review that reported ongoing Sustainable water, sanitation, and hygiene (WASH) program and Mass drug administration (MDA) with Azithromycin which might reduce trachoma prevalence among children in Ethiopia, unlike the South Sudan study which lacks MDA and targeted SAFE strategy [61].

The Subgroup analysis of this review also shows a statistically significant (p=0.01) difference among regions. Trachoma was highly prevalent in Tigray and SNNP followed by Oromia and Amhara regions. Trachoma infection is related to inadequate hygiene, low standard of living, inadequate access to water, and inadequate access to sanitation use. In the Tigray region trachoma prevalence is high which might also be related to extreme climatic events which favor a decline in water availability during dry periods which affects personal hygiene. Another reason for the difference is attributed to baseline and intervention disparity in the communities. MDA with Azithromycin once yearly is needed based on review finding (24%) and Ethiopia is known to require intervention based on WHO 2021 report(1).

Though the decline is not statistically significant (p=0.30) our result from this review revealed studies conducted between 2005-2014 and 2015-2022 show decrement on the prevalence of trachoma from 32 to 19%. The expansion of MDA and WASH programs might be attributed to the decrease in the prevalence. This is review has an implication revealing the national burden of trachoma infection among children, who are a special population accounted for one third of the national population. Moreover, this large magnitude of trachoma infection show significant gap in the implementation of devised WHO and national elimination strategies. Last but not least, from research perspective we recommend to conduct operational studies on the topic.

This review adhered to the PRISMA guidelines and conducted a thorough literature search across multiple databases to identify relevant studies. While the meta-analytic methods employed were robust, caution is advised when interpreting the findings due to the study's limitations. Significant heterogeneity was observed in Trachoma prevalence across regions, potentially influenced by factors such as publication year and sample size.

An effort has been made to eliminate, trachoma infection is still highly prevalent across the Ethiopian regions. Even though the decline is not statistically significant we saw decreased trachoma prevalence in Ethiopian children. Trachoma is highly prevalent in Tigray followed by SNNP. Moreover, trachoma remains a significant public health concern among adults in Ethiopia. The prevalence of trachoma in this population is alarmingly high, highlighting the urgent need for continued efforts to improve access to clean water, sanitation, and hygiene practices. Despite the effort made by the country to eliminate Trachoma infection, According to WHO risk classification, it remains a public health problem in the country. The output of this review will offer valuable data to the Ministry of Health, policymakers, and concerned bodies which work on eliminating trachoma infection in the country. Trachoma infection is highly prevalent based on this review and it underlines the need for improved prevention and control strategies for one of the Neglected tropical diseases in Ethiopia.

- List of Abbreviations CI: Confidence interval; NTD: Neglected tropical disease;
- PRISMA: Preferred reporting items for systematic review and meta-analysis; SAFE:
- Surgery for Trichiasis, Antibiotics, Face Washing and Environmental improvement
- strategy; SDG: Sustainable development goal; SNNPR: South Nation and Nationalities
- people; WHO: World Health Organization.
- Acknowledgment: We are indebted to all the researchers whose studies were included
- in this study.
- Contributors: Conceptualization: YSA, TMK, GAK; Data curation: YSA, TMK, GAK,
- MMK, AYG; Investigation: YSA, AAL, AGE; Methodology: YSA, TMK, GAK, KEH;
- Software: YSA, GAK, TMK; Validation: YSA, MMK, GAK, AYG; Writing: YSA, TMK,
- GAK; Writing review and editing: All the authors read and approve the manuscript.
- Funding: No specific funding for this work has been received by the authors
- Competing interest: The review was conducted without any personal or financial
- relationship that could lead to conflict.
- Patient consent for publication: Not applicable

Data Availability: All associated data and supporting information are included in this systematic review and meta-analysis.

Reference

- 356 1. Organization) WWH. Trachoma. Factsheet Switherland, Geneva 2022.
- 2. Mesfin A. Assessing the prevalence of active trachoma among young children in relation to the implementation of SAFE strategy in Ebinat and East Belesa Woreda, Northwest Ethiopia: Addis Ababa University; 2005.
- 360 3. Solomon AW, Organization WH, Initiative IT. Trachoma control: a guide for programme managers: World Health Organization; 2006.
- 4. Center C. Women and trachoma: Achieving gender equity in the implementation of SAFE. The Carter Center. 2009.
- 5. Habtamu E, Wondie T, Aweke S, Tadesse Z, Zerihun M, Zewdie Z, et al. Trachoma and relative poverty: a case-control study. PLoS neglected tropical diseases. 2015;9(11):e0004228.
- Smith JL, Flueckiger RM, Hooper PJ, Polack S, Cromwell EA, Palmer SL, et al. The
 geographical distribution and burden of trachoma in Africa. PLoS neglected tropical diseases.
 2013;7(8):e2359.
- 7. Basha GW, Woya AA, Tekile AK. Prevalence and risk factors of active trachoma among primary school children of Amhara Region, Northwest Ethiopia. Indian Journal of Ophthalmology. 2020;68(5):750.
- 8. Mohamed H, Weldegebreal F, Mohammed J, Gemechu A. Trachoma and Associated Factors among School Age Children 4-9 Years in Dire Dawa Administration, Eastern Ethiopia. East African Journal of Health and Biomedical Sciences. 2019;3(2):45-54.
- 9. Organization WH. WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2018. Weekly epidemiological record. 2019;94(29):317-28.
- 10. (MOH) FMoH. Second edition of Neglected Tropical Diseases Master Plan 2015/2016.
 379 Addis Ababa, Ethiopia 2016.
- 380 11. Abebe TA, Tucho GT. The impact of access to water supply and sanitation on the 381 prevalence of active trachoma in Ethiopia: A systematic review and meta-analysis. PLoS 382 Neglected Tropical Diseases. 2021;15(9):e0009644.
- 383 12. Gebrie A, Alebel A, Zegeye A, Tesfaye B, Wagnew F. Prevalence and associated factors 384 of active trachoma among children in Ethiopia: a systematic review and meta-analysis. BMC 385 infectious diseases. 2019;19:1-12.
- 13. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International journal of surgery. 2021;88:105906.
- 389 14. Modesti P, Reboldi G, Cappuccio F. Newcastle-Ottawa Quality Assessment Scale 390 (adapted for cross sectional studies). PLoS One. 2016;11(1):e0147601.
- 391 15. Mekonnen J, Kassim J, Ahmed M, Gebeyehu N. Prevalence of active trachoma and associated factors among children 1–9 years old at Arsi Negele Town, West Arsi Zone, Oromia
- Regional State, Southern Ethiopia. Plos one. 2022;17(10):e0273808.

- Oswald WE, Stewart AE, Kramer MR, Endeshaw T, Zerihun M, Melak B, et al. Active trachoma and community use of sanitation, Ethiopia. Bulletin of the World Health Organization. 2017;95(4):250.
- Anteneh ZA, Getu WY. Prevalence of active trachoma and associated risk factors among 17. children in Gazegibela district of Wagehemra Zone, Amhara region, Ethiopia: community-based cross-sectional study. Tropical diseases, travel medicine and vaccines. 2016;2(1):1-7.
- Asres M, Endeshaw M, Yeshambaw M, Muluken A. Prevalence and risk factors of active trachoma among children in Gondar Zuria District North Gondar, Ethiopia. Prev Med. 2016;1(1):5.
- Emerson PM, Ngondi J, Biru E, Graves PM, Ejigsemahu Y, Gebre T, et al. Integrating an 19. NTD with one of "the big three": combined malaria and trachoma survey in Amhara Region of Ethiopia. PLoS neglected tropical diseases. 2008;2(3):e197.
- Ferede AT, Dadi AF, Tariku A, Adane AA. Prevalence and determinants of active trachoma among preschool-aged children in Dembia District, Northwest Ethiopia. Infectious diseases of poverty. 2017;6(1):1-7.
- Gedefaw M, Shiferaw A, Alamrew Z, Feleke A, Fentie T, Atnafu K. Current state of active trachoma among elementary school students in the context of ambitious national growth plan: The case of Ethiopia. Health. 2013;2013.
- Genet A, Dagnew Z, Melkie G, Keleb A, Motbainor A, Mebrat A, et al. Prevalence of active trachoma and its associated factors among 1–9 years of age children from model and non-model kebeles in Dangila district, northwest Ethiopia. Plos one. 2022;17(6):e0268441.
- Golovaty I, Jones L, Gelave B, Tilahun M, Belete H, Kumie A, et al. Access to water source, latrine facilities and other risk factors of active trachoma in Ankober, Ethiopia. PLoS One. 2009;4(8):e6702.
- Ketema K, Tiruneh M, Woldeyohannes D, Muluye D. Active trachoma and associated risk factors among children in Baso Liben District of East Gojjam, Ethiopia. BMC public health. 2012;12(1):1-7.
- Nigusie A, Berhe R, Gedefaw M. Prevalence and associated factors of active trachoma 25. among childeren aged 1–9 years in rural communities of Gonji Kolella district, West Gojjam zone, North West Ethiopia. BMC research notes. 2015;8(1):1-9.
- 26. NIGUSU B. PREVALENCE OF CLINICALLY ACTIVE TRACHOMA AND **ASSOCIATED FACTORS AMONG** ONE-TO-NINE-YEAR-OLD **CHILDREN** TARMABER DISTRICT, AMHARA REGION, ETHIOPIA 2022.
- Shiferaw D, Moges HG. Risk factors for active trachoma among children aged 1-9 years in Maksegnit town, Gondar Zuria District, Northwest Ethiopia. Risk. 2013;2(3):202-6.
- Shimelash A, Alemayehu M, Dagne H, Mihiretie G, Lamore Y, Tegegne E, et al. Prevalence of active trachoma and associated factors among school age children in Debre Tabor
- Town, Northwest Ethiopia, 2019: a community based cross-sectional study. Italian Journal of Pediatrics. 2022;48(1):1-9.
- Tadesse B, Worku A, Kumie A, Yimer SA. The burden of and risk factors for active 29. trachoma in the North and South Wollo Zones of Amhara Region, Ethiopia: a cross-sectional
- study. Infectious diseases of poverty. 2017;6(1):1-12.
- Ayelgn K, Guadu T, Getachew A. Low prevalence of active trachoma and associated
- factors among children aged 1-9 years in rural communities of Metema District, Northwest
- Ethiopia: a community based cross-sectional study. Italian Journal of Pediatrics. 2021;47(1):1-8.

- Adera TH, Macleod C, Endrivas M, Dejene M, Willis R, Chu BK, et al. Prevalence of and risk factors for trachoma in Southern Nations, Nationalities, and Peoples' Region, Ethiopia:
- results of 40 population-based prevalence surveys carried out with the Global Trachoma
- Mapping Project. Ophthalmic epidemiology. 2016;23(sup1):84-93.
- Admassu F, Bayu S, Bejiga A, Amare B. Active trachoma two years after three rounds of
- azithromycin mass treatment in Cheha district Gurage zone, Southern Ethiopia. BMC pediatrics.
- 2013;13:1-5.
 - 33. Admasu W, Hurissa B, Benti A. Prevalence of trachoma and associated risk factors
 - among Yello elementary school students. Loma Woreda, Dawro zone, Ethiopia J Nurs Care.
 - 2015;1:2167.
 - 34. Alemayehu W, Melese M, Fredlander E, Worku A, Courtright P. Active trachoma in
 - children in central Ethiopia: association with altitude. Transactions of the Royal Society of
 - Tropical Medicine and Hygiene. 2005;99(11):840-3.
 - Kedir S, Lemnuro K, Yesse M, Abdella B, Muze M, Mustefa A, et al. Prevalence and
 - Factors Associated with Active Trachoma among Children 1-9 years of Age in the Catchment
 - Population of Tora Primary Hospital, Silte zone, Southern Ethiopia, 2020. The Open
 - Ophthalmology Journal. 2021;15(1).
 - Mehari ZA. Pattern of childhood ocular morbidity in rural eye hospital, Central Ethiopia.
 - BMC ophthalmology. 2014;14(1):1-6.
 - Mengistu K, Shegaze M, Woldemichael K, Gesesew H, Markos Y. Prevalence and 37.
 - factors associated with trachoma among children aged 1-9 years in Zala district, Gamo Gofa
 - Zone, Southern Ethiopia. Clinical Ophthalmology. 2016:1663-70.
 - WoldeKidan E, Daka D, Legesse D, Laelago T, Betebo B. Prevalence of active trachoma 38.
 - and associated factors among children aged 1 to 9 years in rural communities of Lemo district,
 - southern Ethiopia: community based cross sectional study. BMC infectious diseases. 2019;19:1-8.
 - Alambo MM, Lake EA, Bitew Workie S, Wassie AY. Prevalence of active trachoma and associated factors in Areka Town, south Ethiopia, 2018. Interdisciplinary Perspectives on
 - Infectious Diseases. 2020;2020.
 - Bero B, Macleod C, Alemayehu W, Gadisa S, Abajobir A, Adamu Y, et al. Prevalence of
 - and risk factors for trachoma in Oromia regional state of Ethiopia: results of 79 population-based prevalence surveys conducted with the global trachoma mapping project. Ophthalmic
 - epidemiology. 2016;23(6):392-405.
 - Kassim K, Kassim J, Aman R, Abduku M, Tegegne M, Sahiledengle B. Prevalence of
 - active trachoma and associated risk factors among children of the pastoralist population in
 - Madda Walabu rural district, Southeast Ethiopia: a community-based cross-sectional study.
 - BMC infectious diseases. 2019;19(1):1-7.
 - Yalew KN, Mekonnen MG, Jemaneh AA. Trachoma and its determinants in Mojo and 42.
 - Lume districts of Ethiopia. The Pan African Medical Journal. 2012;13(Suppl 1).
 - Mesfin MM, de la Camera J, Tareke IG, Amanual G, Araya T, Kedir AM. A community-
 - based trachoma survey: prevalence and risk factors in the Tigray region of northern Ethiopia.
 - Ophthalmic epidemiology. 2006;13(3):173-81.
 - Reda G, Yemane D, Gebrevesus A. Prevalence and associated factors of active trachoma
 - among 1-9 years old children in Deguatemben, Tigray, Ethiopia, 2018: community cross-
 - sectional study. BMC ophthalmology. 2020;20(1):1-9.

- 488 46. Negash K, Macleod C, Adamu Y, Ahmed M, Ibrahim M, Ali M, et al. Prevalence of 489 trachoma in the Afar Region of Ethiopia: results of seven population-based surveys from the 490 Global Trachoma Mapping Project. Ophthalmic epidemiology. 2018;25(sup1):3-10.
- 491 47. Duale AB, Negussu Ayele N, Macleod CK, Kello AB, Eshetu Gezachew Z, Binegdie A, et al. Epidemiology of trachoma and its implications for implementing the "SAFE" strategy in Somali Region, Ethiopia: results of 14 population-based prevalence surveys. Ophthalmic epidemiology. 2018;25(sup1):25-32.
- 48. Assefa N, Roba AA, Abdosh T, Kemal J, Demissie E. Prevalence and factors associated with trachoma among primary school children in Harari region, eastern Ethiopia. Ophthalmology Research: An International Journal. 2017;7(3):OR. 37212.
- 498 49. Abashawl A, Macleod C, Riang J, Mossisa F, Dejene M, Willis R, et al. Prevalence of trachoma in Gambella Region, Ethiopia: results of three population-based prevalence surveys conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2016;23(sup1):77-83.
- 502 50. Adamu Y, Macleod C, Adamu L, Fikru W, Kidu B, Abashawl A, et al. Prevalence of 503 trachoma in Benishangul Gumuz Region, Ethiopia: results of seven population-based surveys 504 from the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):70-6.
- 505 51. Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedri A, et al. National survey 506 on blindness, low vision and trachoma in Ethiopia: Methods and study clusters profile. Ethiopian 507 Journal of Health Development. 2007;21(3):185-203.
- 508 52. Alemayehu M, Koye DN, Tariku A, Yimam K. Prevalence of active trachoma and its associated factors among rural and urban children in Dera Woreda, Northwest Ethiopia: a comparative cross-sectional study. Biomed research international. 2015;2015.
- 53. Belsti Y, Fekadu SA, Assem AS. Active trachoma prevalence and its associated factors among children aged 1-9 years in rural residents of Lare District, Southwest Ethiopia. International Journal of Ophthalmology. 2021;14(11):1756.
- 54. Ejigu M, Kariuki MM, Ilako DR, Gelaw Y. Rapid trachoma assessment in kersa district, Southwest Ethiopia. Ethiopian journal of health sciences. 2013;23(1):1-9.
- 55. Miller HA, López de Mesa CB, Talero SL, Meza Cárdenas M, Ramírez SP, Moreno-Montoya J, et al. Prevalence of trachoma and associated factors in the rural area of the department of Vaupés, Colombia. Plos one. 2020;15(5):e0229297.
- 519 56. Kilangalanga J, Ndjemba JM, Uvon PA, Kibangala FM, Mwandulo J-LSB, Mavula N, et 520 al. Trachoma in the Democratic Republic of the Congo: results of 46 baseline prevalence surveys 521 conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology.

522 2018;25(sup1):192-200.

- 57. Alada JJ, Mpyet C, Florea VV, Boisson S, Willis R, Bakhtiari A, et al. Prevalence of Trachoma in Kogi State, Nigeria: results of four local government area-level surveys from the global trachoma mapping project. Ophthalmic epidemiology. 2018;25(sup1):33-40.
- 526 58. Baayenda G, Mugume F, Turyaguma P, Tukahebwa EM, Binagwa B, Onapa A, et al.
- Completing Baseline Mapping of Trachoma in Uganda: Results of 14 Population-Based
- 528 Prevalence Surveys Conducted in 2014 and 2018. Ophthalmic epidemiology.
- 529 2018;25(sup1):162-70.

P	a	g
1 2 3 4 5 7		
8		
9		
1	0	
1		
	3	
	4	
1	5	
	6	
1		
	8	
	9 0	
2		
2	2	
	3	
	4	
	5	
2	6	
2	7	
	8	
	9	
	0	
3		
	2	
	3 4	
	4 5	
	6	
3		
	8	
3	9	
4		
4		
4		
4		
4		
4 4		
4		
4		

- Brito CMGd, Medeiros ZMd, Barbosa CC, Montarroyos UR, Ferraz C, Vieira MdT, et al. Prevalence of trachoma in Pernambuco State, Brazil (2014-2015). Revista do Instituto de Medicina Tropical de São Paulo. 2021;63.
 - Nasieku L, Mutai J, Muthami L, Karanja S. Determinants of active trachoma among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County, Kenya. African Journal of Health Sciences. 2017;30(2):77-86.
 - Edwards T, Smith J, Sturrock HJ, Kur LW, Sabasio A, Finn TP, et al. Prevalence of trachoma in Unity State, South Sudan: results from a large-scale population-based survey and potential implications for further surveys. PLoS neglected tropical diseases. 2012;6(4):e1585.
 - Géopogui A, Badila CF, Baldé MS, Nieba C, Lamah L, Reid SD, et al. Baseline trachoma prevalence in Guinea: Results of national trachoma mapping in 31 health districts. PLoS neglected tropical diseases. 2018;12(6):e0006585.

