Health Science Reports

Health Science Reports Open Access

ORIGINAL RESEARCH OPEN ACCESS

Prevalence and Determinants of Scabies Among Schoolchildren in Ethiopia: A Systematic Review and Meta-Analysis

Abayeneh Girma | Indiris Abdu

Department of Biology, College of Natural and Computational Science, Mekdela Amba University, Tulu Awuliya, Ethiopia

Correspondence: Abayeneh Girma (gabayeneh2013@gmail.com)

Received: 19 July 2024 | **Revised:** 9 October 2024 | **Accepted:** 27 October 2024

Funding: The authors received no specific funding for this work.

Keywords: Ethiopia | meta-analysis | mites | scabies | schoolchildren | skin diseases | systematic review

ABSTRACT

Background and Aims: In deprived and poor communities worldwide, scabies remains an overlooked tropical disease. Numerous individual studies have been conducted in Ethiopia on this issue, demonstrating notable disparities and inconclusive findings. This systematic review and meta-analysis aimed to establish Ethiopia's pooled scabies prevalence and determinants among schoolchildren.

Methods: Studies were retrieved from PubMed, Scopus, Science Direct, Google Scholar, and African Journals Online through a systematic search. The Joanna Briggs Institute's critical appraisal tool was employed to assess the quality of observational studies (cross-sectional and case-control). The meta-analysis was performed using Stata software version 14 and its metan command. A forest plot was used with a random effects model to calculate the pooled prevalence and its 95% confidence interval (CI). Subgroup and sensitivity analyses were employed to evaluate potential sources of heterogeneity. The funnel plot and Egger's test were used to evaluate publication bias, while heterogeneity was assessed using inverse variance (I^2).

Results: In this systematic review and meta-analysis, 14.71% (733/5104) of schoolchildren had scabies, with a 95% CI of 8.90% −20.52%. The highest prevalence is recorded in the Amhara region (17.09%; 95% CI: 2.15–32.04), and the lower prevalence is seen in the Oromia region (12.52%; 95% CI: 10.08–14.95). Children sharing clothes with scabies cases, using common sleeping beds/fomites, having a family history of scabies, and having illiterate parents are significantly associated with scabies among Ethiopian schoolchildren (based on adjusted odds ratios: 7.07; 95% CI: 1.55–12.59, 2.13; 95% CI: 0.04–4.22, 1.45; 95% CI: 0.35–3.94, 1.42; 95% CI: 0.94–0.89).

Conclusion: The current prevalence of scabies ranges from 12.52% to 17.09% and is higher in the Amhara region. The national policymakers and health planners should prioritize implementing prevention and control measures of scabies among schoolchildren through ivermectin-based mass drug administration for three to five rounds annually until the prevalence is less than 2%.

1 | Introduction

Human scabies, a skin infection caused by mites (*Sarcoptes scabiei* var. hominis), cause itching and a rash due to burrowing into the skin [1, 2]. Lesion locations differ with age [2–5]. This condition ranks among the most frequent causes of skin diseases. Scabies affects developing countries and tropical regions disproportionately, as well as infants, children, adolescents, and older people. Children in resource-poor areas and tropical countries with high population densities face an elevated risk. In resource-poor regions about 5%–50% of children are more severely affected by scabies than adults and adolescents [6].

Symptoms of scabies include superficial burrows, intense itching, and a generalized rash that can cover much of the body or be limited to specific areas such as the wrists, elbows, armpits, nipples, genitalia, waist, buttocks, and the area between fingers [7]. If left untreated, the skin lesions of scabies increase the risk of opportunistic bacterial infections, some of which may result in serious conditions such as septicemia, renal failure, and rheumatic heart disease [8]. Moreover, scabies causes intense itchiness in school kids, which can create significant emotional and health challenges like feelings of embarrassment, exclusion, fatigue, school absenteeism, loss of performance at school, lack of concentration or memory, intellectual disability, bipolar disorder, trouble focusing, and sleep disturbances [9, 10]. Scabies and its associated problems have a substantial financial impact on individuals, families, communities, and healthcare systems [11, 12].

Worldwide, 200 million people are affected by scabies, with a prevalence ranging from 0.2% to 71.4% [13]. Malaysia [14], Turkey [15], and Thailand [16] reported scabies prevalence rates of 31%, 33%, and 87.3%, respectively. In an Islamic religious school in Bangladesh, the researchers Talukder et al., [17] found a prevalence rate of 61%–62%. 8.1% of the 944 secondary school students in Kuching, Sarawak, Malaysia, reported cases of human scabies [18].

The prevalence rates of scabies in African countries also vary, such as in Egypt, Mali, Malawi, and Kenya, where the prevalence of scabies infestation was 4.4%, 4%, 0.7%, and 8.3%, respectively, according to studies conducted in school settings [19–21]. The prevalence of scabies ranges from 2.5% to 78.4% in Ethiopia [22, 23], 2.9% to 65% in Nigeria [24, 25], 17.8% in Cameroon [26], 15.9% in Gambia [27], and 5.2% in Guinea-Bissau [28].

Epidemiological studies have shown the associated factors with the prevalence of scabies infestations are poor hygiene, poverty, overcrowded living conditions, family history of scabies, sharing beds or clothes, younger age, gender, big families, lack of knowledge about scabies, parent illiteracy, low household income, residency in rural areas, the existence of livestock or rodents at home, seasonal conditions, and movement to contaminated areas [29, 30]. In impoverished nations like Ethiopia, scabies outbreaks have been linked to events like flooding, drought, civil war and conflict, poor water supply and sanitation, and overcrowding living conditions [31].

Ethiopia's unique geography, climate, and cultural practices can support the survival of the scabies mite [32]. Understanding the burden and distribution of scabies is crucial for developing effective prevention and control strategies. In 2020, one systematic review and meta-analysis was conducted in Ethiopia, revealing a prevalence of 14.5% [33]. However, no systematic review and meta-analysis specifically focusing on the prevalence of scabies among schoolchildren in Ethiopia has been carried out. To address this gap, the current study aims to analyze existing data to provide up-to-date and reliable estimates that can inform prevention and control measures in the country.

2 | Methods

2.1 | Design and Protocol Registration

This systematic review and meta-analysis was designed to estimate the pooled prevalence of scabies among schoolchildren in Ethiopia. The result was reported as per the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guideline [34] (S1 PRISMA Checklist). The review protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD42024595481.

2.2 | Eligibility Criteria

This study included articles on the prevalence of scabies among Ethiopian schoolchildren, published between January 31, 2017, and August 31, 2023, and was observational studies (i.e., cohort, case-control, or cross-sectional). The following criteria were not eligible: case reports, reviews, absence of prevalence data, conduct outside educational settings, presentation of other skin conditions, and articles with restricted access or unresponsive corresponding authors via email.

2.3 | Search Strategy

These databases—PubMed, Scopus, Science Direct, Google Scholar, and African Journals Online—were used to retrieve articles. Studies published up to August 2023, regardless of language or publication status, were considered for this review. We uncovered further relevant articles through manual searches for cross-references. The search terms were combined using the Boolean operators "OR" and "AND." Search terms comprised of "prevalence," "associated factors," "determinant factors," "predictors," "scabies," "schoolchildren," "children," and "Ethiopia."

2.4 | Study Selection and Quality Appraisal

The articles were imported into EndNote X8 (Thomson Reuters, USA) to exclude duplicates. Then, two authors (A.G. and I.A.) independently screened the article titles and abstracts. The authors resolved their dispute through conversation. The studies that satisfied our research question and eligibility standards were subjected to full-text evaluation using the JBI critical appraisal checklists tailored for simple prevalence [35], and case-control [36] studies, which consist of 9 and 10 criteria, respectively. A total score ranging from 0 to 9 for simple prevalence studies and 0 to 10 for case-control studies was obtained by summarizing the yes scores for each question. Note: "not reported or not applicable" was assigned a no score. The studies were categorized into low, medium, and high quality based on the assigned points. Articles of high and medium quality were analyzed (Table S1).

2.5 | Data Extraction

Two reviewers (A.G. and I.A.) have participated independently in the data extraction process. Relevant studies were extracted and summarized in an Excel spreadsheet. From the included studies, we extracted the first author's name, publication year, study period, region, study design, sampling method, diagnosis techniques, sample size, case, prevalence, and response rate (Table 1).

2.6 | Data Analysis

The pooled prevalence of scabies, along with its 95% confidence interval (CI), was determined using a random effects model, because of the high heterogeneity. I^2 statistics evaluated the heterogeneity among the included studies. 25, 50, and 75 have respective I^2 values indicating low, medium, and high heterogeneity [46]. To examine the potential source of heterogeneity, we conducted a subgroup and sensitivity analysis. The presence of publication bias was investigated using Egger's test along with a funnel plot. A p-value less than 0.05 in the Egger test indicates statistically significant publication bias [47]. STATA version 14 was used for all analyses.