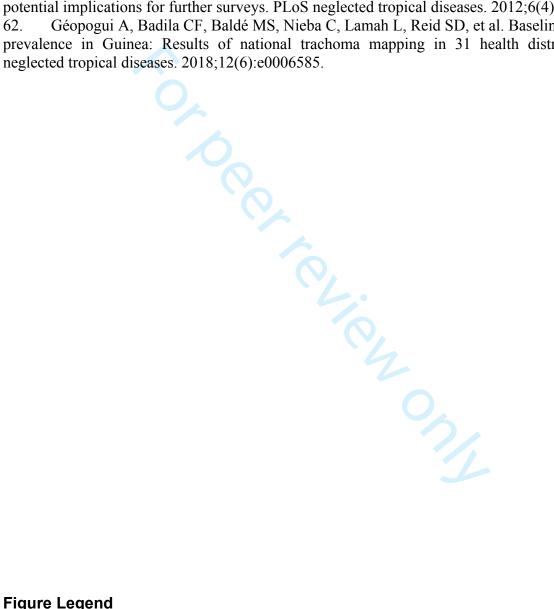


Figure Legend

ining, Al training, and similar technologies

Protected by copyright, including for uses related to text

Figure 1- PRISMA flow diagram of screened articles and the selection process of studies on pooled prevalence of trachoma infection among 1-9 years of age children in Ethiopia 2023.

- Figure 2- Forest plot depicting pooled prevalence of trachoma among 1-9 years of age children in Ethiopia 2023.
- Figure 3- Leave-one sensitivity analysis on the studies included in the pooled oma amo. prevalence of trachoma among 1-9 years of age children in Ethiopia 2023.



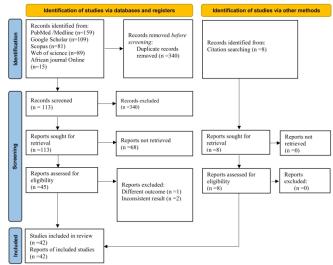


Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on pooled prevalence of trachoma infection among 1-9 years of any children in Ethionic 2022

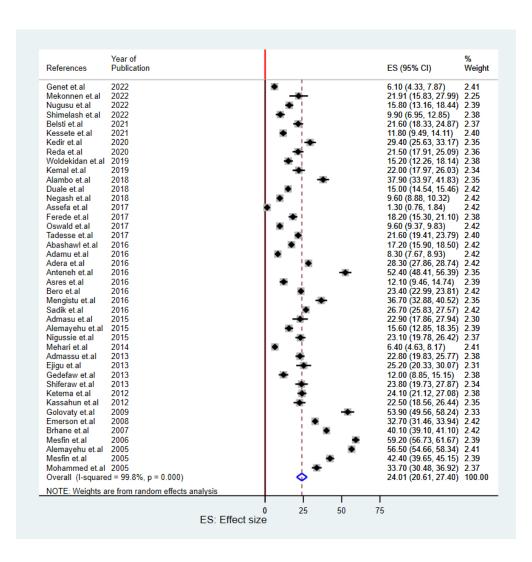
Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

297x210mm (300 x 300 DPI)

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de l Enseignement Superieur (ABES)

, Al training, and similar technologies

Protected by copyright, including for uses related to text and data mining,



290x295mm (72 x 72 DPI)

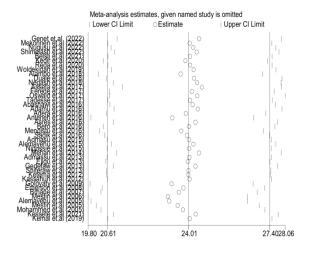


Figure 3. Leave-one sensitivity analysis on the studies included in pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023

Figure 3 Leave one sensitivity analysis on the studies included in the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

215x279mm (300 x 300 DPI)



Supplemental Table 1: PRISMA 2020 Checklist

		rigi 20	
Section and Topic	Item #	Checklist item	Location where iter is reporte
TITLE		iding 23 o	
Title	1	Identify the report as a systematic review.	1
ABSTRACT		# J	
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION		reig eig	
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	3-4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	6
METHODS		t S t S	
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	7
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consultable dentify studies. Specify the date when each source was last searched or consulted.	6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many were screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each poor whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of stomation tools used in the process.	7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presedation of results.	15
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study better the next the planned groups for each synthesis (item #5)).	8
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing semmery statistics, or data conversions.	7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	7
, ,	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	9
)	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analyse, meta-regression).	15
,	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	16
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biase).	15
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	14



PRISMA 2020 Checklist

age 29 of 37		BMJ Open ad I					
PRIS	SMA 2	by copyrig					
Section and Topic	Item #	Checklist item Checklist item	Location where item is reported				
RESULTS		<u>La B23</u>					
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the review, ideally using a flow diagram.	10				
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they we first excluded.	10				
Study characteristics	17	Cite each included study and present its characteristics.	10				
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	8				
Results of individual studies	ividual studies (e.g. confidence/credible interval), ideally using structured tables or plots.						
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	8				
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary at reach and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the confidence of	9				
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	9				
,	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	16				
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assess.	9				
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	9				
DISCUSSION		9, 3					
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	17				
3	23b	Discuss any limitations of the evidence included in the review.	18				
	23c	Discuss any limitations of the review processes used.	18				
)	23d	Discuss implications of the results for practice, policy, and future research.	18				
OTHER INFORMA	1	Describe assistantian information for the providence in abustical providence and a sixtentian information for the providence in abustical providence and a sixtentian information for the providence in abustical providence in a sixtentian information for the providence in abustical providence in a sixtentian information for the providence in a sixtentian information for the providence in a sixtentian information for the providence in a sixtentian for the providence in a sixtentian information in a sixtentian in a sixtentian information in a sixtentian information in a sixtentian information in a sixtentian information in a sixtentian in a sixtentian information in a sixtentian information in a sixtentian information in a sixtentian information in a sixtentian in a sixtentian information in a sixtentian information in a sixtentian information in a sixtentian in a sixtenti	18				
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	11				
Frederick	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	11				
	24c	2000 in a cripiani any amonamente te information provides at regionation of in the proceed.					
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	13				
Competing interests	26	Declare any competing interests of review authors.	13				
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	13				

42
43 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

		BMJ Open	cted by conv	Page 30 of 37
1	Supplemental Table 2: Search Strategy Summary		i con	
2		4	onvrigh	
3	Period search was conducted	20 May 2023 to 20 June 2023	;	
5	Inclusion	Cross sectional study	cludi	
6	criteria	Studies published until 31 July 2023	goza on	5
7		Studies conducted in Ethiopia.		
9		Children (1-9 years)	Б Ш С	-
10		Published in the English Language.	nse nse	5
11		 Studies reported the prevalence of Trachon 		
12	ZX61G61611	Case reports	and in	
13 14	criteria	case series		
15		review articles	Sup	3
16		letters to editors	erie	
17	Libraries	Worldwide	<u> </u>	
18	Records identified from secondary databases, Google	("magnitude"[All Fields] OR "magnitudes"[All Colors of the All Col		
20	scholar	Subheading] OR "epidemiology"[All Fields		
21		"prevalence"[MeSH Terms] OR "prevalance"[Agon		
22		OR "prevalents"[All Fields] OR ("burden"[All		
23 24		"burdening"[All Fields] OR "burdens"[All Fields		
25		"epidemiology"[MeSH Subheading] OR		pidemiology"[All Fields] OR
26		"epidemiology"[MeSH Terms] OR "epidemiology"	en	iology s"[All Fields])) AND
27		("trachoma"[MeSH Terms] OR "trachoma"[All I		
28 29		("eye infections"[MeSH Terms] OR ("eye"[All F		
30		"eye infections"[All Fields] OR ("eye"[All Fields	A	ND "infection"[All Fields]) OR "eye
31		infection"[All Fields]) OR ("Trachomatous"[All	Fie	ds] AND ("intense"[All Fields] OR
32		"intense		.
33 34		ly"[All Fields] OR "intensities"[All Fields] OR "in		
35		Fields])) OR ("Trachomatous"[All Fields]		
36		("Ethiopia"[MeSH Terms] OR "Ethiopia"[All Field	usjų	PR Ethiopia's [All Fleids])
37			e D	
38 39				
40			ibilographique	
41			apn	5 5
42			ģ	
43			9))

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Page 31 of 37

Supplemental Table 3: Methodological quality assessment of included studies using the Newcastle-Ottawa quality assessment scale

Study	Selection				Comparability	Outcome	2023-0	
	Representat iveness of the sample	Sample size	Non respo ndent s	Asce rtain ment of the expo sure (max imu m scor e=2)	The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled((maximum score=2))	Assess ment of the outcom e(maxi mum score=2)	ອ ອ 3.	Total(10)
Abashawl et.al[49]	1	0	0	10	0			6
Adamu et.al[<u>50</u>]	1	1	1	1	1	2 g, and	.bmj.com/	8
Adera et.al[31]	1	0	1	1	1	2 2 2 2 2	on June	7
Admassu et.al[32]	1	0	1	2	1	2	10, 2025	8
Admasu et.al[33]	1	0	1	0	1	2	at Agence Bib	7
Alambo et.al[39]	1	0	1	1	1	2	e Bibliog	7
Alemayehu et.al[52]	1	1	1	1	1	2	liographique	8
Alemayehu et.al [34]	1 Fo	1 r peer review only	1 - http://bm	1 jopen.bm	1 j.com/site/about/guideline	2 s.xhtml	2de I	9

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

3 of 37				ВМЈ Ор	oen		136/bi	
Kedir et.al[<u>35</u>]	1	0	1	1	0	2	mjopen-2 Oy copyri	7
Kemal et.al[<u>41</u>]	1	1	1	1	1	2	miopen-2023-079623 on 1	8
Kessete et.al[<u>30</u>]	1	1	0	1	1	2	23 on 11 1 ding for	7
Ketema et.al[24]	1	0	1	1	1	2	July 2024 Enseigne uses relat	7
Mehari et.al [36]	1	0	1	2	1	2		8
Mekonnen et.al[15]	1	0	5 1	1	0	2	Downloaded fror ment Susserieur () of to text and dat	7
Mengistu et.al[37]	1	1	1	1	1	2	m http://b (ABES) . ta mining,	8
Mesfin et.al[43]	1	1	0	1	1	2	njopen.k 1 Al traini	7
Mesfin et.al[2]	1	1	1	1	1	2	mj.com/ 1 1g, and s	8
Mohammed et.al[8]	1	0	1	1	1	2	on June 2 milar tec	8
Negash et.al[<u>46</u>]	1	1	1	1	1	2	10, 2025 2 hnologie	9
Nigussie et.al[25]	1	1	1	1	1	2		8
Nigusu et.al[<u>26</u>]	1	1	1	1	1	2	at Agence Bibliographique de l	8
Oswald et.al[<u>16</u>]	1	0	1	1	1	2	raphique	7

of age children in	Ethiopia,	2023
--------------------	-----------	------

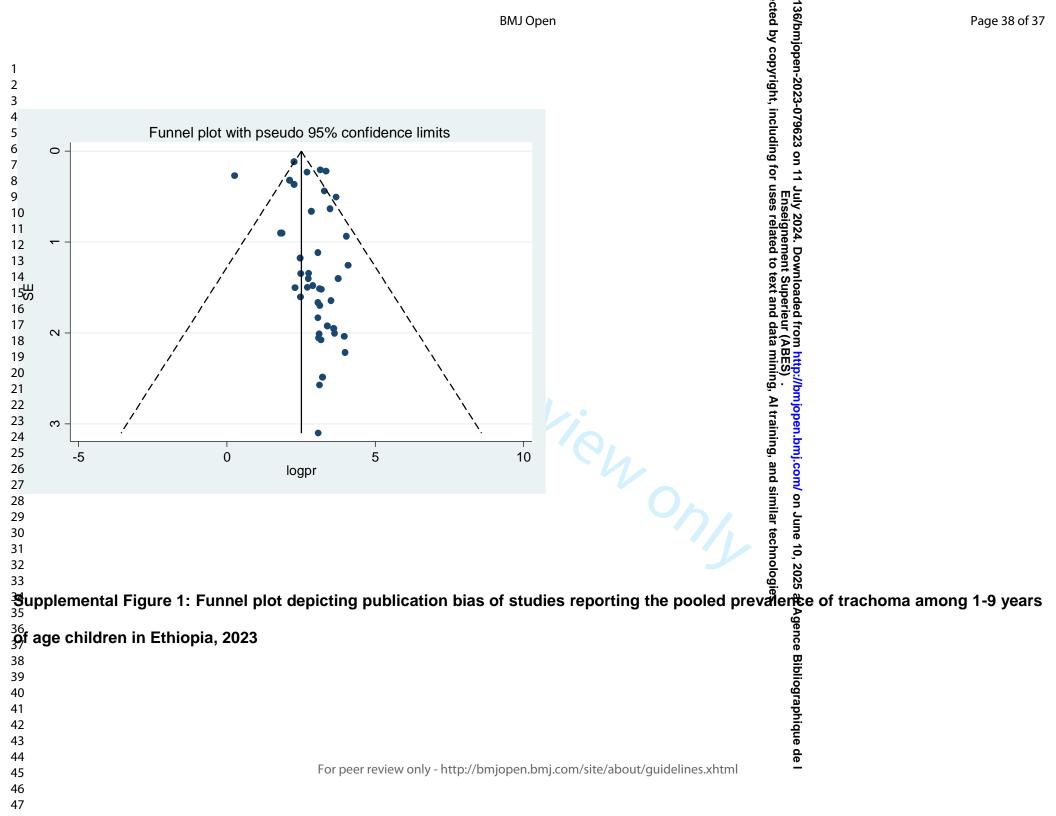
		BMJ Ope	า	136/b	
		s related to the hetero	geneity on the pooled	d prevalenge of tracho	oma among
lren in Ethiopia, 2023	}			n-2023 oyright,	
Variables	Coefficient	95% CI	P-value	n-2023-079623 on 11 yright, including for	
Year of Publication	-1.83	-2.54 to -1.10	0.00	ing for	
Region	1.23	-1.19-3.66	0.30	I July 2024. Enseigner uses relate	
Sample Size	000	00 to 0.00	0.49	2024. Downloaded signement Superie related to text and	
			0.49	http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de I BES) . mining, Al training, and similar technologies.	

BMJ Open

Supplemental table 5: Study characteristics of included studies on the prevalence trachoma among children age 1-9 years; 2023

Author's	Year of Publication	Region	Study Area	Study Design	Sample Size	Male(n)	-2023-079 Fema#e inc (n)	No of cases(n)	Prevalence %
Abashawl et.al ^[48]	2016	Gambela	Region-wide	CS	3238	NA	(n) includir	557	17.2
Adamu et.al ^[49]	2016	Benishangul Gumuz	Region-wide	CS	7417	3212	4205 for u	616	8.3
Adera et.al ^[30]	2016	SNNP	Region wide	CS	41,155	NA	July 2 Ense uses r	11,647	28.3
Admassu et.al ^[31]	2013	SNNP	Guragie	CS	768	386	382 382	175	22.8
Admasu et.al ^[32]	2015	SNNP	Dawro	CS	267	113	382 September 154 To 15	61	22.9
∄lambo et.al ^[38]	2018	SNNP	Areka	CS	586	317	269 Superieu text and 320	222	37.9
Alemayehu et.al ^[51]	2015	Diredawa	Dera	CS	671	351	320 de fr	105	15.6
Alemayehu et.al	2005	SNNP	Guragie	CS	2788	NA	om http://b (ABES) . ata mining,	1561	56.5
Anteneh et.al ^[16]	2016	Amhara	Gazegibela	CS	601	268	333 ≥ ₹	315	52.4
Asres et.al ^[17]	2016	Amhara	Gondar	CS	586	285	301 trainir	71	12.1
Assefa et.al 47	2017	Harari	Harari	CS	1722	804	918 g, and si	22	1.3
Belsti et.al ^[52]	2021	Southwest	Lare	CS	610	283	327 🙇 💆	132	21.6
∄ero et.al ^[39]	2016	Oromia	Region-wide	CS	41642	NA	on Ju NA lar	9744	23.4
∄rhane et.al ^[50]	2007	Nationwide	Nation-wide	CS	9289	NA	ne 10 techr	3725	40.1
Duale et.al ^[46]	2018	Somali	Region-wide	CS	23620	11462	1215&g	3543	15
∄jigu et.al ^[53]	2013	Southwest	Kersa	CS	305	154	151 g a	77	25.2
∄merson et.al ^[18]	2008	Amhara	Region-wide	CS	5485	NA	NA gen	1794	32.7
Ferede et.al ^[19]	2017	Amhara	Dembia	CS	681	NA	NA Bib	121	18.2
Gedefaw et.al ^[20]	2013	Amhara	Dangila	CS	409	215	194 bliogr	49	12
Genet et.al [21]	2022	Amhara	Dangila	CS	704	337	367 gh	43	6.1
⁴² G olovaty et.al ^[22]	2009	Amhara	Ankober	CS	507	219	288	275	53.9
Kassahun et.al ^[41]	2012	Oromia _{For peer}	reMejoonly - http://l	on GS pen.bmj	,c <mark>4,3,1</mark> site/abou	t/ M delines.xh	trNA =	97	22.5

Page 37 of 37				BMJ Oper	1		136/bı		
Kedir et.al ^[34]	2020	SNNP	Silte	CS	561	279	282 c njop	165	29.4
Kemal et.al ^[40]	2019	Oromia	Medawalebu	CS	406	215	191 yrig	89	22
*Kessete et.al ^[29]	2012	Amhara	Baso Liben	CS	792	391	191 401 401 369 85	191	24.1
Ketema et.al ^[23]	2014	SNNP	Guragie	CS	735	366	369 Icludi	47	6.4
Mehari et.al [35]	2022	Oromia	Arsi Negele	CS	178	93	85 on 1	39	21.91
Mekonnen et.al ^[14]	2016	SNNP	Zala	CS	611	286		224	36.7
Mengistu et.al ^[36]	2006	Tigray	Region wide	CS	1526	NA	325 Enseignemer ruses related 643	903	59.2
Mesfin et.al ^[42]	2005	Amhara	Ebinet&East Belesa	CS	1244	601	643 643 643	527	42.4
Mesfin et.al ^[2]	2005	SNNP	Goro	CS	826	438	Download nent Supo I to text a	278	33.7
Mohammed et.al ^[8]	2018	Afar	Region-wide	CS	6399	NA	NA BEE	611	9.6
Negash et.al ^[45]	2015	Amhara	Gonji Kolella	CS	618	353	265 at AF	143	23.1
Nigussie et.al ^[24]	2022	Amhara	Tarimaber	CS	736	380	356 in BES	116	15.8
Nigusu et.al ^[25]	2017	Amhara	Region wide	CS	62869	NA	y, Al t	6035	9.6
Oswald et.al [15]	2020	Tigray	Deguatemben	CS	502	257	245 trainit	108	21.5
Reda et.al ^[43]	2016	Tigray	Region-wide	CS	10023	NA	NA a	2676	26.7
Sadik et.al ^[44]	2013	Amhara	Makisegnit	CS	420	209	211 d si	100	23.8
\$hiferaw et.al [26]	2022	Amhara	Debretabor	CS	394	70	on Ju imilar	39	9.9
Shimelash et.al ^[27]	2017	Amhara	Wollo	CS	1358	638	720 720	293	21.6
32adesse et.al ^[28]	2019	SNNP	Lemo	CS	574	NA	720 rechnologies.	87	15.2
34 S: Cross-sectional st	udy	1				I	gies.		
36							gen		
37 38							e B		
39							Bibliographique		
40							ogra		
41							aph		
42							niqu		
43							ē O		
44 45		For peer	review only - http://b	mjopen.bmj	.com/site/abou	t/guidelines.xh	tml e		



BMJ Open

Prevalence of active trachoma among 1-9 years of age children in Ethiopia: a systematic review and meta-analysis