3 | Results

3.1 | Selection of Studies

A total of 422 articles were identified through the above-mentioned databases. After 170 duplicates were removed, another 157 studies were also excluded from the remaining articles after evaluating the title and/or abstract. In addition, five articles were also excluded after the full-text assessment. Furthermore, a total of 81 articles were removed due to: review articles ($n = 11$); qualitative studies ($n = 17$); other skin diseases among schoolchildren ($n = 41$); out-of-schoolchildren ($n = 11$); and correspondence, proceedings, and letter to the editor ($n = 1$). Finally, nine of the articles met the eligibility criteria and were included in the systematic review and meta-analysis (Figure 1).

3.2 | Characteristics of Included Studies

The characteristics of the selected studies are outlined in Table 1. Nine studies were carried out in four regions. Amhara and SNNPR regions had the highest number of studies (three each), while Oromia had two and Tigray Region had one. Seven of the studies were cross-sectional, while the remaining two were case-control. Different studies used different diagnosis techniques, such as confirmed and clinical scabies (two studies), clinical scabies (five studies), and clinical and suspected scabies and suspected scabies (one each). Studies conducted in different seasons such as summer (two), spring (three), and spring, summer, autumn, winter, spring, summer, winter, and spring, autumn, winter (one each). The studies are exclusively conducted in schools. Five thousand and one hundred four children underwent examinations for scabies. The number of students in the included studies varied from 300 to 864.

3.3 | Pooled Prevalence of Scabies

The overall prevalence of 14.71% (95% CI: 8.90–20.52) was obtained from 733 schoolchildren infested with scabies. High heterogeneity was observed in all the included studies ($I^2 = 97.2\%$, $p < 0.001$) (Figure 2).

3.4 | Subgroup Analysis

Subgroup analysis was performed and the results are shown in Table 2 and Figures S1–S7. In studies with sample sizes below 500, the prevalence of scabies (14.37%; 95% CI: 6.33–22.41) was lower than in studies with sample sizes above 500 (15.22%; 95% CI: 4.44–25.99). Amhara and SNNPR regions had the highest prevalence, respectively, of 17.09% (95% CI: 2.15–32.04) and 14.47% (95% CI: 2.83–26.11). In Tigray, the prevalence was 12.93% (95% CI: 9.53–16.33), while in Oromia, it was the lowest at 12.52% (95% CI: 10.08–14.95). A higher overall estimate was observed in case-control studies 33.30% (95% CI: 30.26–36.34) than in cross-sectional studies 9.41% (95% CI: 6.67–12.15). The prevalence of scabies was significantly higher (21.41%, 95% CI: 7.15–35.68) in studies employing systematic random sampling compared to studies (9.40%, 95% CI: 6.16–12.65) that used simple random sampling. The pooled prevalence of scabies was significantly higher among studies made clinical and suspected scabies diagnosis technique (33.30%, 95% CI: 29.00–37.60), followed by clinical scabies (14.31%, 95% CI: 6.28–22.35), confirmed and clinical scabies (9.59%, 95% CI: 1.36–17.82), and suspected scabies (8.80%, 95% CI: 5.10–12.50). The prevalence of scabies was significantly higher among study seasons conducted in spring (25.27%, 95% CI: 8.79–41.74), followed by spring, autumn, and winter (13.90%; 95% CI: 10.50–17.30), in four seasons (spring, summer, autumn, and winter) 12.93% (95% CI: 9.53–16.33), autumn (11.40%; 95% CI: 8.40–14.40), summer (6.78%; 95% CI: 3.63–9.94), and the list in three seasons (spring, summer, and winter) 5.30% (95% CI: 3.75–6.85). The percentage of scabies cases dropped from 15.40% (2017–2019) to 14.22% (2020–2023).

3.5 | Quality Assessment and Publication Bias

The quality assessment of individual studies is summarized in Table S1, with all studies exhibiting high quality (low risk of bias). Figure 3A reveals the presence of publication bias within the analyzed studies, as shown by the funnel plot's asymmetry. According to the Egger test (Figure S8), publication bias was statistically significant ($p = 0.001$). A sensitivity analysis was conducted by sequentially eliminating each study to examine its influence on the overall effect size. The effects of Walker et al. [38], Ejigu et al. [39], Reta et al. [42], and Amare and Lindtjorn [42] studies were pivotal in determining the overall magnitude of scabies among Ethiopian schoolchildren, with corresponding estimates of 11.22 (10.20–12.24), 9.02 (8.08–9.96), 9.02 (8.08–9.96), and 12.74 (11.60–13.88), respectively, upon removal of each study one at a time. After removing all of the four influencing studies as presented in Figure 3B, the estimate becomes 11.40 (9.88–12.92).

3.6 | Factors Associated With Scabies Infestation Among Schoolchildren

Among schoolchildren in Ethiopia, four articles revealed an association between sharing common sleeping beds/fomites and sharing clothes with the scabies case, while five articles

TABLE 1 | General characteristics of the included studies.