Journal:	BMJ Open
Manuscript ID	bmjopen-2023-079623.R2
Article Type:	Original research
Date Submitted by the Author:	30-Apr-2024
Complete List of Authors:	Asgedom, Yordanos; Wolaita Sodo University, Epidemiology; Wolaita Sodo University Melaku , Tsegaye; Jimma University, Institute of Health Gebrekidan, Amanuel; Wolaita Sodo University, School of Public Health Meskele , Mengistu ; Wolaita Sodo University, School of Public Health Asnake, Gedeon; Hawassa University, Midwifery Alemu, Afework; Wolaita Sodo University, medicine Efa, Amelework; SNNPR, Medicine Haile, Kirubel; Wolaita Sodo University, Nursing Kassie, Gizachew ; Wolaita Sodo University
Primary Subject Heading :	Ophthalmology
Secondary Subject Heading:	Infectious diseases
Keywords:	Systematic Review, Meta-Analysis, EPIDEMIOLOGY, Infection control < INFECTIOUS DISEASES, Public health < INFECTIOUS DISEASES, Paediatric ophthalmology < OPHTHALMOLOGY

SCHOLARONE™ Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text

- Prevalence of active trachoma among 1-9 years of age children in Ethiopia: a
- systematic review and meta-analysis
- Yordanos Sisay Asgedom*, Tsegaye Melaku Kebede² Amanuel Yosef Gebrekidan³,
- Mengistu Meskele Kovira⁴, Gedeon Asnake Azeze ^{5,} Afework Alemu Lombebo⁶,
- Amelework Gonfa Efa⁷, Kirubel Eshetu Haile⁸, Gizachew Ambaw Kassie¹
- ^{1,9} Department of Epidemiology, Wolaita Sodo University, SNNPR, Ethiopia
- Institute of Health, Jimma University, Oromia, Ethiopia
- ^{3, 4} Schools of Public Health, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing and Midwifery, Hawassa University, Sidama, Ethiopia
- ^{6,7} School of Medicine, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing, Wolaita Sodo University, SNNPR, Ethiopia
- *Correspondence:
- Corresponding Author
- yordusisay@gmail.com/yordanos.sisay@wsu.edu.et
- Keywords: Trachoma, Children, Systematic review, Meta-analysis, Ethiopia

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to

Abstract

- Objective: To determine the pooled prevalence of active trachoma among 1-9 years of
- children in Ethiopia.
- Design: A systematic review and meta-analysis was employed in accordance with the
- 26 Preferred Reporting Items for Systematic Reviews.
- Data sources: Medline/PubMed, Scopus, web of science, African journal of online (AJOL)
- and Google scholar databases were systematically explored to find studies published in
- 29 English until July 2023.
- 30 Eligibility criteria: The following criteria: (1) Condition (Co): Studies examined the
- prevalence of trachoma among children (1-9) years old; (2) Context (Co): Studies
- conducted in Ethiopia; (3) Population (Pop): Studies that were done among children (1-9
- years); (4) Study type: Observational studies; (5) Language: Studies published in English.
- 34 Data extraction and synthesis: The data was extracted using a Microsoft Excel
- spreadsheet. DerSimonian-Laird Random effect model was used to estimate the pooled
- prevalence of active trachoma among 1-9 years of age children. Cochrane Q-test and I²
- 37 statistics were used across studies to assess heterogeneity. To identify possible
- publication bias Egger's test was performed.
- **Primary outcome:** Prevalence of active trachoma.
- **Results:** Overall, a total of forty-two articles with 235,005 study participants were included
- in the final analysis. The estimated pooled prevalence of active trachoma using random
- effect model was 24% (95% CI: 20-27%). The sub-group analysis by region revealed the
- 43 highest prevalence of trachoma was 36% (95% CI: 13-58%) in Tigray region and
- publication year revealed the prevalence of trachoma is decreasing from 32% to 19% after
- 45 2015.
- **Conclusion:** In this review, the pooled prevalence of active trachoma was found to be
- 47 high in Ethiopia compared to World health Organization (WHO) threshold level. This
- 48 underscores the need for increased focus on high-risk age groups to decrease trachoma
- and to achieve elimination of trachoma from the country by 2030.

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de

ata mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

Strength and Limitations of this study

- It follows the recommended updated PRISMA guidelines
- We also rigorously searched the literature in different databases and identified eligible studies.
- One limitation of this systematic review and meta-analysis is that it only includes cross-sectional studies that report the proportion of trachoma cases.
- AOI C This review have not assessed for associated factors.

Word count: 3285

Introduction

Globally, trachoma is the leading infectious cause of blindness. Trachoma has been named one of 20 neglected tropical diseases (NTD) by the World Health Organization (WHO) [1, 2]. Children are the primary reservoirs of infection. Children aged 1 to 9 years are more likely to have an active trachoma [3]. Due to their tendency for close contact with others, children are frequently infected with *Chlamydia trachomatis* [4].

The poorest of the poor are primarily affected by trachoma [5]. The WHO 2021 report shows that trachoma is responsible for 1.9 million people with blindness and visual impairment, moreover, approximately 125 million people live in trachoma-endemic areas worldwide[1]. Around 3.8 million cases of blinding trachoma and 27.8 million cases of active trachoma have been reported in Africa which is one of the most affected continents [6]. Ethiopia has the world's highest trachoma burden, with 76.2 million people living in endemic areas at risk of contracting the disease. Among Ethiopian children active trachoma is ranged from 10.3%[7] to 74.3% [8] . For children aged 1-9 years living in endemic areas the prevalence of Trachomatous inflammation-follicular (TF) <5% is the elimination target set by WHO(3), However, the prevalence in Ethiopian children is higher than the target. If TF is > =5% among children aged 1-9 years SAFE strategy which includes Antibiotics, Face washing, and Environmental Improvement (A, F, and E) is recommended [9]. Globally an estimated US\$ 8 billion in annual product loss is attributed to this disease [1].

Direct personal contact such as shared towels, flies, clothes, and fingers that interact with the infected person's eyes or nose is known for transmission of trachoma infection. The scarcity of safe drinking water access and sanitation systems has spread Chlamydia trachomatis infections. Corneal scarring and eyelid deformities can occur after inflammation and recurrent infections subsequently, if not treated and eyelid inversion (Entropion) and the lashes turn inward (trichiasis) occur as late complications. Trichiasis and permanent damage to the cornea frequently results in irreversible blindness [1].

Eliminating trachoma by 2020 through the implementation SAFE strategy (surgery for inturned eyelashes, antibiotics to clear the infection, and facial cleanliness and environmental improvement to reduce infection transmission) was set by the WHO and

other concerned organizations[1]. Ethiopia intended to eliminate trachoma through the SAFE strategy by implementing a national trachoma action plan in 2012 and implementing a second master plan for 2016 to 2020 [10, 11]. Despite significant development, trachoma elimination was not met by December 2020 and it was pushed back to 2030 to align with the Sustainable Development Goals (SDGs) [1].

Despite the fact that numerous studies have been conducted in Ethiopian children (1-9) years) to assess the prevalence of trachoma and systematic review and meta-analysis in 2019 [12]; Our reason for undergoing this systematic review and meta-analysis is many studies have been published since then and our study aimed to address specific Stastical limitations in the previous studies. As a result, this study aimed to deliver a comprehensive updated nationwide prevalence of trachoma infection among children, and geographical locations, and to assess the ongoing preventive and control measures impact in the country.

- Furthermore, the government and other concerned bodies may contribute by focusing on preventive measures such as improving access to water and sanitation specifically in areas of trachoma infection high prevalence.
- **Research Question:** What is the pooled prevalence of trachoma infection among children (1-9yrs) old in Ethiopia?

Methods

Reporting

- We performed our analyses according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [13]. The article screening was based on the PRISMA 2020 statement, and the selection process has been shown using a PRISMA -P flow diagram. The finding is presented using the standard PRISMA checklist
 - (Supplemental Table 1). The review protocol is not registered in PROSPERO.

Search Strategy and study identification

To estimate the prevalence of trachoma among children (1-9) years old in Ethiopia a systematic review and meta-analysis were performed. After an initial exploration of Google Scholar, MEDLINE, and SCOPUS with limited parameters, a follow-up search was conducted using all identified keywords and index terms across several databases including MEDLINE, PubMed, SCOPUS, Web of Science, and African journal online(AJOL). All studies conducted on trachoma Prevalence among children in Ethiopia were retrieved. The search included all articles published from database inception to July 31, 2023. English-language studies were only searched. Medical subject heading (MeSH) (((("Magnitude") OR "prevalence" OR "burden") AND "Trachoma") OR "Eye infection" OR "Trachomatous intense" OR "Trachomatous Follicular")) AND Ethiopia) were used in various combinations as the primary search keywords (Supplemental Table 2). During the systematic review and meta-analysis, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [13].

Eligibility Criteria

- We used condition, context, and population (CoCoPop) framework for the search and meta-analysis of eligibility criteria.
- 143 Inclusion Criteria
- The following criteria were used to include studies in this systematic review and metaanalysis.
 - Condition (Co): We include studies examined the prevalence of trachoma among children (1-9) years old.
 - Context (Co): Studies conducted in Ethiopia were included.
 - Population (Pop): Studies that were done among children (1-9 years).
 - Study type: Observational studies
 - Language: Studies published in English were included

We excluded studies other than children (1-9 years) as well as with different outcome of interest, qualitative studies, case reports, case series, review paper, conference proceedings and abstracts.

Outcome measurement

This study aimed to gather and analyze data from various studies conducted in Ethiopia to determine the pooled prevalence of Trachoma among children (1-9 years). We used a systematic approach to identify the relevant studies and extract data from them. Then we employ Stastical methods to combine the data from different studies to estimate the overall pooled prevalence of Trachoma among children (1-9 years) in Ethiopia. Prevalence of trachoma defined here as trachomatous inflammation follicular or Trachomatous inflammation intense among children was the major outcome of this review. We calculated the prevalence of trachoma in children by adjusting for the proportion of each age group (1-year increments) with active trachoma (TF) based on the local population distribution of 1-9 year-olds from the latest census data.

Data extraction and quality assessment

The Endnote citation manager (Version X8, for Windows, Thomson Reuters, Philadelphia, PA, USA) was used to import the retrieved studies and then duplicates were removed. Two independent reviewers screened all the articles for eligibility criteria. Reviewers began by screening the abstracts and titles, followed by full-text screening. The quality of the articles was assessed by using Newcastle-Ottawa Quality Assessment Scale (adapted for cross-sectional studies) [14]. Disagreements were resolved by a third investigator. The articles were critically appraised by the following criteria from the tool: Representativeness of the sample (1 score maximum), sample size (1 score maximum), non-respondent (1 score maximum), ascertainment of exposure (2 score maximum), Comparability of outcome based on study design (2 score maximum), outcome assessment (2 score maximum) and Statistical analysis (1 score maximum). All the included studies assessed through the tool with a score of ≥5 were included in this systematic review and meta-analysis (Supplemental Table 3). After quality rating no study was dismissed. During our quality assessment nineteen studies score eight, seventeen studies score seven, five studies

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

score nine and one study score six out of ten. Overall, the distribution of scores in your quality assessment indicates that the majority of studies were of good to high quality, with only a few studies showing lower scores. Two investigators used a standardized extraction format prepared in Microsoft Excel. The excel spreadsheet includes the name of the first author, publication year, study design, region, study area, gender, sample size, number of cases and trachoma prevalence.



Statistical Analysis

Data was extracted in Microsoft Excel format and analyzed using STATA software version 16.0 (Stata Corp LLC, Texas, USA). We used forest plots to report the estimated pooled prevalence of the study with confidence interval (CI) to provide a visual summary of the data. Effect sizes were expressed as a proportion with 95% CI around the summary estimate. The data was first presented using narrative synthesis of the included studies. We assumed no, low, medium, and high heterogeneity across studies if the I² values were 0%, 25%, 50%, and 75%, respectively. A meta-analysis using a random effects model was performed to analyze the pooled prevalence with 95% confidence intervals (CI) since significant heterogeneity was detected between studies. The heterogeneity of each outcome measure was assessed using both X² and 1² statistics to determine dispersion. Meta-regression analysis was performed to investigate the source of heterogeneity. A Funnel plot and Egger's regression test was conducted to assess publication bias. In addition, a leave one-out sensitivity analysis to evaluate small study effect by excluding each study one at a time, the analysis was performed to assess the effect of each study on the pooled prevalence of trachoma and subgroup analysis was performed to ensure consistency of pooled results. Statistical significance was considered at p< 0.05.

Patient and public involvement

The public/patient was not involved in the design, conduct, reporting, o dissemination plans of this review.

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text and

Results

Search results

Our searching strategy initially identified 453 Articles and 340 duplicates were excluded by using the endnotes citation manager. Finally, 68 Studies were further excluded after reviewing the title and abstract and then 45 articles full text was reviewed for necessary criteria. Excluding three articles as they were not reported outcomes of interest; finally, 42 studies that fulfilled the inclusion criteria were considered for the final analysis to estimate the overall pooled prevalence of trachoma among children (1-9 years) in Ethiopia. (Figure 1) illustrates the process of the literature review, screening, and eligibility assessment of the study articles.

Included studies characteristics

A total of forty-two cross-sectional studies (235,006 children) were included in this systematic review and meta-analysis (**Supplemental Table 4**). The spanned publication period was from 2005 to 2023. The sample size of the included studies ranges from 178 [15] to 62869[16]. With regard to study sites, sixteen of the primary studies included from Amhara region [2, 16-30], nine from SNNPR region [31-39] and six studies included from Oromia [15, 40-42], three from Tigray [43-45] respectively. However, one study each reported from Afar[46], Somali[47], Harari[48], Diredawa [8], Gambela [49], BenshangulGumuz [50], and nationwide [51] (Table 1).

Table 1: Summary of 42 included studies on the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023.

	Publication					I	9 n or 11	
Author's	year	Region	Study Area	Sample	Male(n)	Female (n)	Mato of cases (n)	Prevalence %
Abashawl et.al[49]	2016	Gambela	Region-wide	3238	NA	NA	y 202 saigi s (%)	17.2
Adamu et.al[<u>50</u>]	2016	Benishangul Gumuz	Region-wide	7417	3212	4205	s sully 2024. Downloaded from http://bm oEnseignement/Superieur (ABES) of Denseignement/Superieur (ABES) of Denseignement/Superieur (ABES)	8.3
Adera et.al[31]	2016	SNNP	Region-wide	41,155	NA	NA	wale nes to le	28.3
Admassu et.al[32]	2013	SNNP	Guragie	768	386	382	oade uperi ct an	22.8
Admasu et.al[33]	2015	SNNP	Dawro	267	113	154	d fro	22.9
Alambo et.al[39]	2018	SNNP	Areka	586	317	269	a 20 Dit	37.9
Alemayehu et.al[52]	2015	Amhara	Dera	671	351	320	p://k S) ₅ .	15.6
Alemayehu et.al [34]	2005	SNNP	Guragie	2788	NA	NA	bmjopen.bmj.com/ on Jul 61 61 70 71 71 72 72 73 74 74 75 75 75 76 76 76 76 76 76 76 76 76 76 76 76 76	56.5
Anteneh et.al[17]	2016	Amhara	Gazegibela	601	268	333	oen.k	52.4
Asres et.al[<u>18</u>]	2016	Amhara	Gondar	586	285	301	mj.c	12.1
Assefa et.al[48]	2017	Harari	Harari	1722	804	918	nog s	1.3
Belsti et.al[<u>53</u>]	2021	Southwest	Lare	610	283	327	on J	21.6
Bero et.al[40]	2016	Oromia	Regionwide	41642	NA	NA	967 44 m	23.4
Brhane et.al[<u>51</u>]	2007	Nationwide	Nationwide	9289	NA	NA	10, 2025 a	40.1
Duale et.al[47]	2018	Somali	Region-wide	23620	11462	12158	025 a	15
Ejigu et.al[<u>54</u>]	2013	Southwest	Kersa	305	154	151	77 A g	25.2
Emerson et.al[19]	2008	Amhara	Region wide	5485	NA	NA	1794 e	32.7
Ferede et.al[20]	2017	Amhara	Dembia	681	NA	NA		18.2
Gedefaw et.al[21]	2013	Amhara	Dangila	409	215	194	121 Bi bill 60 49 Gra	12

⁻ 37			ВМЈ О	36/bmj sted by				
							136/bmjopen-2023-079623 on 1 cted by copyright, Packvalingട്ട്o	
Genet et.al [22]	2022	Amhara	Dangila	704	337	367	23-07	6.1
Golovaty et.al[<u>23</u>]	2009	Amhara	Ankober	507	219	288	9623 2015	53.9
(assahun et.al[<u>42</u>]	2012	Oromia	Mojo	431	NA	NA	on 1	22.5
(edir et.al[<u>35]</u>	2020	SNNP	Silte	561	279	282	 	29.4
(emal et.al[41]	2019	Oromia	Medawalebu	406	215	191	y 20;	22
(essete et.al[<u>30</u>]	2021	Amhara	Metema	752	352	400	24. D	11.8
(etema et.al[24]	2012	Amhara	Baso Liben	792	391	401	July 2024. Downloaded from http://t .Enseignement Superieur (ABES), . மீses ஐelatஐd tottextand அataிhinன்ற	24.1
lehari et.al [<u>36</u>]	2014	SNNP	Guragie	735	366	369	loade Super	6.4
lekonnen et.al[<u>15</u>]	2022	Oromia	Arsi Negele	178	93	85	ed from the second seco	21.91
lengistu et.al[<u>37]</u>	2016	SNNP	Zala	611	286	325	A ABL	36.7
lesfin et.al[<u>43</u>]	2006	Tigray	Regionwide	1526	NA	NA	in Sign	59.2
lesfin et.al[2]	2005	Amhara	Ebinet	1244	601	643	3≥ 7 3 .	42.4
Iohammed et.al[<u>8</u>]	2005	Diredawa	Goro	826	438	388	mjopen.bmj.com/	33.7
egash et.al[<u>46</u>]	2018	Afar	Regionwide	6339	NA	NA		9.6
ligussie et.al[25]	2015	Amhara	Gonji Kolella	618	353	265	10 43	23.1
ligusu et.al[<u>26</u>]	2022	Amhara	Tarimaber	736	380	356	on June 1	15.8
Swald et.al[16]	2017	Amhara	Region wide	62869	NA	NA	an an a a a a a a a a a a	9.6
Reda et.al[44]	2020	Tigray	Deguatemben	502	257	245	10, 2025 http://www.new.new.new.new.new.new.new.new.new.	21.5
Sadik et.al[45]	2016	Tigray	Regionwide	10023	NA	NA	025 g	26.7
Shiferaw et.al[27]	2013	Amhara	Makisegnit	420	209	211	100 Age	23.8
Shimelash et.al[28]	2022	Amhara	Debretabor	394	70	324	39 e nce	9.9
adesse et.al[<u>29</u>]	2017	Amhara	Wollo	1358	638	720	293 💆	21.6
Voldekidan et.al[38]	2019	SNNP	Lemo	574	NA	NA	87 87 e e e	15.2

The pooled prevalence estimates of trachoma among children in Ethiopia

The pooled prevalence of trachoma among children (1-9 years) in Ethiopia was identified in 42 studies, from a total of 235,006 children, 45,711 children were infected with trachoma. Stastically significant heterogeneity was observed ($I_{=}^{2}$ 99.8%); p<0.0001). There we used random effect model to estimate the pooled prevalence of trachoma among children (1-9 years) which was 24.01 %(95% CI: 20.67-27.40%) (Figure 2).

Subgroup analysis

To identify the potential source of heterogeneity, a subgroup analysis was executed based on study area (region) and publication year. Based on the subgroup analysis by study are (region) of Ethiopia the highest prevalence of trachoma was reported in Tigray region 35.81 (95% CI: 13.84-57.78) and followed by SNNP where 28.98 (20.14-37.82). Subgroup analysis by publication year was performed to overlook the trends over ten years on the pooled prevalence of trachoma among children in Ethiopia. The results of the subgroup analysis revealed a significant difference in the pooled prevalence of trachoma among children, with rates of 32.53% (95% CI: 24.32-40.76) before 2015 and 19.93% (95% CI: 16.35-23.51) since 2015 (Table 2).

Table 2: Subgroup-analysis on the pooled prevalence of trachoma infection among children (1-9 years) in Ethiopia, 2023

Subgroups	Number of studies	Prevalence (95%CI)	l ²	P-value
Regions				I
Amhara	16	23.02(16.7,29.31)	59.5	0.001
SNNPR	10	28.58 (20.14,37.82)	99.5	0.001
Oromia	6	23.36(22.96,23.75)	0.00	0.107
Tigray	3	35.81(13.84,57.78)	59.7	0.100
Others	7	15.29(7.33,23.26)	59.9	0.600
Over all	42	24.01(20.61,27.40)		59.8
Publication :	year			
>= 2015	28	19.71(16.27,23.15)	99.8	0.001
<2015	14	32.53(24.31,40.76)	99.5	0.001
Over all	42	24.01(20.61,27.40)		59.8
The funnel p statistically s publications (Supplemen estudies inclu	upported by Egger's to in a large inverted fur tal Figure 1). The Egg	ed to assess potential publicest. The symmetrical distringular indicated the absence ger tests revealed no publiceooled prevalence of track	bution of the of a publication bias	ne included cation bias among the
		14		

Publication bias assessment

Meta-Regression

Meta-regression was used to identify factors associated with the pooled prevalence of trachoma among children (1-9 years) old. For the meta-regression, publication year, region and sample size were considered. The analysis revealed a significant correlation between the pooled prevalence of trachoma among children (1-9 years) and publication year (P<0.001) but no significant correlation with sample size and region (Supplemental Table 5).

Sensitivity analysis

By excluding each study individually, a leave-out-one sensitivity analysis was used to determine the effect of a single study on pooled prevalence of trachoma among children (1-9 years) in Ethiopia. Our finding revealed no single study had a significant impact on the pooled prevalence of trachoma among children (1-9 years) in Ethiopia (Figure 3).

Discussion

The purpose of this systematic review and meta-analysis is to append national data on the prevalence of trachoma infection among Ethiopian children to eliminate the disease. Although different studies from different regions have been published in the country, the data on trachoma infections have to be organized and updated every time. Therefore, updating the information has the potential to inform and help develop different strategies by targeting highly endemic areas.

The pooled overall prevalence of Trachoma (24.01 %) observed in the current review is comparable with a study from Colombia [55], but higher than the study done in the Democratic Republic of Congo [56], Nigeria [57], Uganda [58], Brazil [59], Kenya [60]. This prevalence is lower than studies from South Sudan [61] and Guinea [62]. The disparity among the findings might be due to environmental factors such as the level of participants' hygiene, sanitation, Access to functional latrines, and clear water supply, and recent studies were included in our review that reported ongoing Sustainable water, sanitation, and hygiene (WASH) program and Mass drug administration (MDA)

with Azithromycin which might reduce trachoma prevalence among children in Ethiopia, unlike the South Sudan study which lacks MDA and targeted SAFE strategy [61].

The Subgroup analysis of this review also shows a statistically significant (p=0.01) difference among regions. Trachoma was highly prevalent in Tigray and SNNP followed by Oromia and Amhara regions. Trachoma infection is related to inadequate hygiene, low standard of living, inadequate access to water, and inadequate access to sanitation use. In the Tigray region trachoma prevalence is high which might also be related to extreme climatic events which favor a decline in water availability during dry periods which affects personal hygiene. Another reason for the difference is attributed to baseline and intervention disparity in the communities. MDA with Azithromycin once yearly is needed based on review finding (24%) and Ethiopia is known to require intervention based on WHO 2021 report(1).

Though the decline is not statistically significant (p=0.30) our result from this review revealed studies conducted between 2005-2014 and 2015-2022 show decrement on the prevalence of trachoma from 32 to 19%. The expansion of MDA and WASH programs might be attributed to the decrease in the prevalence. This is review has an implication revealing the national burden of trachoma infection among children, who are a special population accounted for one third of the national population. Moreover, this large magnitude of trachoma infection show significant gap in the implementation of devised WHO and national elimination strategies. Last but not least, from research perspective we recommend to conduct operational studies on the topic.

Strength and limitations of the study

The current meta-analysis has several strengths. It provides a comprehensive overview of trachoma among Ethiopian children in accordance with the most recent PRISMA guidelines. We conducted a thorough search of the literature using multiple databases and found eligible studies. Although the meta-analytic techniques used in this study were strong, the results should be interpreted with caution due to the study's limitations. First, there was significant heterogeneity in trachoma prevalence in Ethiopia. However, this heterogeneity can be attributed to factors such as publication year and sample size.

Conclusions

An effort has been made to eliminate, trachoma infection is still highly prevalent across the Ethiopian regions. Even though the decline is not statistically significant we saw decreased trachoma prevalence in Ethiopian children. Trachoma is highly prevalent in Tigray followed by SNNP. Moreover, trachoma remains a significant public health concern among adults in Ethiopia. The prevalence of trachoma in this population is alarmingly high, highlighting the urgent need for continued efforts to improve access to clean water, sanitation, and hygiene practices. Despite the effort made by the country to eliminate Trachoma infection, According to WHO risk classification, it remains a public health problem in the country. The output of this review will offer valuable data to the Ministry of Health, policymakers, and concerned bodies which work on eliminating trachoma infection in the country. Trachoma infection is highly prevalent based on this review and it underlines the need for improved prevention and control strategies for one of the Neglected tropical diseases in Ethiopia.

- List of Abbreviations CI: Confidence interval; NTD: Neglected tropical disease;
- PRISMA: Preferred reporting items for systematic review and meta-analysis; SAFE:
- Surgery for Trichiasis, Antibiotics, Face Washing and Environmental improvement
- strategy; SDG: Sustainable development goal; SNNPR: South Nation and Nationalities
- people; WHO: World Health Organization.
- Acknowledgment: We are indebted to all the researchers whose studies were included
- in this study.
- Contributors: Conceptualization: YSA, TMK, GAK; Data curation: YSA, TMK, GAK,
- MMK, AYG; Investigation: YSA, AAL, AGE; Methodology: YSA, TMK, GAK, KEH;
- Software: YSA, GAK, TMK; Validation: YSA, MMK, GAK, AYG; Writing: YSA, TMK,
- GAK; Writing review and editing: All the authors read and approve the manuscript.
- Funding: No specific funding for this work has been received by the authors

- 356 Patient consent for publication: Not applicable
- **Ethical approval:** Not applicable
- 358 Data Availability: All associated data and supporting information are included in this
- 359 systematic review and meta-analysis.

Reference

- 361 1. Organization) WWH. Trachoma. Factsheet Switherland, Geneva 2022.
- Mesfin A. Assessing the prevalence of active trachoma among young children in relation to the implementation of SAFE strategy in Ebinat and East Belesa Woreda, Northwest Ethiopia:
- Addis Ababa University; 2005.
- 365 3. Solomon AW, Organization WH, Initiative IT. Trachoma control: a guide for programme managers: World Health Organization; 2006.
- 4. Center C. Women and trachoma: Achieving gender equity in the implementation of SAFE. The Carter Center. 2009.
- 5. Habtamu E, Wondie T, Aweke S, Tadesse Z, Zerihun M, Zewdie Z, et al. Trachoma and relative poverty: a case-control study. PLoS neglected tropical diseases. 2015;9(11):e0004228.
- 571 6. Smith JL, Flueckiger RM, Hooper PJ, Polack S, Cromwell EA, Palmer SL, et al. The geographical distribution and burden of trachoma in Africa. PLoS neglected tropical diseases. 2013;7(8):e2359.
- 7. Basha GW, Woya AA, Tekile AK. Prevalence and risk factors of active trachoma among primary school children of Amhara Region, Northwest Ethiopia. Indian Journal of Ophthalmology. 2020;68(5):750.
- 8. Mohamed H, Weldegebreal F, Mohammed J, Gemechu A. Trachoma and Associated Factors among School Age Children 4-9 Years in Dire Dawa Administration, Eastern Ethiopia. East African Journal of Health and Biomedical Sciences. 2019;3(2):45-54.
- 9. Organization WH. WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2018. Weekly epidemiological record. 2019;94(29):317-28.
- 10. (MOH) FMoH. Second edition of Neglected Tropical Diseases Master Plan 2015/2016. Addis Ababa, Ethiopia 2016.
- 385 11. Abebe TA, Tucho GT. The impact of access to water supply and sanitation on the 386 prevalence of active trachoma in Ethiopia: A systematic review and meta-analysis. PLoS 387 Neglected Tropical Diseases. 2021;15(9):e0009644.
- 388 12. Gebrie A, Alebel A, Zegeye A, Tesfaye B, Wagnew F. Prevalence and associated factors 389 of active trachoma among children in Ethiopia: a systematic review and meta-analysis. BMC 390 infectious diseases. 2019;19:1-12.
- 391 13. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The
- PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International
- 393 journal of surgery. 2021;88:105906.

- Modesti P, Reboldi G, Cappuccio F. Newcastle-Ottawa Quality Assessment Scale (adapted for cross sectional studies). PLoS One. 2016;11(1):e0147601.
- 15. Mekonnen J, Kassim J, Ahmed M, Gebeyehu N. Prevalence of active trachoma and associated factors among children 1–9 years old at Arsi Negele Town, West Arsi Zone, Oromia Regional State, Southern Ethiopia. Plos one. 2022;17(10):e0273808.
- Oswald WE, Stewart AE, Kramer MR, Endeshaw T, Zerihun M, Melak B, et al. Active trachoma and community use of sanitation, Ethiopia. Bulletin of the World Health Organization. 2017;95(4):250.
- Anteneh ZA, Getu WY. Prevalence of active trachoma and associated risk factors among 17. children in Gazegibela district of Wagehemra Zone, Amhara region, Ethiopia: community-based cross-sectional study. Tropical diseases, travel medicine and vaccines. 2016;2(1):1-7.
- Asres M, Endeshaw M, Yeshambaw M, Muluken A. Prevalence and risk factors of active trachoma among children in Gondar Zuria District North Gondar, Ethiopia. Prev Med. 2016;1(1):5.
- Emerson PM, Ngondi J, Biru E, Graves PM, Ejigsemahu Y, Gebre T, et al. Integrating an 19. NTD with one of "the big three": combined malaria and trachoma survey in Amhara Region of Ethiopia. PLoS neglected tropical diseases. 2008;2(3):e197.
- Ferede AT, Dadi AF, Tariku A, Adane AA. Prevalence and determinants of active trachoma among preschool-aged children in Dembia District, Northwest Ethiopia. Infectious diseases of poverty. 2017;6(1):1-7.
- Gedefaw M, Shiferaw A, Alamrew Z, Feleke A, Fentie T, Atnafu K. Current state of active trachoma among elementary school students in the context of ambitious national growth plan: The case of Ethiopia. Health. 2013;2013.
- Genet A, Dagnew Z, Melkie G, Keleb A, Motbainor A, Mebrat A, et al. Prevalence of active trachoma and its associated factors among 1–9 years of age children from model and nonmodel kebeles in Dangila district, northwest Ethiopia. Plos one. 2022;17(6):e0268441.
- Golovaty I, Jones L, Gelaye B, Tilahun M, Belete H, Kumie A, et al. Access to water source, latrine facilities and other risk factors of active trachoma in Ankober, Ethiopia. PLoS One. 2009;4(8):e6702.
- Ketema K, Tiruneh M, Woldeyohannes D, Muluye D. Active trachoma and associated risk factors among children in Baso Liben District of East Gojjam, Ethiopia. BMC public health. 2012;12(1):1-7.
- Nigusie A, Berhe R, Gedefaw M. Prevalence and associated factors of active trachoma among childeren aged 1–9 years in rural communities of Gonji Kolella district, West Gojjam zone, North West Ethiopia. BMC research notes. 2015;8(1):1-9.
- NIGUSU B. PREVALENCE OF CLINICALLY ACTIVE TRACHOMA AND 26. ONE-TO-NINE-YEAR-OLD **ASSOCIATED FACTORS** AMONG CHILDREN TARMABER DISTRICT, AMHARA REGION, ETHIOPIA 2022.
- Shiferaw D, Moges HG. Risk factors for active trachoma among children aged 1-9 years in Maksegnit town, Gondar Zuria District, Northwest Ethiopia. Risk. 2013;2(3):202-6.
- Shimelash A, Alemayehu M, Dagne H, Mihiretie G, Lamore Y, Tegegne E, et al.
- Prevalence of active trachoma and associated factors among school age children in Debre Tabor
- Town, Northwest Ethiopia, 2019: a community based cross-sectional study. Italian Journal of
- Pediatrics. 2022;48(1):1-9.

- 29. Tadesse B, Worku A, Kumie A, Yimer SA. The burden of and risk factors for active trachoma in the North and South Wollo Zones of Amhara Region, Ethiopia: a cross-sectional study. Infectious diseases of poverty. 2017;6(1):1-12.
- Ayelgn K, Guadu T, Getachew A. Low prevalence of active trachoma and associated factors among children aged 1-9 years in rural communities of Metema District, Northwest
- Ethiopia: a community based cross-sectional study. Italian Journal of Pediatrics. 2021;47(1):1-8.
- Adera TH, Macleod C, Endriyas M, Dejene M, Willis R, Chu BK, et al. Prevalence of and risk factors for trachoma in Southern Nations, Nationalities, and Peoples' Region, Ethiopia:
- results of 40 population-based prevalence surveys carried out with the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2016;23(sup1):84-93.
- Admassu F, Bayu S, Bejiga A, Amare B. Active trachoma two years after three rounds of azithromycin mass treatment in Cheha district Gurage zone, Southern Ethiopia. BMC pediatrics. 2013;13:1-5.
- Admasu W, Hurissa B, Benti A. Prevalence of trachoma and associated risk factors 33. among Yello elementary school students. Loma Woreda, Dawro zone, Ethiopia J Nurs Care. 2015;1:2167.
- Alemayehu W, Melese M, Fredlander E, Worku A, Courtright P. Active trachoma in 34. children in central Ethiopia: association with altitude. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2005;99(11):840-3.
- Kedir S, Lemnuro K, Yesse M, Abdella B, Muze M, Mustefa A, et al. Prevalence and 35. Factors Associated with Active Trachoma among Children 1-9 years of Age in the Catchment Population of Tora Primary Hospital, Silte zone, Southern Ethiopia, 2020. The Open Ophthalmology Journal. 2021;15(1).
- Mehari ZA. Pattern of childhood ocular morbidity in rural eye hospital, Central Ethiopia. BMC ophthalmology. 2014;14(1):1-6.
 - Mengistu K, Shegaze M, Woldemichael K, Gesesew H, Markos Y. Prevalence and 37. factors associated with trachoma among children aged 1-9 years in Zala district, Gamo Gofa Zone, Southern Ethiopia. Clinical Ophthalmology. 2016:1663-70.
 - WoldeKidan E, Daka D, Legesse D, Laelago T, Betebo B. Prevalence of active trachoma 38. and associated factors among children aged 1 to 9 years in rural communities of Lemo district, southern Ethiopia: community based cross sectional study. BMC infectious diseases. 2019;19:1-8.
 - Alambo MM, Lake EA, Bitew Workie S, Wassie AY. Prevalence of active trachoma and associated factors in Areka Town, south Ethiopia, 2018. Interdisciplinary Perspectives on Infectious Diseases. 2020;2020.
 - Bero B, Macleod C, Alemayehu W, Gadisa S, Abajobir A, Adamu Y, et al. Prevalence of and risk factors for trachoma in Oromia regional state of Ethiopia: results of 79 population-based prevalence surveys conducted with the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(6):392-405.
- Kassim K, Kassim J, Aman R, Abduku M, Tegegne M, Sahiledengle B. Prevalence of active trachoma and associated risk factors among children of the pastoralist population in Madda Walabu rural district, Southeast Ethiopia: a community-based cross-sectional study.
- BMC infectious diseases. 2019;19(1):1-7.
- 42. Yalew KN, Mekonnen MG, Jemaneh AA. Trachoma and its determinants in Mojo and Lume districts of Ethiopia. The Pan African Medical Journal. 2012;13(Suppl 1).

Ophthalmic epidemiology. 2006;13(3):173-81.

Reda G, Yemane D, Gebreyesus A. Prevalence and associated factors of active trachoma among 1-9 years old children in Deguatemben, Tigray, Ethiopia, 2018: community cross-sectional study. BMC ophthalmology. 2020;20(1):1-9.

- Sherief ST, Macleod C, Gigar G, Godefay H, Abraha A, Dejene M, et al. The prevalence of trachoma in Tigray Region, Northern Ethiopia: results of 11 population-based prevalence surveys completed as part of the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):94-9.
- Negash K, Macleod C, Adamu Y, Ahmed M, Ibrahim M, Ali M, et al. Prevalence of trachoma in the Afar Region of Ethiopia: results of seven population-based surveys from the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2018;25(sup1):3-10.
- Duale AB, Negussu Ayele N, Macleod CK, Kello AB, Eshetu Gezachew Z, Binegdie A, 47. et al. Epidemiology of trachoma and its implications for implementing the "SAFE" strategy in Somali Region, Ethiopia: results of 14 population-based prevalence surveys. Ophthalmic epidemiology. 2018;25(sup1):25-32.
- Assefa N, Roba AA, Abdosh T, Kemal J, Demissie E. Prevalence and factors associated with trachoma among primary school children in Harari region, eastern Ethiopia. Ophthalmology Research: An International Journal. 2017;7(3):OR. 37212.
- Abashawl A, Macleod C, Riang J, Mossisa F, Dejene M, Willis R, et al. Prevalence of trachoma in Gambella Region, Ethiopia: results of three population-based prevalence surveys conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology. 2016;23(sup1):77-83.
- Adamu Y, Macleod C, Adamu L, Fikru W, Kidu B, Abashawl A, et al. Prevalence of trachoma in Benishangul Gumuz Region, Ethiopia: results of seven population-based surveys from the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):70-6.
- Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedri A, et al. National survey on blindness, low vision and trachoma in Ethiopia: Methods and study clusters profile. Ethiopian Journal of Health Development. 2007;21(3):185-203.
- Alemayehu M, Koye DN, Tariku A, Yimam K. Prevalence of active trachoma and its associated factors among rural and urban children in Dera Woreda, Northwest Ethiopia: a comparative cross-sectional study. Biomed research international. 2015;2015.
- Belsti Y, Fekadu SA, Assem AS. Active trachoma prevalence and its associated factors among children aged 1-9 years in rural residents of Lare District, Southwest Ethiopia. International Journal of Ophthalmology. 2021;14(11):1756.
- Ejigu M, Kariuki MM, Ilako DR, Gelaw Y. Rapid trachoma assessment in kersa district, Southwest Ethiopia. Ethiopian journal of health sciences. 2013;23(1):1-9.
- Miller HA, López de Mesa CB, Talero SL, Meza Cárdenas M, Ramírez SP, Moreno-Montova J, et al. Prevalence of trachoma and associated factors in the rural area of the
- department of Vaupés, Colombia. Plos one. 2020;15(5):e0229297.
- Kilangalanga J, Ndjemba JM, Uvon PA, Kibangala FM, Mwandulo J-LSB, Mavula N, et al. Trachoma in the Democratic Republic of the Congo: results of 46 baseline prevalence surveys
- conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology.
- 2018;25(sup1):192-200.