Author	Year	Study period	Region	Study design	Sampling method	Diagnosis techniques	Sample size	Cases	Prevalence	Response rate (%)
Lulu et al.	2017 [37]	October to May, 2015	Oromia	Cross-sectional	A multistage systematic random	• Confirmed and • Clinical scabies	828	115	13.9	100
Walker et al.	2017 [38]	June 2016	SNNPR	Cross-sectional	Systematic random	• Confirmed and • Clinical scabies	343	19	5.5	—
Ejigu et al.	2019 [39]	May 1 to 30, 2018	SNNPR	Unmatched case-control	Systematic random	• Clinical scabies	711	237	33.3	98
Dagne et al.	2019 [40]	May 1 to 15, 2018	Amhara	Cross-sectional	A multistage simple random	• Clinical scabies	494	46	9.3	91.84
Tefera et al.	2020 [41]	November 2017 to June 2018	Tigray	Cross-sectional	A multistage simple random	• Clinical scabies	495	64	12.93	100
Reta et al.	2020 [42]	March to May 2019	Amhara	Unmatched case-control	A multistage systematic random	• Clinical and • Suspected scabies	300	100	33.3	—
Amare and Lindtjorn	2021 [43]	February to June 2017	SNNPR	Cross-sectional	A three-stage simple random	• Clinical scabies	864	46	5.3	—
Hassen et al.	2023 [44]	October 20 to November 20, 2022	Oromia	Cross-sectional	A multistage simple random	• Clinical scabies	447	51	11.4	97
Walle and Ferede	2023 [45]	June 04 to 15, 2021	Amhara	Cross-sectional	Simple random	• Suspected scabies	622	55	8.8	98

Abbreviation: SNNPR, Southern Nations, Nationalities, and Peoples' Region.

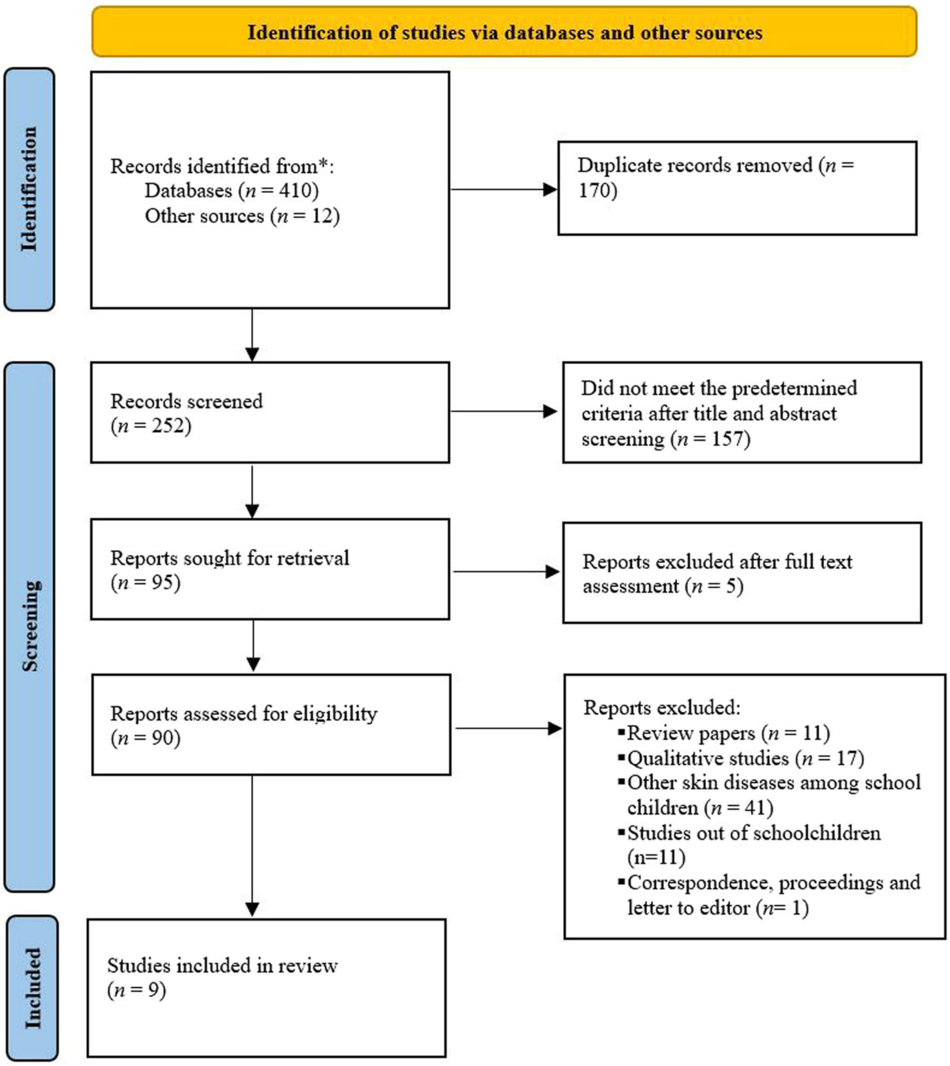

FIGURE 1 | PRISMA flow diagram outlining study selection process.

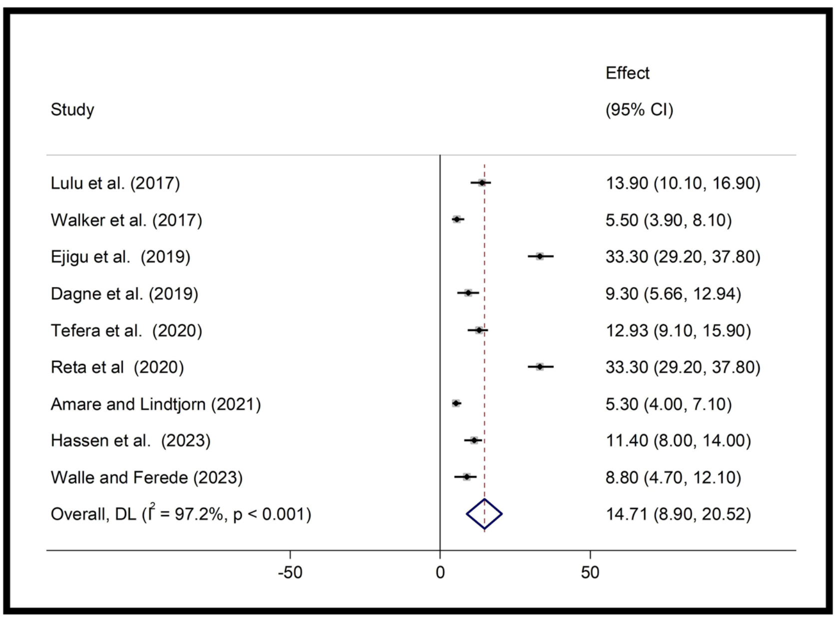

FIGURE 2 | Forest plot displaying the pooled magnitude of scabies among schoolchildren in Ethiopia.

TABLE 2 | Subgroup analysis of the magnitude of scabies among schoolchildren in Ethiopia.

Variables	Characteristics	Included studies	Sample size	Prevalence (95% CI)	I^2, p value
Sample size	< 500	5	2079	14.37 (95% CI: 6.33–22.41)	97.0, $p < 0.001$
	> 500	4	3025	15.22 (95% CI: 4.44–25.99)	98.0, $p < 0.001$
Region	Oromia	2	1275	12.52 (95% CI: 10.08–14.95)	14.4, $p = 0.280$
	SNNPR	3	1918	14.47 (95% CI: 2.83–26.11)	98.7, $p < 0.001$
	Amhara	3	1416	17.09 (95% CI: 2.15–32.04)	97.8, $p < 0.001$
	Tigray	1	195	12.93 (95% CI: 9.53–16.33)	0.0, ––––––
Study design	Cross-sectional	7	4093	9.41 (95% CI: 6.67–12.15)	85.8, $p < 0.001$
	Case-control	2	1011	33.30 (95% CI: 30.26–36.34)	0.0, $p = 1.000$
Sampling method	Systematic random	4	2182	21.41 (95% CI: 7.15–35.68)	98.6, $p < 0.001$
	Simple random	5	2922	9.40% (95% CI: 6.16–12.65)	84.1, $p < 0.001$
Diagnosis techniques	Confirmed and clinical scabies	2	1171	9.59% (95% CI: 1.36–17.82)	94.1, $p < 0.001$
	Clinical scabies	5	3011	14.31% (95% CI: 6.28–22.35)	97.4, $p < 0.001$
	Clinical and suspected scabies	1	300	33.30% (95% CI: 29.00–37.60)	0.0, p––––––
	Suspected scabies	1	622	8.80% (95% CI: 5.10–12.50)	0.0, p––––––
Season of the studies	Spring, autumn, winter	1	828	13.90% (95% CI: 10.50–17.30)	0.0, p––––––
	Summer	2	965	6.78% (95% CI: 3.63–9.94)	56.7, $p = 0.128$
	Spring	3	1505	25.27% (95% CI: 8.79–41.74)	98.0, $p < 0.001$
	Spring, summer, autumn, winter	1	495	12.93% (95% CI: 9.53–16.33)	0.0, p––––––
	Spring, summer, winter	1	864	5.30% (95% CI: 3.75–6.85)	0.0, p––––––
	Autumn	1	447	11.40% (95% CI: 8.40–14.40)	0.0, p––––––
Publication year	2017–2019	4	2076	15.40 (95% CI: 4.67–26.13)	97.7, $p < 0.001$
	2020–2023	5	2728	14.22 (95% CI: 6.15–22.28)	97.4, $p < 0.001$
	Overall	9	5104	14.71% (95% CI: 8.90–20.52)	97.2, $p < 0.001$