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text and

- Alada JJ, Mpyet C, Florea VV, Boisson S, Willis R, Bakhtiari A, et al. Prevalence of Trachoma in Kogi State, Nigeria: results of four local government area-level surveys from the
- global trachoma mapping project. Ophthalmic epidemiology. 2018;25(sup1):33-40.
- Baayenda G, Mugume F, Turyaguma P, Tukahebwa EM, Binagwa B, Onapa A, et al. Completing Baseline Mapping of Trachoma in Uganda: Results of 14 Population-Based
- Prevalence Surveys Conducted in and 2018. Ophthalmic epidemiology. 2018;25(sup1):162-70.
 - Brito CMGd, Medeiros ZMd, Barbosa CC, Montarroyos UR, Ferraz C, Vieira MdT, et al.
- Prevalence of trachoma in Pernambuco State, Brazil (2014-2015). Revista do Instituto de Medicina Tropical de São Paulo. 2021:63.
 - 60. Nasieku L, Mutai J, Muthami L, Karanja S. Determinants of active trachoma among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County, Kenya. African Journal
 - of Health Sciences. 2017;30(2):77-86.
 - Edwards T, Smith J, Sturrock HJ, Kur LW, Sabasio A, Finn TP, et al. Prevalence of 61. trachoma in Unity State, South Sudan: results from a large-scale population-based survey and potential implications for further surveys. PLoS neglected tropical diseases. 2012;6(4):e1585.
 - Géopogui A, Badila CF, Baldé MS, Nieba C, Lamah L, Reid SD, et al. Baseline trachoma 62. prevalence in Guinea: Results of national trachoma mapping in 31 health districts. PLoS

neglected tropical diseases. 2018;12(6):e0006585.

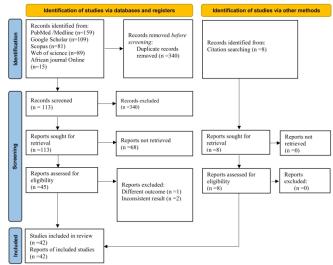


Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on pooled prevalence of trachoma infection among 1-9 years of any children in Ethioxic 2022

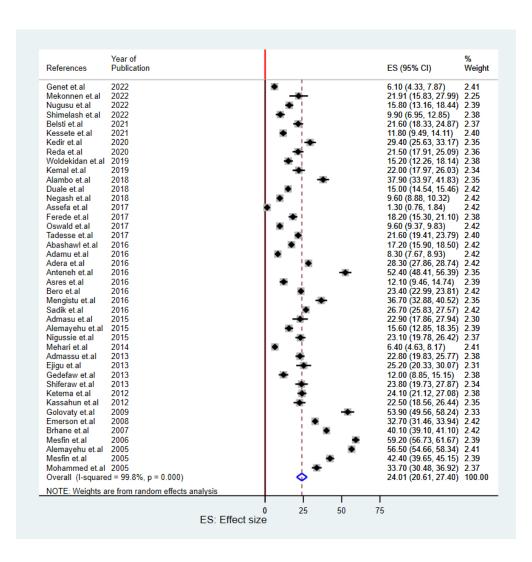
Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

297x210mm (300 x 300 DPI)

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de l Enseignement Superieur (ABES)

, Al training, and similar technologies

Protected by copyright, including for uses related to text and data mining,



290x295mm (72 x 72 DPI)

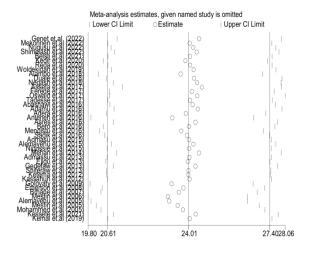


Figure 3. Leave-one sensitivity analysis on the studies included in pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023

Figure 3 Leave one sensitivity analysis on the studies included in the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

215x279mm (300 x 300 DPI)



Supplemental Table 1: PRISMA 2020 Checklist

		igl 20	
Section and Topic	Item #	Checklist item	Location where it is report
TITLE		iding	
Title	1	Identify the report as a systematic review.	1
ABSTRACT		u _ u	
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION		reig eig	
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	3-4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	6
METHODS			7
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	(
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consultable date when each source was last searched or consulted.	6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many were screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each poor whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of stromation tools used in the process.	7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presedation of results.	15
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study between the planned groups for each synthesis (item #5)).	8
;	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	7
7 3 9	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	9
)	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analyse, meta-regression).	15
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	16
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biase 2.	15
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	14



PRISMA 2020 Checklist

Page 29 of 37		BMJ Open BMJ Op	
PRIS	SMA 2	2020 Checklist copyrig 2020 Checklist	
Section and Topic	Item #	Checklist item	Location where item is reported
RESULTS		10i	
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the review, ideally using a flow diagram.	10
9	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	10
10 Study 11 characteristics	17	Cite each included study and present its characteristics.	10
12 Risk of bias in 13 studies	18	Present assessments of risk of bias for each included study.	8
14 Results of15 individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	8
16 Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	8
17 syntheses 18	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary at a gate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction the direction of the confidence of th	9
19	20c	Present results of all investigations of possible causes of heterogeneity among study results.	9
21	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	16
22 Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	9
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	9
25 DISCUSSION		9, 3.	
²⁶ Discussion 27	23a	Provide a general interpretation of the results in the context of other evidence.	17
21 28	23b	Discuss any limitations of the evidence included in the review.	18
29	23c	Discuss any limitations of the review processes used.	18
30	23d	Discuss implications of the results for practice, policy, and future research.	18
OTHER INFORMAT			18
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	11
۱ ۲	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	11
34 3 5 	24c	Describe and explain any amendments to information provided at registration or in the protocol.	11
36 Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	13
37 Competing 38 interests	26	Declare any competing interests of review authors.	13
39 Availability of 40 data, code and 4 other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	13

42
43 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systemat reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

		BMJ Open	cted by conv	Page 30 of 37
1	Supplemental Table 2: Search Strategy Summary		i con	
2		4	onvrigh	
3	Period search was conducted	20 May 2023 to 20 June 2023	;	
5	Inclusion	Cross sectional study	cludi	
6	criteria	Studies published until 31 July 2023	goza on	5
7		Studies conducted in Ethiopia.		
9		Children (1-9 years)	Ε Π Ξ	
10		Published in the English Language.	nse nse	5
11		 Studies reported the prevalence of Trachon 		
12	ZX61G61611	Case reports	and in	
13 14	criteria	case series		
15		review articles	Sup	3
16		letters to editors	erie and	
17	Libraries	Worldwide		
18 19	Records identified from secondary databases, Google	("magnitude"[All Fields] OR "magnitudes"[Al		
20	scholar	Subheading] OR "epidemiology"[All Fields		
21		"prevalence"[MeSH Terms] OR "prevalance"[Ago OR "prevalence s"[All Fields] OR "prevalent"[Ago OR "prevalent"[Ago OR "prevalent"]		
22		OR "prevalents"[All Fields] OR ("burden"[All		
23 24		"burdening"[All Fields] OR "burdens"[All Fields		
25		"epidemiology"[MeSH Subheading] OR		pidemiology"[All Fields] OR
26		"epidemiology"[MeSH Terms] OR "epidemiology"	en	iology s"[All Fields])) AND
27		("trachoma"[MeSH Terms] OR "trachoma"[All I		
28 29		("eye infections"[MeSH Terms] OR ("eye"[All F		
30		"eye infections"[All Fields] OR ("eye"[All Fields	A	ND "infection"[All Fields]) OR "eye
31		infection"[All Fields]) OR ("Trachomatous"[All	Fie	ds] AND ("intense"[All Fields] OR
32		"intense		.
33 34		ly"[All Fields] OR "intensities"[All Fields] OR "in		
35		Fields])) OR ("Trachomatous"[All Fields]		
36		("Ethiopia"[MeSH Terms] OR "Ethiopia"[All Field	asjų	PR Ethiopia's [All Fleids])
37			e	3
38 39				
40			ibilographique	
41			a pr	
42			q	
43			e	

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Page 31 of 37

Supplemental Table 3: Methodological quality assessment of included studies using the Newcastle-Ottawa quality assessment scale

Study	Selection				Comparability	Outcome	2023-0	
	Representat iveness of the sample	Sample size	Non respo ndent s	Asce rtain ment of the expo sure (max imu m scor e=2)	The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled((maximum score=2))	Assess ment of the outcom e(maxi mum score=2	s e te San 11 July 2024. Downloaded from http C Enseignement Superieur (ABES)	Total(10)
Abashawl et.al[49]	1	0	0	1	0	2	2 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6
Adamu et.al[50]	1	1	1	1	1	2 🤵	1 _{j.com}	8
Adera et.al[31]	1	0	1	1	1	2	on June	7
Admassu et.al[32]	1	0	1	2	1	2		8
Admasu et.al[33]	1	0	1	0	1	2 9	at Agence Bib	7
Alambo et.al[39]	1	0	1	1	1	2	liog	7
Alemayehu et.al[52]	1	1	1	1	1	2	graphique	8
Alemayehu et.al [34]	1 Fo	1 r peer review only	1 - http://bm	1 jopen.bm	1 j.com/site/about/guideline	2 s.xhtml	2e de l	9

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
42 43	
44	
45	

3 of 37				BMJ O	oen		136/bm	
Kedir et.al[<u>35]</u>	1	0	1	1	0	2	136/bmjopen-2023-079623 on 11 Cted by copyright, including for	7
Kemal et.al[<u>41]</u>	1	1	1	1	1	2	njopen-2023-079623 on 1 2 7 copyright, including fo	8
Kessete et.al[30]	1	1	0	1	1	2	23 on 11 ding for	7
Ketema et.al[24]	1	0	1	1	1	2	July 2024 Enseign	7
Mehari et.al [<u>36</u>]	1	0	1	2	1	2	July 2024. Downloaded from http://bmjopen.b Enseignement Superieur (ABES) . T Ises related to text and data mining, Altrainit	8
Mekonnen et.al[<u>15</u>]	1	0	5 1	1	0	2	aded fror perieur (7
Mengistu et.al[<u>37</u>]	1	1		1	1	2	n http://b ላቴES) . a mining,	8
Mesfin et.al[<u>43</u>]	1	1	0	1	1	2	mjopen.k	7
Mesfin et.al[<u>2]</u>	1	1	1	1	1 4	2	1.com	8
Mohammed et.al[8]	1	0	1	1	1	2	on June	8
legash et.al[<u>46]</u>	1	1	1	1	1	2	10, 2025 2 2	9
ligussie et.al[<u>25]</u>	1	1	1	1	1	2		8
Nigusu et.al[<u>26]</u>	1	1	1	1	1	2	at Agence Bibliographique de I	8
Oswald et.al[<u>16</u>]	1	0	1	1	1	2	raphique	7

Page 35 of 37

BMJ Open

BMJ Open

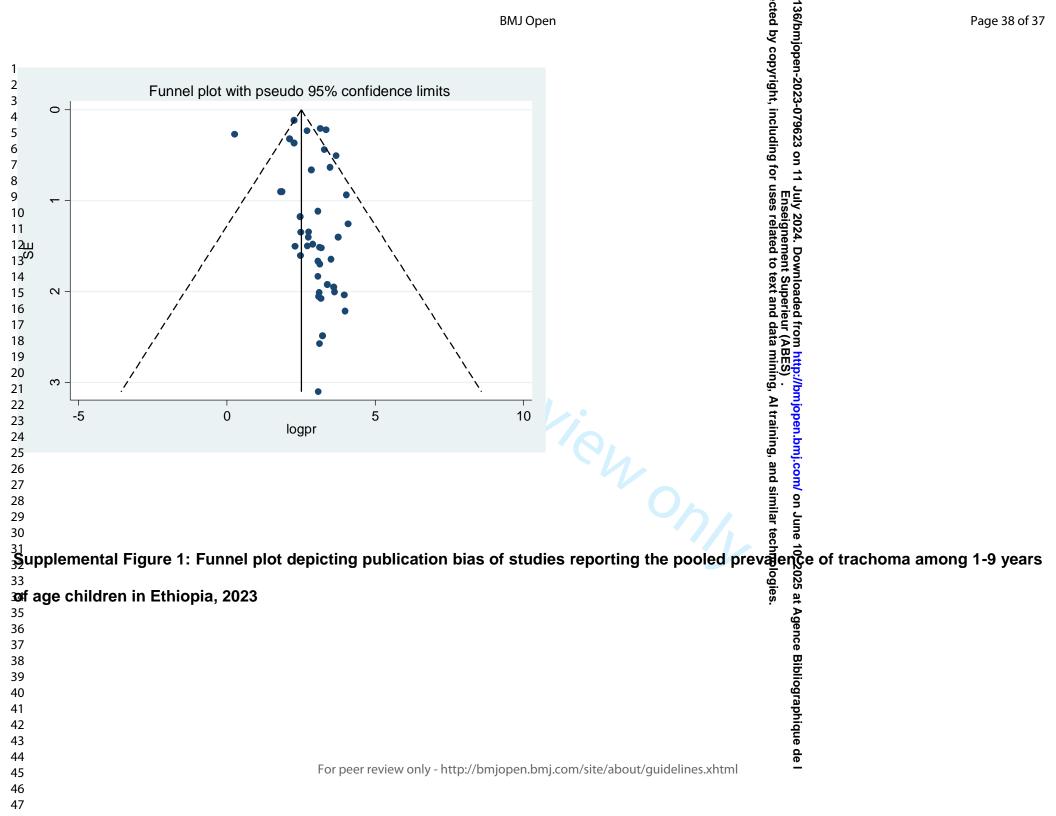
Supplemental Table 4: Study characteristics of included studies on the prevalence trachoma among children age 1-9 years; 2023

Author's	Year of Publication	Region	Study Area	Study Design	Sample Size	Male(n)	Female 20 (n) in	No of cases(n)	Prevalence %
Abashawl et.al [48]	2016	Gambela	Region-wide	CS	3238	NA	NA inclu	557	17.2
Adamu et.al ^[49]	2016	Benishangul Gumuz	Region-wide	CS	7417	3212	4205 ding fo	616	8.3
Adera et.al ^[30]	2016	SNNP	Region wide	CS	41,155	NA	NA use	11,647	28.3
Admassu et.al [31]	2013	SNNP	Guragie	CS	768	386	NA Enseign Fruses rela	175	22.8
Admasu et.al ^[32]	2015	SNNP	Dawro	CS	267	113	154 6 6	61	22.9
Alambo et.al ^[38]	2018	SNNP	Areka	CS	586	317	269 to te	222	37.9
Alemayehu et.al [51]	2015	Diredawa	Dera	CS	671	351	320 Superie	105	15.6
将lemayehu et.al	2005	SNNP	Guragie	CS	2788	NA	from http eur (ABES) d data min	1561	56.5
Anteneh et.al [16]	2016	Amhara	Gazegibela	CS	601	268	333 .	315	52.4
²² Asres et.al ^[17]	2016	Amhara	Gondar	CS	586	285	301 trainin	71	12.1
Assefa et.al [47]	2017	Harari	Harari	CS	1722	804	918 in bin	22	1.3
Belsti et.al ^[52]	2021	Southwest	Lare	CS	610	283		132	21.6
Bero et.al ^[39]	2016	Oromia	Region-wide	CS	41642	NA	NA similar te	9744	23.4
Brhane et.al ^[50]	2007	Nationwide	Nation-wide	CS	9289	NA	June lar te	3725	40.1
Duale et.al 46	2018	Somali	Region-wide	CS	23620	11462	12158 5	3543	15
∄jigu et.al ^[53]	2013	Southwest	Kersa	CS	305	154	151 gie	77	25.2
54 5€merson et.al ^[18]	2008	Amhara	Region-wide	CS	5485	NA	NA * A	1794	32.7
Ferede et.al ^[19]	2017	Amhara	Dembia	CS	681	NA	NA ence	121	18.2
Gedefaw et.al ^[20]	2013	Amhara	Dangila	CS	409	215	194 Bi	49	12
Genet et.al [21]	2022	Amhara	Dangila	CS	704	337	367	43	6.1
41 Ģ olovaty et.al ^[22]	2009	Amhara	Ankober	CS	507	219	288 Biqu	275	53.9
∰assahun et.al ^[41]	2012	Oromia	Мојо	CS	431	NA	NA de	97	22.5
K edir et.al ^[34]	2020	SNNP For peer	review only - http://k Silte	ngigpen.bmj	561	t/guidelines.xh 279	282	165	29.4

, 2025 at Agence Bibliographique de l

				BIVIJ Opei	n e		/bn d b		Page 36 01
Kemal et.al ^[40]	2019	Oromia	Medawalebu	CS	406	215	191 8 9	89	22
Kessete et.al ^[29]	2012	Amhara	Baso Liben	CS	792	391	75 (0	191	24.1
Ketema et.al ^[23]	2014	SNNP	Guragie	CS	735	366	369 Ft. 23-03	47	6.4
Mehari et.al [35]	2022	Oromia	Arsi Negele	CS	178	93	369 ht, includii 85	39	21.91
Mekonnen et.al ^[14]	2016	SNNP	Zala	CS	611	286	325 g on 1	224	36.7
Mengistu et.al ^[36]	2006	Tigray	Region wide	CS	1526	NA	NA us	903	59.2
Mesfin et.al ^[42]	2005	Amhara	Ebinet&East Belesa	CS	1244	601	643 September 1988 Se	527	42.4
Mesfin et.al ^[2]	2005	SNNP	Goro	CS	826	438	388 dimension	278	33.7
Mohammed et.al ^[8]	2018	Afar	Region-wide	CS	6399	NA	NA text and 265	611	9.6
Negash et.al ^[45]	2015	Amhara	Gonji Kolella	CS	618	353	265 and of	143	23.1
Nigussie et.al [24]	2022	Amhara	Tarimaber	CS	736	380	356 tar	116	15.8
Nigusu et.al ^[25]	2017	Amhara	Region wide	CS	62869	NA	NA ninin	6035	9.6
Oswald et.al ^[15]	2020	Tigray	Deguatemben	CS	502	257	245 ≥ 3	108	21.5
Reda et.al ^[43]	2016	Tigray	Region-wide	CS	10023	NA	NA traini	2676	26.7
S adik et.al ^[44]	2013	Amhara	Makisegnit	CS	420	209	211 🤵 🧾	100	23.8
Shiferaw et.al ^[26]	2022	Amhara	Debretabor	CS	394	70	324 and si	39	9.9
\$himelash et.al ^[27]	2017	Amhara	Wollo	CS	1358	638	720 mi on du	293	21.6
³ Padesse et.al ^[28]	2019	SNNP	Lemo	CS	574	NA	NA NA	87	15.2
32 §S: Cross-sectional st 34	udy						nologies.		

of 37		ВМЈ Оре	n	136/bm,
lemental Table 5: Meta-reg	ression of factor	s related to the heter	ogeneity on the pooled p	prevagenge of trachoma among 1-9 years
BMJ Open cod by Region 1.23 -0.000 0.000 Region 1.23 -0.000 0.000 Sample Size00000 to 0.000 0.49	ight, ii			
Variables	Coefficient	95% CI	P-value	79623
Year of Publication	-1.83	-2.54 to -1.10	0.00	on 11
Region	1.23	-1.19-3.66	0.30	July 20
Sample Size	000	00 to 0.00	0.49	024. Do
				tp://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de l S) . ning, Al training, and similar technologies.
				aphique o



BMJ Open

Prevalence of active trachoma among 1-9 years of age children in Ethiopia: a systematic review and meta-analysis