Abbreviation: SNNPR, Southern Nations, Nationalities, and People's Region.

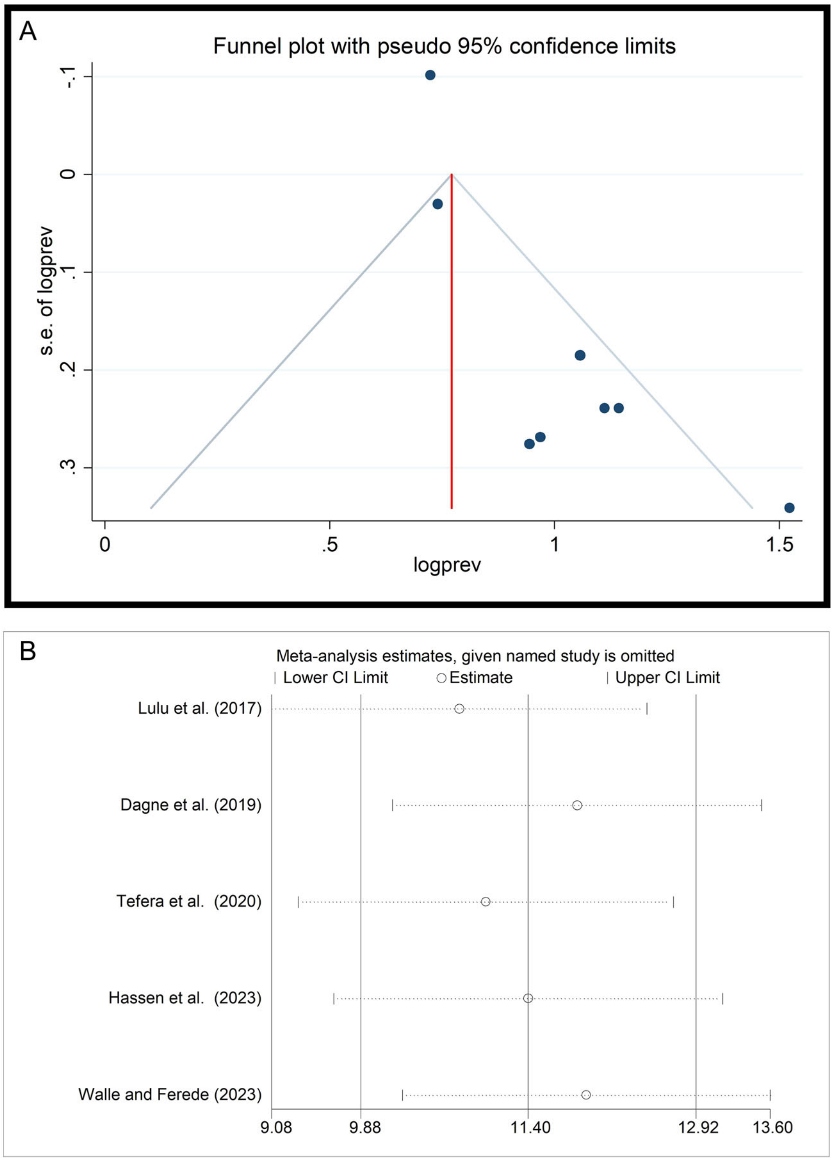

FIGURE 3 | (A) Funnel plot representing evidence of publication bias, (B) sensitivity analysis result of the included studies that assessed the impact of each study on the overall magnitude of scabies.

TABLE 3 | Factors associated with the prevalence of scabies among schoolchildren in Ethiopia.

Variables	Number of articles	Pooled odds ratio (95% CI)	I-squared (%)	I^2 *p* value
Male	3	2.53 (1.65–3.42)	0	0.536
Family size above 5	3	1.67 (1.08–2.25)	0	0.440
Children education less than grade 5	3	3.51 (1.54–5.49)	0	0.931
Sharing history of clothes with family	3	1.45 (0.35–3.94)	74.6	0.019
No formal family education	5	1.42 (0.94–1.89)	82.5	< 0.001
Sharing clothes with scabies case	4	7.07 (1.55–12.59)	62.5	0.046
Having a history of contact with skin itching cases/scabies	2	3.02 (1.93–4.11)	0	0.731
Sharing common sleeping beds/fomites	4	2.13 (0.04–4.22)	84.9	< 0.001
Family member with itchy signs/scabies	3	5.26 (1.99–8.52)	0	0.661
Not taking a bath with water and soap	2	8.51 (0.02–21.15)	74.8	0.046

reported a connection between family education and scabies; not taking a bath with soap and water was linked to scabies in two articles (Table 3). Three articles reported sex, family size, educational status of children, sharing of clothing, and the presence of itchy signs/scabies family members, while two articles reported a history of contact with skin itching cases/scabies and none of the above-mentioned factors were significantly associated with scabies among schoolchildren (Table 3).

4 | Discussion

Scabies persistently affect children living in low- and middle-income countries, including Ethiopia. This study evaluated the pooled prevalence of scabies and associated factors among schoolchildren in Ethiopia. In the current study, nine studies involving 5104 subjects were included.

The pooled prevalence of scabies among schoolchildren was 14.71%. This finding was comparable with individual studies conducted in Australia (16.5%) [48] and Cameroon (17.8%) [26]. On the other hand, individual surveillance studies that showed a higher prevalence than our findings were reported in Malaysia (31%) [14], Turkey (33%) [15], Solomon Islands (54.3%) [49], Bangladesh (61%–62%) [17], Sierra Leone (67%) [50], and Thailand (87.5%) [16]. However, our results were higher than those of individual studies conducted in Taiwan (1.4%) [51], Egypt (4.4%) [19], Australia (8.2%) [52], and Nigeria (10.5%) [53] and meta-analysis in African schoolchildren (10.81) [54]. These variations could be due to sociodemographic characteristics, the season of data collection, study population, sample sizes, methodology used, and economic status.

Children with a history of sharing clothing with family and sharing clothes with scabies cases were at 1.45 and 7.07 times higher risk for scabies infestation compared to those who did not share clothes with family and had scabies cases. Similar results were reported elsewhere [19, 26, 55, 56]. This might be due to the consequences of living in impoverished conditions.

In this study, scabies occurred 1.42 times more frequently among children from illiterate families than literate ones. The current study's findings align with those of earlier investigations [19, 37, 39, 44, 57–59]. This could be explained by the fact that children from educated families are more likely to earn more money, have better living conditions, and seek out better healthcare [37].

Sleeping in the same bed or sharing fomites with others was another significant predictor. Schoolchildren sleeping in the same beds had a 2.13-fold higher risk of scabies infestation. This result is consistent with studies conducted elsewhere [19, 26, 60–63]. Close contact while sleeping in the same bed with a person who has scabies might be a cause of acquiring the disease. On the other hand, previously reported studies in Ethiopia did not reveal a significant association between scabies and shared sleeping beds/fomites [30, 64, 65].

In the current review, the majority of included studies made suspected and clinical diagnoses, and only two studies confirmed scabies. Similarly, the International Alliance for the Control of Scabies (IACS) criteria [66] also reported that the method of diagnosis generally has a big influence on the prevalence of scabies and disclosed that suspected and clinical diagnoses are much more prevalent than confirmed diagnoses.

The Amhara region reported the highest prevalence (17.09%) of scabies in schoolchildren, while the Oromia region had the lowest (12.52%). This disparity could be attributed to distinctions in lifestyle and healthcare utilization. The 15.40% prevalence rate in 2017–19 studies was greater than the 14.22% rate in 2020–2023 studies. The decrease in scabies cases may be due to improved diagnostic tools, varying study seasons (spring, summer, autumn, and winter), increased access to health facilities and education, and enhanced awareness of skin diseases. Therefore, according to the current result, ivermectin-based mass drug administration (MDA) is recommended for the control of outbreaks in the community and in closed institutions such as schools [67–69].

4.1 | Strengths and Limitations

This systematic review and meta-analysis is the first to estimate the pooled prevalence of scabies among Ethiopian schoolchildren. The pooled risk factors for scabies infestation were also identified. Despite its strengths, this review also has certain limitations. The heterogeneity among published studies may stem from variations in data acquisition and disparities in sample sizes. The study's estimate of Ethiopia's scabies infestation prevalence might not be representative due to the limited regions included in the study. Methodological flaws of the study designs, like the inclusion of case-control studies for determining the prevalence and the methods used to diagnose scabies in schoolchildren, also affect the pooled prevalence of scabies.