Journal:	BMJ Open
Manuscript ID	bmjopen-2023-079623.R3
Article Type:	Original research
Date Submitted by the Author:	24-May-2024
Complete List of Authors:	Asgedom, Yordanos; Wolaita Sodo University, Epidemiology; Wolaita Sodo University Melaku , Tsegaye; Jimma University, Institute of Health Gebrekidan, Amanuel; Wolaita Sodo University, School of Public Health Meskele , Mengistu ; Wolaita Sodo University, School of Public Health Asnake, Gedeon; Hawassa University, Midwifery Alemu, Afework; Wolaita Sodo University, medicine Efa, Amelework; SNNPR, Medicine Haile, Kirubel; Wolaita Sodo University, Nursing Kassie, Gizachew ; Wolaita Sodo University
Primary Subject Heading :	Ophthalmology
Secondary Subject Heading:	Infectious diseases
Keywords:	Systematic Review, Meta-Analysis, EPIDEMIOLOGY, Infection control < INFECTIOUS DISEASES, Public health < INFECTIOUS DISEASES, Paediatric ophthalmology < OPHTHALMOLOGY

SCHOLARONE™ Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

- 2 systematic review and meta-analysis
- 3 Yordanos Sisay Asgedom*, Tsegaye Melaku Kebede² Amanuel Yosef Gebrekidan³, ,
- 4 Mengistu Meskele Koyira⁴, Gedeon Asnake Azeze ^{5,} Afework Alemu Lombebo⁶,
- 5 Amelework Gonfa Efa⁷, Kirubel Eshetu Haile⁸, Gizachew Ambaw Kassie¹
- 6 1,9 Department of Epidemiology, Wolaita Sodo University, SNNPR, Ethiopia
- 7 ² Institute of Health, Jimma University, Oromia, Ethiopia
- 8 ^{3, 4} Schools of Public Health, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing and Midwifery, Hawassa University, Sidama, Ethiopia
- 10 6,7 School of Medicine, Wolaita Sodo University, SNNPR, Ethiopia
- School of Nursing, Wolaita Sodo University, SNNPR, Ethiopia
- *Correspondence:
- 13 Corresponding Author
- 14 yordusisay@gmail.com/yordanos.sisay@wsu.edu.et
- 15 Keywords: Trachoma, Children, Systematic review, Meta-analysis, Ethiopia

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

22 Abstract

- **Objective:** To determine the pooled prevalence of active trachoma among 1-9 year old
- children in Ethiopia.
- **Design:** A systematic review and meta-analysis were employed in accordance with the
- 26 Preferred Reporting Items for Systematic Reviews.
- 27 Data sources: Medline/PubMed, Scopus, Web of Science, African Journal of Online
- 28 (AJOL), and Google scholar databases were systematically explored to find studies
- 29 published in English until July 2023.
- **Eligibility criteria**: The following criteria apply: (1) Condition (Co): Studies examined the
- prevalence of trachoma among children (1-9) years old; (2) Context (Co): Studies
- conducted in Ethiopia; (3) Population (Pop): Studies that were done among children (1-9)
- years old; (4) Study type: observational studies; (5) Language: Studies published in
- 34 English.
- 35 Data extraction and synthesis: The data was extracted using a Microsoft Excel
- spreadsheet. DerSimonian-Laird random effect model was used to estimate the pooled
- prevalence of active trachoma among 1-9 years old children. Cochrane Q-tests and 1²
- 38 statistics were used across studies to assess heterogeneity. To identify possible
- publication bias, Egger's test was performed.
- **Primary outcome:** Prevalence of active trachoma.
- **Results:** Overall, a total of forty-two articles with 235,005 study participants were included
- 42 in the final analysis. The estimated pooled prevalence of active trachoma using random
- effect model was 24% (95% CI: 20%-27%). The sub-group analysis by region revealed the
- 44 highest prevalence of trachoma was 36% (95% CI: 13%-58%) in the Tigray region, and
- publication year revealed the prevalence of trachoma was decreasing from 32% to 19%
- 46 after 2015.
- **Conclusion:** In this review, the pooled prevalence of active trachoma was found to be
- 48 high in Ethiopia compared to World health Organization (WHO) threshold level. This

ng, Al training, and similar technologies

Protected by copyright, including for uses related

underscores the need for increased focus on high-risk age groups to decrease trachoma and to achieve the elimination of trachoma from the country by 2030.

Strength and Limitations of this study

- It follows the recommended updated PRISMA guidelines.
- We also rigorously searched the literature in different databases and identified eligible studies.
- One limitation of this systematic review and meta-analysis is that it only includes cross-sectional studies that report the proportion of trachoma cases.
- This review has not assessed associated factors.

Word count: 3285

Introduction

Globally, trachoma is the leading infectious cause of blindness. Trachoma has been named one of 20 neglected tropical diseases (NTDs) by the World Health Organization (WHO) [1, 2]. Children are the primary reservoirs of infection. Children aged 1 to 9 years are more likely to have an active trachoma [3]. Due to their tendency for close contact with others, children are frequently infected with *Chlamydia trachomatis* [4].

The poorest of the poor are primarily affected by trachoma [5]. The WHO 2021 report shows that trachoma is responsible for 1.9 million people with blindness and visual impairment; moreover, approximately 125 million people live in trachoma-endemic areas worldwide [1]. Around 3.8 million cases of blinding trachoma and 27.8 million cases of active trachoma have been reported in Africa, which is one of the most affected continents [6]. Ethiopia has the world's highest trachoma burden, with 76.2 million people living in endemic areas at risk of contracting the disease. Among Ethiopian children, active trachoma is ranged from 10.3% [7] to 74.3% [8] . For children aged 1-9 years living in endemic areas the prevalence of Trachomatous inflammation-follicular (TF) <5% is the elimination target set by WHO , However, the prevalence in Ethiopian children is higher than the target. If TF is > =5% among children aged 1-9 years, a SAFE strategy which includes Antibiotics, Face washing, and Environmental Improvement (A, F, and E) is recommended [9]. Globally, an estimated 8 billion US\$ in annual product loss is attributed to this disease [1].

Direct personal contact such as shared towels, flies, clothes, and fingers that interact with the infected person's eyes or nose is known for transmission of trachoma infection. The scarcity of safe drinking water access and sanitation systems has spread Chlamydia trachomatis infections. Corneal scarring and eyelid deformities can occur after inflammation and recurrent infections; if not treated, eyelid inversion (entropion) and the lashes turning inward (trichiasis) occur as late complications. Trichiasis and permanent damage to the cornea frequently result in irreversible blindness [1].

Eliminating trachoma by 2020 through the implementation of the SAFE strategy (surgery for in-turned eyelashes, antibiotics to clear the infection, and facial cleanliness and environmental improvement to reduce infection transmission) was set by the WHO and

Protected by copyright, including for uses related to text

other concerned organizations [1]. Ethiopia intended to eliminate trachoma through the SAFE strategy by implementing a national trachoma action plan in 2012 and a second master plan for 2016 to 2020 [10, 11]. Despite significant development, trachoma elimination was not met by December 2020 and it was pushed back to 2030 to align with the Sustainable Development Goals (SDGs) [1].

Despite the fact that numerous studies have been conducted in Ethiopian children (1-9 years) to assess the prevalence of trachoma and systematic review and meta-analysis in 2019 [12], Our reason for undergoing this systematic review and meta-analysis is that many studies have been published since then, and our study aimed to address specific stastical limitations in the previous studies. As a result, this study aimed to deliver a comprehensive updated nationwide prevalence of trachoma infection among children and geographical locations and to assess the ongoing preventive and control measures impact in the country.

Furthermore, the government and other concerned bodies may contribute by focusing on preventive measures such as improving access to water and sanitation, specifically in areas of high trachoma infection prevalence.

Research Question: What is the pooled prevalence of trachoma infection among children (1-9 years old) in Ethiopia?

Methods

Reporting

We performed our analyses according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [13]. The article screening was based

on the PRISMA 2020 statement, and the selection process has been shown using a PRISMA P flow diagram. The finding is presented using the standard PRISMA checklist (Supplemental Table 1). The review protocol is not registered in PROSPERO.

Search Strategy and study identification

To estimate the prevalence of trachoma among children (1–9) years old in Ethiopia, a systematic review and meta-analysis were performed. After an initial exploration of Google Scholar, MEDLINE, and SCOPUS with limited parameters, a follow-up search was conducted using all identified keywords and index terms across several databases. including MEDLINE, PubMed, SCOPUS, Web of Science, and African Journal Online (AJOL). All studies conducted on trachoma prevalence among children in Ethiopia were retrieved. The search included all articles published from database inception to July 31, 2023. English-language studies were only searched. Medical subject headings (MeSH) ((((("Magnitude") OR "prevalence" OR "burden") AND "Trachoma") OR "Eye infection" OR "Trachomatous intense" OR "Trachomatous follicular")) AND Ethiopia) were used in various combinations as the primary search keywords (Supplemental Table 2). During the systematic review and meta-analysis, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

[13].

Eligibility Criteria

- We used the condition, context, and population (CoCoPop) framework for the search and meta-analysis of eligibility criteria.
- Inclusion Criteria
- The following criteria were used to include studies in this systematic review and meta-analysis.
 - Condition (Co): we include studies that examine the prevalence of trachoma among children (1-9) years old.
 - Context (Co): studies conducted in Ethiopia were included.
 - Population (Pop): studies that were done among children (1-9 years).

Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies

Language: studies published in English were included

Exclusion criteria

- We excluded studies other than children (1-9 years) as well as those with different outcomes of interest, qualitative studies, case reports, case series, review papers, conference proceedings, and abstracts.
 - or comoronico procedumigo, ama abomac

Outcome measurement

This study aimed to gather and analyze data from various studies conducted in Ethiopia to determine the pooled prevalence of trachoma among children aged 1-9 years. We used a systematic approach to identify the relevant studies and extract data from them. Then we employ stastical methods to combine the data from different studies to estimate the overall pooled prevalence of trachoma among children (1-9 years old) in Ethiopia. The prevalence of trachoma, defined here as trachomatous inflammation follicular or trachomatous inflammation intense, among children was the major outcome of this review. We calculated the prevalence of trachoma in children by adjusting for the proportion of each age group (1-year increments) with active trachoma (TF) based on the local population distribution of 1-9 year-olds from the latest census data.

Data extraction and quality assessment

The Endnote citation manager (Version X8, for Windows, Thomson Reuters, Philadelphia, PA, USA) was used to import the retrieved studies, and then duplicates were removed. Two independent reviewers screened all the articles for eligibility criteria. The reviewers began by screening the abstracts and titles, followed by full-text screening. The quality of the articles was assessed using the Newcastle-Ottawa Quality Assessment Scale (adapted for cross- sectional studies) [14]. Disagreements were resolved by a third investigator. The articles were critically appraised by the following criteria from the tool: representativeness of the sample (1 score maximum), sample size (1 score maximum), non-respondent (1 score maximum), ascertainment of exposure (2 score maximum), comparability of outcome based on study design (2 score maximum), outcome assessment (2 score maximum) and statistical analysis (1 score maximum). All the included studies

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

assessed through the tool with a score of ≥5 were included in this systematic review and meta-analysis (Supplemental Table 3). After quality rating, no study was dismissed. During our quality assessment, nineteen studies score eight, seventeen studies score seven, five studies score nine and one study score six out of ten. Overall, the distribution of scores in the quality assessment indicates that the majority of studies were of good to high quality, with only a few studies showing lower scores. Two investigators used a standardized extraction format prepared in Microsoft Excel. The excel spreadsheet includes the name of the first author, publication year, study design, region, study area, number . gender, sample size, number of cases and trachoma prevalence.

Data was extracted in Microsoft Excel format and analyzed using STATA software version 16.0 (Stata Corp., LLC, Texas, USA). We used forest plots to report the estimated pooled prevalence of the study with a confidence interval (CI) to provide a visual summary of the data. Effect sizes were expressed as a proportion with 95% CI around the summary estimate. The data was first presented using a narrative synthesis of the included studies. We assumed no, low, medium, and high heterogeneity across studies if the l² values were 0%, 25%, 50%, and 75%, respectively. A meta-analysis using a random effects model was performed to analyze the pooled prevalence with 95% confidence intervals (CI) since significant heterogeneity was detected between studies. The heterogeneity of each outcome measure was assessed using both X² and I² statistics to determine dispersion. A meta-regression analysis was performed to investigate the source of heterogeneity. A funnel plot and Egger's regression test was conducted to assess publication bias. In addition, a leave-one-out sensitivity analysis was performed to evaluate the small study effect by excluding each study one at a time. The analysis was performed to assess the effect of each study on the pooled prevalence of trachoma, and subgroup analysis was performed to ensure consistency of the pooled results. Statistical significance was considered at p< 0.05.

Patient and public involvement

The public or patient were not involved in the design, conduct, reporting, or dissemination plans of this review.

data mining, Al training, and similar technologies

Protected by copyright, including for uses related to text and

Results

Search results

Our searching strategy initially identified 453 articles, and 340 duplicates were excluded by using the endnotes citation manager. Finally, 68 studies were further excluded after reviewing the title and abstract, and then the full text of 45 articles was reviewed for the necessary criteria. Excluding three articles as they were not reported outcomes of interest, finally, 42 studies that fulfilled the inclusion criteria were considered for the final analysis to estimate the overall pooled prevalence of trachoma among children (1–9 years) in Ethiopia. (Figure 1) illustrates the process of the literature review, screening, and eligibility assessment of the study articles.

Included studies characteristics

A total of forty-two cross-sectional studies (235,006 children) were included in this systematic review and meta-analysis (**Supplemental Table 4**). The spanned publication period was from 2005 to 2023. The sample size of the included studies ranges from 178 [15] to 62869[16]. With regard to study sites, sixteen of the primary studies included from the Amhara region [2, 16-30], nine from the SNNPR region [31-39] and six studies were included from Oromia [15, 40-42], and three from Tigray [43-45], respectively. However, one study each reported from Afar [46], Somali [47], Harari[48], Diredawa [8], Gambela [49], BenshangulGumuz [50], and nationwide [51] (Table

	Publication					Female		
Author's	year	Region	Study Area	Sample	Male(n)	(n)	Mato of cases (n)	Prevalence %
Abashawl et.al[49]	2016	Gambela	Region-wide	3238	NA	NA	7 202 seigi s (%)	17.2
Adamu et.al[50]	2016	Benishangul Gumuz	Region-wide	7417	3212	4205	2024. Downloaded from http://b signement/Superieur (ABES) திள்கு tottext/and துள்கிறாற்ற	8.3
Adera et.al[31]	2016	SNNP	Region-wide	41,155	NA	NA	wal to 1e	28.3
Admassu et.al[32]	2013	SNNP	Guragie	768	386	382	oade uperi	22.8
Admasu et.al[33]	2015	SNNP	Dawro	267	113	154	d fro	22.9
Alambo et.al[39]	2018	SNNP	Areka	586	317	269	m ht	37.9
Alemayehu et.al[52]	2015	Amhara	Dera	671	351	320	ning S) ning	15.6
Alemayehu et.al [34]	2005	SNNP	Guragie	2788	NA	NA	1561 on 150 on	56.5
Anteneh et.al[17]	2016	Amhara	Gazegibela	601	268	333	en.k	52.4
Asres et.al[<u>18</u>]	2016	Amhara	Gondar	586	285	301	omj.com/	12.1
Assefa et.al[48]	2017	Harari	Harari	1722	804	918	om/	1.3
Belsti et.al[<u>53</u>]	2021	Southwest	Lare	610	283	327	mjopen.bmj.com/ on Ju 61 61 79 trathing⊊an@simtlar	21.6
Bero et.al[40]	2016	Oromia	Regionwide	41642	NA	NA	967 44 m	23.4
Brhane et.al[<u>51</u>]	2007	Nationwide	Nationwide	9289	NA	NA	10, 2025 a	40.1
Duale et.al[47]	2018	Somali	Region-wide	23620	11462	12158)25 a o∰es	15
Ejigu et.al[<u>54</u>]	2013	Southwest	Kersa	305	154	151	77 Age	25.2
Emerson et.al[19]	2008	Amhara	Region wide	5485	NA	NA	1794 c	32.7
Ferede et.al[20]	2017	Amhara	Dembia	681	NA	NA	121	18.2
Gedefaw et.al[21]	2013	Amhara	Dangila	409	215	194	ogra	12

⁻ 37		ВМЈ О	36/bmj ted by					
							136/bmjopen-2023-079623 on 1 cted by copyright, Packvalingട്ട്o	
Genet et.al [22]	2022	Amhara	Dangila	704	337	367	23-07	6.1
Golovaty et.al[<u>23</u>]	2009	Amhara	Ankober	507	219	288	9623 2015	53.9
(assahun et.al[<u>42</u>]	2012	Oromia	Mojo	431	NA	NA	on 1	22.5
(edir et.al[<u>35]</u>	2020	SNNP	Silte	561	279	282	 	29.4
emal et.al[41]	2019	Oromia	Medawalebu	406	215	191	y 20; seig	22
(essete et.al[<u>30</u>]	2021	Amhara	Metema	752	352	400	24. D	11.8
(etema et.al[24]	2012	Amhara	Baso Liben	792	391	401	July 2024. Downloaded from http://t .Enseignement Superieur (ABES), . மீses ஐelatஐd tottextand அataிhinன்ற	24.1
lehari et.al [<u>36</u>]	2014	SNNP	Guragie	735	366	369	loade Super	6.4
lekonnen et.al[<u>15</u>]	2022	Oromia	Arsi Negele	178	93	85	ed from the second seco	21.91
lengistu et.al[<u>37]</u>	2016	SNNP	Zala	611	286	325	A ABL	36.7
lesfin et.al[<u>43</u>]	2006	Tigray	Regionwide	1526	NA	NA	in Sign	59.2
lesfin et.al[2]	2005	Amhara	Ebinet	1244	601	643	3≥ 7 3 .	42.4
lohammed et.al[<u>8</u>]	2005	Diredawa	Goro	826	438	388	mjopen.bmj.com/	33.7
egash et.al[<u>46]</u>	2018	Afar	Regionwide	6339	NA	NA		9.6
ligussie et.al[<u>25</u>]	2015	Amhara	Gonji Kolella	618	353	265	20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	23.1
ligusu et.al[<u>26</u>]	2022	Amhara	Tarimaber	736	380	356	on J	15.8
swald et.al[<u>16</u>]	2017	Amhara	Region wide	62869	NA	NA	on June 1	9.6
Reda et.al[44]	2020	Tigray	Deguatemben	502	257	245	10, 2025 http://www.new.new.new.new.new.new.new.new.new.	21.5
Sadik et.al[45]	2016	Tigray	Regionwide	10023	NA	NA	025 g	26.7
Shiferaw et.al[27]	2013	Amhara	Makisegnit	420	209	211	100 Age	23.8
Shimelash et.al[<u>28]</u>	2022	Amhara	Debretabor	394	70	324	39 Gence	9.9
adesse et.al[29]	2017	Amhara	Wollo	1358	638	720	293 💆	21.6
Voldekidan et.al[<u>38]</u>	2019	SNNP	Lemo	574	NA	NA	87 87 e e e	15.2

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http Enseignement Superieur (ABES)

Protected by copyright, including for uses related to text and

pooled prevalence estimates of trachoma among The

children in Ethiopia

Subgroup analysis

The pooled prevalence of trachoma among children (1–9 years old) in Ethiopia was identified in 42 studies. Of a total of 235,006 children, 45,711 were infected with trachoma. Stastically significant heterogeneity was observed (I2 = 99.8%; p<0.0001).

We used a random effect model to estimate the pooled prevalence of trachoma among children (1–9 years), which was 24.1% (995% CI: 20.67–27.40%) (Figure 2).

To identify the potential source of heterogeneity, a subgroup analysis was executed based on the study area (region) and publication year. Based on the subgroup analysis by the study, in the region of Ethiopia, the highest prevalence of trachoma was reported in Tigray at 35.81 (95% CI: 13.84-57.78), followed by SNNP at 28.98 (20.14-37.82). Subgroup analysis by publication year was performed to overlook the trends over ten years in the pooled prevalence of trachoma among children in Ethiopia. The results of the subgroup analysis revealed a significant difference in the pooled prevalence of trachoma among children, with rates of 32.53% (95% CI: 24.32-40.76) before 2015 and 19.93% (95% CI: 16.35-23.51) since 2015 (Table 2).

Table 2: Subgroup-analysis on the pooled prevalence of trachoma infection among children (1-9 years) in Ethiopia, 2023

Table 2: Sul	ogroup-analysis on the	pooled prevalence of trac	choma infec	tion	. a
	dren (1-9 years) in Ethic				9
Subgroups	Number of studies	Prevalence (95%CI)	l ²	P-value	
Regions		1			- E
Amhara	16	23.02(16.7,29.31)	59.5	0.001	
SNNPR	10	28.58 (20.14,37.82)	99.5	0.001	
Oromia	6	23.36(22.96,23.75)	0.00	0.107	
Tigray	3	35.81(13.84,57.78)	59.7	0.100	

Others	7	15.29(7.33,23.26)	59.9	0.600	
Over all	42	24.01(20.61,27.40)		59.8	0.001
Publication	ı year				
>= 2015	28	19.71(16.27,23.15)	99.8	0.001	Prote
<2015	14	32.53(24.31,40.76)	99.5	0.001	cted by
Over all	42	24.01(20.61,27.40)	,	59.8	0.0016
	ion bias asses	sment spected to assess potential publi	cation bias.	which was	Protected by copyright, including for 0.00
statistically	supported by Egge	er's test. The symmetrical distri	bution of th	ne included	r uses re
•	· ·	d funnel indicated the absence Egger tests revealed no publi	·		uses related to text and data
studies incl	luded to estimate	the pooled prevalence of track	noma infect	ion among	text
children in E	Ethiopia, with p -valu	es of (p = 0.260).			and o
Meta-Re	gression				data minii

Publication bias assessment

data mining, Al training, and similar technologies

http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de

Meta-Regression

Meta-regression was used to identify factors associated with the pooled prevalence of trachoma among children (1–9 years old). For the meta-regression, publication year, region, and sample size were considered. The analysis revealed a significant correlation between the pooled prevalence of trachoma among children (1–9 years) and publication year (P<0.001) but no significant correlation with sample size or region (Supplemental Table 5).

Sensitivity analysis

By excluding each study individually, a leave-out-one sensitivity analysis was used to determine the effect of a single study on the pooled prevalence of trachoma among children (1-9 years) in Ethiopia. Our finding revealed that no single study had a

Discussion

The purpose of this systematic review and meta-analysis is to add national data on the prevalence of trachoma infection among Ethiopian children to eliminate the disease. Although different studies from different regions have been published in the country, the data on trachoma infections has to be organized and updated every time. Therefore, updating the information has the potential to inform and help develop different strategies by targeting highly endemic areas.

The pooled overall prevalence of Trachoma (24.01%) observed in the current review is comparable with a study from Colombia [55], but higher than the study done in the Democratic Republic of Congo[56], Nigeria [57], Uganda [58], Brazil [59], and Kenya [60]. This prevalence is lower than studies from South Sudan [61] and Guinea [62]. The disparity among the findings might be due to environmental factors such as the level of participants' hygiene, sanitation, access to functional latrines, and clear water supply, and recent studies were included in our review that reported an ongoing sustainable water, sanitation, and hygiene (WASH) program and mass drug administration (MDA) with azithromycin which might reduce trachoma prevalence among children in Ethiopia, unlike the South Sudan study, which lacks MDA and targets SAFE strategy [61].

The subgroup analysis of this review also shows a statistically significant (p = 0.01) difference among regions. Trachoma was highly prevalent in Tigray and SNNP, followed by Oromia and the Amhara regions. Trachoma infection is related to inadequate hygiene, a low standard of living, inadequate access to water, and inadequate access to sanitation. In the Tigray region, trachoma prevalence is high ,which might also be related to extreme climatic events that favor a decline in water availability during dry periods, which affects personal hygiene. Another reason for the difference is attributed to baseline and intervention disparities in the communities. MDA

with azithromycin once a year is needed based on the review findings (24%), and Ethiopia is known to require intervention based on the WHO 2021 report (1).

Though the decline is not statistically significant (p = 0.30), our results from this review revealed studies conducted between 2005-2014 and 2015-2022, which show a decrease in the prevalence of trachoma from 32% to 19%. The expansion of MDA and WASH programs might be attributed to the decrease in prevalence. This review has the implication of revealing the national burden of trachoma infection among children, who are a special population and account for one-third of the national population. Moreover, this large magnitude of trachoma infection shows a significant gap in the implementation of WHO designed and national elimination strategies. Last but not least, from a research perspective, we recommend conducting operational studies on the topic.

Strength and limitations of the study

The current meta-analysis has several strengths. It provides a comprehensive overview of trachoma among Ethiopian children in accordance with the most recent PRISMA guidelines. We conducted a thorough search of the literature using multiple databases and found eligible studies. Although the meta-analytic techniques used in this study were strong, the results should be interpreted with caution due to the study's limitations. First, there was significant heterogeneity in trachoma prevalence in Ethiopia. However, this heterogeneity can be attributed to factors such as publication year and sample size. Secondly, all the included studies were cross-sectional, which, owing to the nature of the study design, makes it challenging to demonstrate a cause-and-effect relationship. Moreover, this systematic review and meta-analysis has not assessed associated factors of trachoma among children in Ethiopia.

Conclusions

An effort has been made to eliminate trachoma infection, which is still highly prevalent across the Ethiopian regions. Even though the decline is not statistically significant, we saw decreased trachoma prevalence in Ethiopian children. Trachoma is highly prevalent

in Tigray, followed by SNNPR. Moreover, trachoma remains a significant public health concern among adults in Ethiopia. The prevalence of trachoma in this population is alarmingly high, highlighting the urgent need for continued efforts to improve access to clean water, sanitation, and hygiene practices. Despite the effort made by the country to eliminate trachoma infection, according to the WHO risk classification, it remains a public health problem in the country. The output of this review will offer valuable data to the Ministry of Health, policymakers, and concerned bodies that work on eliminating trachoma infection in the country. Trachoma infection is highly prevalent based on this review, and it underlines the need for improved prevention and control strategies for one of the neglected tropical diseases in Ethiopia.

- List of Abbreviations CI: Confidence interval; NTDs: Neglected tropical disease;
- PRISMA: Preferred reporting items for systematic review and meta-analysis; SAFE:
- 349 Surgery for Trichiasis, Antibiotics, Face Washing and Environmental improvement
- strategy; SDG: Sustainable development goal; SNNPR: South Nation and Nationalities
- people; WHO: World Health Organization.
- Acknowledgment: We are indebted to all the researchers whose studies were included
- in this study.

- Contributors: Conceptualization: YSA, TMK, GAK; Data curation: YSA, TMK, GAK,
- MMK, AYG; Investigation: YSA, AAL, AGE; Methodology: YSA, TMK, GAK, KEH;
- Software: YSA, GAK, TMK; Validation: YSA, MMK, GAK, AYG; Writing: YSA, TMK,
- 357 GAK; Writing review and editing: All the authors read and approve the manuscript.
- Funding: No specific funding for this work has been received by the authors.
- 359 Competing interest: The review was conducted without any personal or financial
- relationship that could lead to conflict.
- Patient consent for publication: Not applicable
- **Ethical approval:** Not applicable
- Data Availability: All associated data and supporting information are included in this
- 364 systematic review and meta-analysis.

Reference

- 1. World Health Organization (WHO). Trachoma. Factsheet Switherland, Geneva 2022.
- Mesfin A. Assessing the prevalence of active trachoma among young children in relation to the implementation of SAFE strategy in Ebinat and East Belesa Woreda, Northwest Ethiopia: Addis Ababa University; 2005.
- 371 3. Solomon AW, Organization WH, Initiative IT. Trachoma control: a guide for programme managers: World Health Organization; 2006.
- 4. Center C. Women and trachoma: Achieving gender equity in the implementation of SAFE. The Carter Center. 2009.
- 5. Habtamu E, Wondie T, Aweke S, Tadesse Z, Zerihun M, Zewdie Z, et al. Trachoma and relative poverty: a case-control study. PLoS neglected tropical diseases. 2015;9(11):e0004228.
- 577 6. Smith JL, Flueckiger RM, Hooper PJ, Polack S, Cromwell EA, Palmer SL, et al. The geographical distribution and burden of trachoma in Africa. PLoS neglected tropical diseases. 379 2013;7(8):e2359.
- 7. Basha GW, Woya AA, Tekile AK. Prevalence and risk factors of active trachoma among primary school children of Amhara Region, Northwest Ethiopia. Indian Journal of Ophthalmology. 2020;68(5):750.
- 8. Mohamed H, Weldegebreal F, Mohammed J, Gemechu A. Trachoma and Associated Factors among School Age Children 4-9 Years in Dire Dawa Administration, Eastern Ethiopia. East African Journal of Health and Biomedical Sciences. 2019;3(2):45-54.
- 9. Organization WH. WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2018. Weekly epidemiological record. 2019;94(29):317-28.
- 10. (MOH) FMoH. Second edition of Neglected Tropical Diseases Master Plan 2015/2016.
 390 Addis Ababa, Ethiopia 2016.
- 391 11. Abebe TA, Tucho GT. The impact of access to water supply and sanitation on the 392 prevalence of active trachoma in Ethiopia: A systematic review and meta-analysis. PLoS 393 Neglected Tropical Diseases. 2021;15(9):e0009644.
- 394 12. Gebrie A, Alebel A, Zegeye A, Tesfaye B, Wagnew F. Prevalence and associated factors 395 of active trachoma among children in Ethiopia: a systematic review and meta-analysis. BMC 396 infectious diseases. 2019;19:1-12.
- 13. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International journal of surgery. 2021;88:105906.
- 400 14. Modesti P, Reboldi G, Cappuccio F. Newcastle-Ottawa Quality Assessment Scale 401 (adapted for cross sectional studies). PLoS One. 2016;11(1):e0147601.
- 15. Mekonnen J, Kassim J, Ahmed M, Gebeyehu N. Prevalence of active trachoma and associated factors among children 1–9 years old at Arsi Negele Town, West Arsi Zone, Oromia Regional State, Southern Ethiopia. Plos one. 2022;17(10):e0273808.
- Oswald WE, Stewart AE, Kramer MR, Endeshaw T, Zerihun M, Melak B, et al. Active
 trachoma and community use of sanitation, Ethiopia. Bulletin of the World Health Organization.
 2017;95(4):250.
- 408 17. Anteneh ZA, Getu WY. Prevalence of active trachoma and associated risk factors among 409 children in Gazegibela district of Wagehemra Zone, Amhara region, Ethiopia: community-based 410 cross-sectional study. Tropical diseases, travel medicine and vaccines. 2016;2(1):1-7.

trachoma among children in Gondar Zuria District North Gondar, Ethiopia. Prev Med.

2016;1(1):5.

- 19. Emerson PM, Ngondi J, Biru E, Graves PM, Ejigsemahu Y, Gebre T, et al. Integrating an NTD with one of "the big three": combined malaria and trachoma survey in Amhara Region of
- Ethiopia. PLoS neglected tropical diseases. 2008;2(3):e197.
- Ferede AT, Dadi AF, Tariku A, Adane AA. Prevalence and determinants of active
- trachoma among preschool-aged children in Dembia District, Northwest Ethiopia. Infectious diseases of poverty. 2017;6(1):1-7.
- Gedefaw M, Shiferaw A, Alamrew Z, Feleke A, Fentie T, Atnafu K. Current state of
- active trachoma among elementary school students in the context of ambitious national growth
- plan: The case of Ethiopia. Health. 2013;2013.
- Genet A, Dagnew Z, Melkie G, Keleb A, Motbainor A, Mebrat A, et al. Prevalence of
- active trachoma and its associated factors among 1–9 years of age children from model and non-
- model kebeles in Dangila district, northwest Ethiopia. Plos one. 2022;17(6):e0268441.
- Golovaty I, Jones L, Gelaye B, Tilahun M, Belete H, Kumie A, et al. Access to water
- source, latrine facilities and other risk factors of active trachoma in Ankober, Ethiopia. PLoS
- One. 2009;4(8):e6702.
- Ketema K, Tiruneh M, Woldeyohannes D, Muluye D. Active trachoma and associated
- risk factors among children in Baso Liben District of East Gojjam, Ethiopia. BMC public health.
- 2012;12(1):1-7.
- 25. Nigusie A, Berhe R, Gedefaw M. Prevalence and associated factors of active trachoma
- among childeren aged 1–9 years in rural communities of Gonji Kolella district, West Gojjam
- zone, North West Ethiopia. BMC research notes. 2015;8(1):1-9.
- NIGUSU B. PREVALENCE OF CLINICALLY ACTIVE TRACHOMA AND
- **ASSOCIATED FACTORS AMONG** ONE-TO-NINE-YEAR-OLD **CHILDREN** IN
- TARMABER DISTRICT, AMHARA REGION, ETHIOPIA 2022.
- Shiferaw D, Moges HG. Risk factors for active trachoma among children aged 1-9 years
- in Maksegnit town, Gondar Zuria District, Northwest Ethiopia. Risk. 2013;2(3):202-6.
- Shimelash A, Alemayehu M, Dagne H, Mihiretie G, Lamore Y, Tegegne E, et al.
- Prevalence of active trachoma and associated factors among school age children in Debre Tabor
- Town, Northwest Ethiopia, 2019: a community based cross-sectional study. Italian Journal of
- Pediatrics. 2022;48(1):1-9.
- Tadesse B, Worku A, Kumie A, Yimer SA. The burden of and risk factors for active 29.
- trachoma in the North and South Wollo Zones of Amhara Region, Ethiopia: a cross-sectional
- study. Infectious diseases of poverty. 2017;6(1):1-12.
- Ayelgn K, Guadu T, Getachew A. Low prevalence of active trachoma and associated
- factors among children aged 1–9 years in rural communities of Metema District, Northwest
- Ethiopia: a community based cross-sectional study. Italian Journal of Pediatrics. 2021;47(1):1-8.
- Adera TH, Macleod C, Endriyas M, Dejene M, Willis R, Chu BK, et al. Prevalence of
- and risk factors for trachoma in Southern Nations, Nationalities, and Peoples' Region, Ethiopia:
- results of 40 population-based prevalence surveys carried out with the Global Trachoma
- Mapping Project. Ophthalmic epidemiology. 2016;23(sup1):84-93.
- Admassu F, Bayu S, Bejiga A, Amare B. Active trachoma two years after three rounds of
- azithromycin mass treatment in Cheha district Gurage zone, Southern Ethiopia. BMC pediatrics.
- 2013;13:1-5.

33.

36.

37.

39.

40.

42.

2015;1:2167.

Tropical Medicine and Hygiene. 2005;99(11):840-3.

Zone, Southern Ethiopia. Clinical Ophthalmology. 2016:1663-70.

Ophthalmology Journal. 2021;15(1).

BMC ophthalmology. 2014;14(1):1-6.

Infectious Diseases. 2020;2020.

epidemiology. 2016;23(6):392-405.

BMC infectious diseases. 2019;19(1):1-7.

Ophthalmic epidemiology. 2006;13(3):173-81.

among Yello elementary school students. Loma Woreda, Dawro zone, Ethiopia J Nurs Care.

children in central Ethiopia: association with altitude. Transactions of the Royal Society of

Factors Associated with Active Trachoma among Children 1-9 years of Age in the Catchment

Population of Tora Primary Hospital, Silte zone, Southern Ethiopia, 2020. The Open

factors associated with trachoma among children aged 1-9 years in Zala district, Gamo Gofa

and associated factors among children aged 1 to 9 years in rural communities of Lemo district,

southern Ethiopia: community based cross sectional study. BMC infectious diseases. 2019;19:1-

associated factors in Areka Town, south Ethiopia, 2018. Interdisciplinary Perspectives on

and risk factors for trachoma in Oromia regional state of Ethiopia: results of 79 population-based

prevalence surveys conducted with the global trachoma mapping project. Ophthalmic

active trachoma and associated risk factors among children of the pastoralist population in

Madda Walabu rural district, Southeast Ethiopia: a community-based cross-sectional study.

based trachoma survey: prevalence and risk factors in the Tigray region of northern Ethiopia.

among 1-9 years old children in Deguatemben, Tigray, Ethiopia, 2018: community cross-

Admasu W, Hurissa B, Benti A. Prevalence of trachoma and associated risk factors

Alemayehu W, Melese M, Fredlander E, Worku A, Courtright P. Active trachoma in

Kedir S, Lemnuro K, Yesse M, Abdella B, Muze M, Mustefa A, et al. Prevalence and

Mehari ZA. Pattern of childhood ocular morbidity in rural eye hospital, Central Ethiopia.

Mengistu K, Shegaze M, Woldemichael K, Gesesew H, Markos Y. Prevalence and

WoldeKidan E, Daka D, Legesse D, Laelago T, Betebo B. Prevalence of active trachoma

Alambo MM, Lake EA, Bitew Workie S, Wassie AY. Prevalence of active trachoma and

Bero B, Macleod C, Alemayehu W, Gadisa S, Abajobir A, Adamu Y, et al. Prevalence of

Kassim K, Kassim J, Aman R, Abduku M, Tegegne M, Sahiledengle B. Prevalence of

Yalew KN, Mekonnen MG, Jemaneh AA. Trachoma and its determinants in Mojo and

Mesfin MM, de la Camera J, Tareke IG, Amanual G, Araya T, Kedir AM. A community-

Reda G, Yemane D, Gebrevesus A. Prevalence and associated factors of active trachoma

Sherief ST, Macleod C, Gigar G, Godefay H, Abraha A, Dejene M, et al. The prevalence

of trachoma in Tigray Region, Northern Ethiopia: results of 11 population-based prevalence surveys completed as part of the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):94-9.

sectional study. BMC ophthalmology. 2020;20(1):1-9.

Negash K, Macleod C, Adamu Y, Ahmed M, Ibrahim M, Ali M, et al. Prevalence of trachoma in the Afar Region of Ethiopia: results of seven population-based surveys from the

Lume districts of Ethiopia. The Pan African Medical Journal. 2012;13(Suppl 1).

Global Trachoma Mapping Project. Ophthalmic epidemiology. 2018;25(sup1):3-10.

Somali Region, Ethiopia: results of 14 population-based prevalence surveys. Ophthalmic

epidemiology. 2018;25(sup1):25-32.

Assefa N, Roba AA, Abdosh T, Kemal J, Demissie E. Prevalence and factors associated with trachoma among primary school children in Harari region, eastern Ethiopia. Ophthalmology Research: An International Journal. 2017;7(3):OR. 37212.

- Abashawl A, Macleod C, Riang J, Mossisa F, Dejene M, Willis R, et al. Prevalence of trachoma in Gambella Region, Ethiopia: results of three population-based prevalence surveys
- conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology.
- 2016;23(sup1):77-83.

- Adamu Y, Macleod C, Adamu L, Fikru W, Kidu B, Abashawl A, et al. Prevalence of trachoma in Benishangul Gumuz Region, Ethiopia: results of seven population-based surveys
- from the global trachoma mapping project. Ophthalmic epidemiology. 2016;23(sup1):70-6.
- Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedri A, et al. National survey
- on blindness, low vision and trachoma in Ethiopia: Methods and study clusters profile. Ethiopian
- Journal of Health Development. 2007;21(3):185-203.
- Alemayehu M, Koye DN, Tariku A, Yimam K. Prevalence of active trachoma and its
- associated factors among rural and urban children in Dera Woreda, Northwest Ethiopia: a
- comparative cross-sectional study. Biomed research international. 2015;2015.
- Belsti Y, Fekadu SA, Assem AS. Active trachoma prevalence and its associated factors
- among children aged 1-9 years in rural residents of Lare District, Southwest Ethiopia.
- International Journal of Ophthalmology. 2021;14(11):1756.
- Ejigu M, Kariuki MM, Ilako DR, Gelaw Y. Rapid trachoma assessment in kersa district, Southwest Ethiopia. Ethiopian journal of health sciences. 2013;23(1):1-9.
- Miller HA, López de Mesa CB, Talero SL, Meza Cárdenas M, Ramírez SP, Moreno-55.
- Montoya J, et al. Prevalence of trachoma and associated factors in the rural area of the department of Vaupés, Colombia. Plos one. 2020;15(5):e0229297.
- Kilangalanga J, Ndjemba JM, Uvon PA, Kibangala FM, Mwandulo J-LSB, Mavula N, et 56.
- al. Trachoma in the Democratic Republic of the Congo: results of 46 baseline prevalence surveys
- conducted with the Global Trachoma Mapping Project. Ophthalmic epidemiology.
- 2018;25(sup1):192-200.
- Alada JJ, Mpyet C, Florea VV, Boisson S, Willis R, Bakhtiari A, et al. Prevalence of
- Trachoma in Kogi State, Nigeria: results of four local government area-level surveys from the global trachoma mapping project. Ophthalmic epidemiology, 2018;25(sup1):33-40.
- Baayenda G, Mugume F, Turyaguma P, Tukahebwa EM, Binagwa B, Onapa A, et al. Completing Baseline Mapping of Trachoma in Uganda: Results of 14 Population-Based
- Prevalence Surveys Conducted in and 2018. Ophthalmic epidemiology.
- 2018;25(sup1):162-70.
- Brito CMGd, Medeiros ZMd, Barbosa CC, Montarroyos UR, Ferraz C, Vieira MdT, et al.
- Prevalence of trachoma in Pernambuco State, Brazil (2014-2015). Revista do Instituto de
- Medicina Tropical de São Paulo. 2021;63.
- Nasieku L, Mutai J, Muthami L, Karanja S. Determinants of active trachoma among 60.
- children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County, Kenya. African Journal
- of Health Sciences. 2017;30(2):77-86.

Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies

1	
2	
3	
	547
4	548
5	
5	549
7	550
8	551
9	552
10	332
11	553
12	
13	554
14	
15	555
16	
17	556
18	330
19	
20	557
21	337
22	
	558
23	
24	
25	559
26	
27	
28	560
29	
30	F.C.4
31	561
32	
33	562
	302
34	
35	563
36	
37	
38	564
39	
40	
41	565
42	
43	566
44	
45	567
46	507
47	
48	568
49	500
50	
51	569
52	
53	570
54	
55	
56	571

57

58 59

- 61. Edwards T, Smith J, Sturrock HJ, Kur LW, Sabasio A, Finn TP, et al. Prevalence of trachoma in Unity State, South Sudan: results from a large-scale population-based survey and potential implications for further surveys. PLoS neglected tropical diseases. 2012;6(4):e1585.
- Géopogui A, Badila CF, Baldé MS, Nieba C, Lamah L, Reid SD, et al. Baseline trachoma prevalence in Guinea: Results of national trachoma mapping in 31 health districts. PLoS neglected tropical diseases. 2018;12(6):e0006585. TO BEEL CLICK ONL

ata mining, Al training, and similar technologies

Protected by copyright, including for uses related to text

Figure Legend

- Figure 1- PRISMA flow diagram of screened articles and the selection process of studies on pooled prevalence of trachoma infection among 1-9 years of age children in Ethiopia 2023.
- Figure 2- Forest plot depicting pooled prevalence of trachoma among 1-9 years of age children in Ethiopia 2023.
- Figure 3- Leave-one sensitivity analysis on the studies included in the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia 2023.

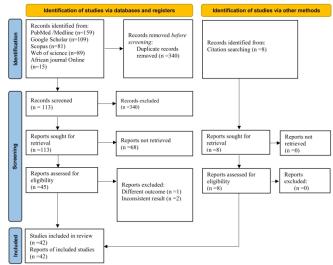


Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on pooled prevalence of trachoma infection among 1-9 years of any children in Ethioxic 2022

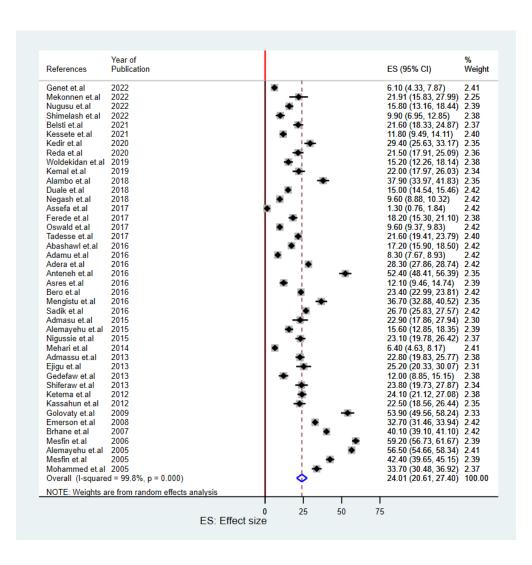
Figure 1 PRISMA flow diagram of screened articles and the selection process of studies on the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

297x210mm (300 x 300 DPI)

BMJ Open: first published as 10.1136/bmjopen-2023-079623 on 11 July 2024. Downloaded from http://bmjopen.bmj.com/ on June 10, 2025 at Agence Bibliographique de l Enseignement Superieur (ABES)

, Al training, and similar technologies

Protected by copyright, including for uses related to text and data mining,



290x295mm (72 x 72 DPI)

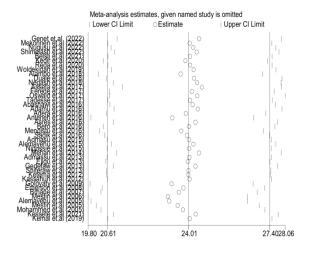


Figure 3. Leave-one sensitivity analysis on the studies included in pooled prevalence of trachoma among 1-9 years of age children in Ethiopia, 2023

Figure 3 Leave one sensitivity analysis on the studies included in the pooled prevalence of trachoma among 1-9 years of age children in Ethiopia,2023

215x279mm (300 x 300 DPI)



Supplemental Table 1: PRISMA 2020 Checklist

		igl 20:	
Section and Topic	Item #	Checklist item	Location where its
TITLE		ding	
Title	1	Identify the report as a systematic review.	1
ABSTRACT		E_C	
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION		reig eig	
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	3-4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	6
METHODS			7
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	1
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consultations. Specify the date when each source was last searched or consulted.	6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how man were screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each port whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of stomation tools used in the process.	7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presedence of results.	15
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study between the comparing against the planned groups for each synthesis (item #5)).	8
;	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	7
•	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	7
7 3 9	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	9
) 	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analyse, meta-regression).	15
•	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	16
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biase).	15
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	14



PRISMA 2020 Checklist

age 29 of 37		BMJ Open BMJ Open	
PRIS	SMA 2	by copyrig	
Section and Topic	Item #	Checklist item	Location where item is reported
RESULTS		La 23	
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the regime of studies included in the review, ideally using a flow diagram.	10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they we fig. excluded.	10
Study characteristics	17	Cite each included study and present its characteristics.	10
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	8
Results of findividual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an structured and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	8
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	8
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary at a gate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction the effect.	9
9	20c	Present results of all investigations of possible causes of heterogeneity among study results.	9
1	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	16
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assess.	9
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	9
DISCUSSION		9 3	
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	17
1 8	23b	Discuss any limitations of the evidence included in the review.	18
J 9	23c	Discuss any limitations of the review processes used.	18
OTHER INCORMA	23d	Discuss implications of the results for practice, policy, and future research.	18
OTHER INFORMA	1		18
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	11
4	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	11
4	24c	December and explain any americanisms to information provided at regionation of in the proceeds.	13
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	13
Competing interests	26	Declare any competing interests of review authors.	
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; da extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	13

43 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

		BMJ Open	cted by conv	Page 30 of 37
1	Supplemental Table 2: Search Strategy Summary		i con	
2		4	onvrigh	
3	Period search was conducted	20 May 2023 to 20 June 2023	;	
5	Inclusion	Cross sectional study	reludii	
6	criteria	Studies published until 31 July 2023	goza on	5
7		Studies conducted in Ethiopia.		
9		Children (1-9 years)	Б Ш С	-
10		Published in the English Language.	nse nse	5
11		 Studies reported the prevalence of Trachon 		
12	2Xoldololl	Case reports	and in	
13 14	criteria	case series		
15		review articles	Sup	3
16		letters to editors	erie	
17	Libraries	Worldwide	<u> </u>	
18	Records identified from secondary databases, Google	("magnitude"[All Fields] OR "magnitudes"[All Colors of the All Col		
20	scholar	Subheading] OR "epidemiology"[All Fields		
21		"prevalence"[MeSH Terms] OR "prevalance"[Ago OR "prevalence s"[All Fields] OR "prevalent"[Ago OR "prevalent"[Ago OR "prevalent"]		
22		OR "prevalents"[All Fields] OR ("burden"[All		
23 24		"burdening"[All Fields] OR "burdens"[All Fields		
25		"epidemiology"[MeSH Subheading] OR		pidemiology"[All Fields] OR
26		"epidemiology"[MeSH Terms] OR "epidemiology"	en	iology s"[All Fields])) AND
27		("trachoma"[MeSH Terms] OR "trachoma"[All I		
28 29		("eye infections"[MeSH Terms] OR ("eye"[All F		
30		"eye infections"[All Fields] OR ("eye"[All Fields	A	ND "infection"[All Fields]) OR "eye
31		infection"[All Fields]) OR ("Trachomatous"[All	Fie	ds] AND ("intense"[All Fields] OR
32		"intense		.
33 34		ly"[All Fields] OR "intensities"[All Fields] OR "in		
35		Fields])) OR ("Trachomatous"[All Fields]		
36		("Ethiopia"[MeSH Terms] OR "Ethiopia"[All Field	usjų	PR Ethiopia's [All Fleids])
37			e D	
38 39				
40			ibilographique	
41			apn	5 5
42			ģ	
43			9))

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Page 31 of 37

Supplemental Table 3: Methodological quality assessment of included studies using the Newcastle-Ottawa quality assessment scale

Study	Selection				Comparability	Outcome	2023-0	
	Representat iveness of the sample	Sample size	Non respo ndent s	Asce rtain ment of the expo sure (max imu m scor e=2)	The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled((maximum score=2))	Assess ment of the outcom e(maxi mum score=2	s e te San 11 July 2024. Downloaded from http C Enseignement Superieur (ABES)	Total(10)
Abashawl et.al[49]	1	0	0	1	0	2	2 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0	6
Adamu et.al[50]	1	1	1	1	1	2 🤵	1 _{j.com}	8
Adera et.al[31]	1	0	1	1	1	2	on June	7
Admassu et.al[32]	1	0	1	2	1	2		8
Admasu et.al[33]	1	0	1	0	1	2 9	at Agence Bib	7
Alambo et.al[39]	1	0	1	1	1	2	liog	7
Alemayehu et.al[52]	1	1	1	1	1	2	graphique	8
Alemayehu et.al [34]	1 Fo	1 r peer review only	1 - http://bm	1 jopen.bm	1 j.com/site/about/guideline	2 s.xhtml	2e de l	9

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
37 38
30 39
40
41
42
43
44
45

3 of 37				BMJ O _l	oen		136/bm	
Kedir et.al[<u>35]</u>	1	0	1	1	0	2	136/bmjopen-2023-079623 on 11 Cted by copyright, including for	7
Kemal et.al[<u>41]</u>	1	1	1	1	1	2	njopen-2023-079623 on 1 O T T T T T T T T T T T T T T T T T T T	8
Kessete et.al[30]	1	1	0	1	1	2	23 on 11 ding for	7
Ketema et.al[24]	1	0	1	1	1	2	July 2024 Enseign	7
Mehari et.al [<u>36</u>]	1	0	1	2	1	2	July 2024. Downloaded from http://bmjopen.b Enseignement Superieur (ABES) . ¬ Ises related to text and data mining, Al trainit	8
Mekonnen et.al[<u>15</u>]	1	0	500	1	0	2	aded fror perieur (7
Mengistu et.al[<u>37</u>]	1	1		1	1	2	n http://b ላቴES) . a mining,	8
Mesfin et.al[<u>43</u>]	1	1	0	1	1	2	mjopen.k Al traini	7
Mesfin et.al[<u>2]</u>	1	1	1	1	100	2	1.com/	8
Mohammed et.al[8]	1	0	1	1	1	2	on June	8
legash et.al[<u>46]</u>	1	1	1	1	1	2	10, 2025 2 2	9
ligussie et.al[<u>25]</u>	1	1	1	1	1	2		8
ligusu et.al[<u>26]</u>	1	1	1	1	1	2	at Agence Bibliographique de I	8
Oswald et.al[<u>16</u>]	1	0	1	1	1	2	raphique	7

Page 35 of 37

BMJ Open

BMJ Open

Supplemental Table 4: Study characteristics of included studies on the prevalence trachoma among children age 1-9 years; 2023

Author's	Year of Publication	Region	Study Area	Study Design	Sample Size	Male(n)	Female 20 (n) in	No of cases(n)	Prevalence %
Abashawl et.al [48]	2016	Gambela	Region-wide	CS	3238	NA	NA inclu	557	17.2
Adamu et.al ^[49]	2016	Benishangul Gumuz	Region-wide	CS	7417	3212	4205 ding fo	616	8.3
Adera et.al ^[30]	2016	SNNP	Region wide	CS	41,155	NA	NA use	11,647	28.3
Admassu et.al [31]	2013	SNNP	Guragie	CS	768	386	NA Enseign Fruses rela	175	22.8
Admasu et.al ^[32]	2015	SNNP	Dawro	CS	267	113	154 6 6	61	22.9
Alambo et.al ^[38]	2018	SNNP	Areka	CS	586	317	269 to te	222	37.9
Alemayehu et.al [51]	2015	Diredawa	Dera	CS	671	351	320 Superie	105	15.6
将lemayehu et.al	2005	SNNP	Guragie	CS	2788	NA	from http eur (ABES) d data min	1561	56.5
Anteneh et.al [16]	2016	Amhara	Gazegibela	CS	601	268	333 .	315	52.4
²² Asres et.al ^[17]	2016	Amhara	Gondar	CS	586	285	301 trainin	71	12.1
Assefa et.al [47]	2017	Harari	Harari	CS	1722	804	918 in bin	22	1.3
Belsti et.al ^[52]	2021	Southwest	Lare	CS	610	283		132	21.6
Bero et.al ^[39]	2016	Oromia	Region-wide	CS	41642	NA	NA similar te	9744	23.4
Brhane et.al ^[50]	2007	Nationwide	Nation-wide	CS	9289	NA	June lar ter	3725	40.1
Duale et.al 46	2018	Somali	Region-wide	CS	23620	11462	12158 5	3543	15
∄jigu et.al ^[53]	2013	Southwest	Kersa	CS	305	154	151 gie	77	25.2
54 5€merson et.al ^[18]	2008	Amhara	Region-wide	CS	5485	NA	NA * A	1794	32.7
Ferede et.al ^[19]	2017	Amhara	Dembia	CS	681	NA	NA ence	121	18.2
Gedefaw et.al ^[20]	2013	Amhara	Dangila	CS	409	215	194 Bi	49	12
Genet et.al [21]	2022	Amhara	Dangila	CS	704	337	367	43	6.1
41 Ģ olovaty et.al ^[22]	2009	Amhara	Ankober	CS	507	219	288 Biqu	275	53.9
∰assahun et.al ^[41]	2012	Oromia	Мојо	CS	431	NA	NA de	97	22.5
K edir et.al ^[34]	2020	SNNP For peer	review only - http://k Silte	ngigpen.bmj	561	t/guidelines.xh 279	282	165	29.4

, 2025 at Agence Bibliographique de l

				BIVIJ Opei	n e		/bn d b		Page 36 01
Kemal et.al ^[40]	2019	Oromia	Medawalebu	CS	406	215	191 8 9	89	22
Kessete et.al ^[29]	2012	Amhara	Baso Liben	CS	792	391	75 (0	191	24.1
Ketema et.al ^[23]	2014	SNNP	Guragie	CS	735	366	369 Ft. 23-03	47	6.4
Mehari et.al [35]	2022	Oromia	Arsi Negele	CS	178	93	369 ht, includii 85	39	21.91
Mekonnen et.al ^[14]	2016	SNNP	Zala	CS	611	286	325 g on 1	224	36.7
Mengistu et.al ^[36]	2006	Tigray	Region wide	CS	1526	NA	NA us	903	59.2
Mesfin et.al ^[42]	2005	Amhara	Ebinet&East Belesa	CS	1244	601	643 September 1988 Se	527	42.4
Mesfin et.al ^[2]	2005	SNNP	Goro	CS	826	438	388 dimension	278	33.7
Mohammed et.al ^[8]	2018	Afar	Region-wide	CS	6399	NA	NA text and 265	611	9.6
Negash et.al ^[45]	2015	Amhara	Gonji Kolella	CS	618	353	265 and ried	143	23.1
Nigussie et.al [24]	2022	Amhara	Tarimaber	CS	736	380	356 tar	116	15.8
Nigusu et.al ^[25]	2017	Amhara	Region wide	CS	62869	NA	NA ninin	6035	9.6
Oswald et.al ^[15]	2020	Tigray	Deguatemben	CS	502	257	245 ≥ 3	108	21.5
Reda et.al ^[43]	2016	Tigray	Region-wide	CS	10023	NA	NA traini	2676	26.7
S adik et.al ^[44]	2013	Amhara	Makisegnit	CS	420	209	211 🤵 🧾	100	23.8
Shiferaw et.al ^[26]	2022	Amhara	Debretabor	CS	394	70	324 and si	39	9.9
\$himelash et.al ^[27]	2017	Amhara	Wollo	CS	1358	638	720 mi on du	293	21.6
³ Padesse et.al ^[28]	2019	SNNP	Lemo	CS	574	NA	NA NA	87	15.2
32 §S: Cross-sectional st 34	udy						nologies.		

37 of 37		BMJ Ope	n	cted by change of trachoma among	
plemental Table 5: Meta-reg	ression of factor	s related to the hetero	ogeneity on the pooled	prevagenge of trachoma among	1-9 years
ge children in Ethiopia, 2023				2023-0 ight, ii	
Variables	Coefficient	95% CI	P-value	79623	
Year of Publication	-1.83	-2.54 to -1.10	0.00	-2023-079623 on 11 July 2024. Downloaded Enseignement Superie right, including for uses related to text and	
Region	1.23	-1.19-3.66	0.30	July 20	
Sample Size	000	00 to 0.00	0.49	024. D. gnemu	
	$ \frac{O_{F}}{}$		0.49	to te	
				vt ar	
				nd d	
				rom Sata	
				m. BE	
), · //bn	
				AI t	
				rair	
				ı.bn	
				அ <u>ப்</u>	
				n ö	
				njopen.bmj.com/ on June 10, 2025 at Al training, and similar technologies.	
				n Jila	
				r te	
				ch 10	
				nol	
				025	
				es.	
				Ag	
				e n	
				Ce	
				Bit	
				olio Sio	
				ğ	
				ďφ	
				i. Qu	
				at Agence Bibliographique de l	
	For neer rev	iew only - http://hmionen.hm	j.com/site/about/guidelines.xh	tml —	
	i di peci levi	ew only inter/onligopen.onl	j.com/ site/ about/ guidelines.xii	um	