5 | Conclusion

The pooled prevalence of scabies among schoolchildren in Ethiopia is 14.71%. Children sharing clothes with scabies cases, using common sleeping beds, having a family history of scabies, and having illiterate parents are significantly linked to scabies among schoolchildren in the country. Further extensive school-based surveys on the nature, dynamics, and risk factors of scabies are suggested among different regions of Ethiopia to develop evidence-based scabies control and preventive measures.

Author Contributions

Abayeneh Girma: conceptualization, data curation, formal analysis, investigation, methodology, software, supervision, validation, visualization, writing–review and editing. **Indiris Abdu:** conceptualization, data curation, investigation, methodology, project administration, resources, validation, visualization, writing–original draft.

Acknowledgments

The authors received no specific funding for this work.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All the data in this review are included in the manuscript.

Transparency Statement

The lead author Abayeneh Girma affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

References

1. J. Heukelbach, S. F. Walton, and H. Feldmeier, "Ectoparasitic Infestations," *Current Infectious Disease Reports* 7 (2005): 373–380.

2. L. V. Stamm and L. C. Strowd, "Ignoring the "Itch": The Global Health Problem of Scabies," *American Journal of Tropical Medicine and Hygiene* 97 (2017): 1647–1649.

3. A. Jackson, J. Heukelbach, A. F. Filho, B. Júnior Ede, and H. Feldmeier, "Clinical Features and Associated Morbidity of Scabies in a Rural Community in Alagoas, Brazil," *Tropical Medicine & International Health: TM & IH* 12 (2007): 493–502.

4. B. J. Currie, D. J. Kemp, S. F. Walton, et al., "Scabies: More Than Just an Irritation," 80 (2004): 382–387.

5. G. Johnston and M. Sladden, "Scabies: Diagnosis and Treatment," *BMJ* 331 (2005): 619–622.

6. World Health Organization, Epidemiology and Management of Common Skin Diseases in Children in Developing Countries (Geneva: World Health Organization, 2005), https://www.who.int/news-room/fact-sheets/detail/scabies.

7. R. R. Yotsu, J. Yoshizumi, and A. Izri, "Biology of *Sarcoptes scabiei* and Its Relevance to Human Scabies: Clinical Symptoms, Treatment, and Management," in *Scabies* (Springer, 2023), 19–34.

8. R. J. Hay, A. C. Steer, D. Engelman, and S. Walton, "Scabies in the Developing World–Its Prevalence, Complications, and Management," *Clinical Microbiology and Infection* 18 (2012): 313–323.

9. J. Al-Dabbagh, R. Younis, and R. Sliman, "The Differential Diagnoses and Complications of Scabies Variants," 81 (2023): 259–266.

10. A. Jannic, C. Bernigaud, E. Brenaut, and O. Chosidow, "Scabies Itch," *Dermatologic Clinics* 36 (2018): 301–308.

11. R. J. Hay, R. E. Castanon, H. A. Hernandez, et al., "Wastage of Family Income on Skin Disease in Mexico," *BMJ* 309 (1994): 848.

12. B. L. Verma and R. N. Srivastava, "Measurement of the Personal Cost of Illness Due to Some Major Water-Related Diseases in an Indian Rural Population," *International Journal of Epidemiology* 19 (1990): 169–176.

13. L. Romani, A. C. Steer, M. J. Whitfeld, and J. M. Kaldor, "Prevalence of Scabies and Impetigo Worldwide: A Systematic Review," *Lancet Infectious Diseases* 15 (2015): 960–967.

14. M. M. Zayyid, R. S. Saadah, A. Adil, et al., "Prevalence of Scabies and Head Lice Among Children in a Welfare Home in Pulau Pinang, Malaysia," *Tropical Biomedicine* 27 (2010): 442–446.

15. S. Oztürkcan, S. Ozçelik, G. Saygi, and S. Ozçelik, "Spread of Scabies and *Pediculus Humanus* Among the Children at Sivas Orphanage," *Indian pediatrics* 31 (1994): 210–213.

16. C. Pruksachatkunakorn, A. Wongthanee, and V. Kasiwat, "Scabies in Thai Orphanages," *Pediatrics international* 45 (2003): 719–723.

17. K. Talukder, M. Q. K. Talukder, M. G. Farooque, et al., "Controlling Scabies in Madrasahs (Islamic Religious Schools) in Bangladesh," *Public Health* 127 (2013): 83–91.

18. F. B.-B. Yap, E. M. T. Elena, and M. Pubalan, "Prevalence of Scabies and Head Lice Among Students of Secondary Boarding Schools in Kuching, Sarawak, Malaysia," *Pediatric Infectious Disease Journal* 29 (2010): 682–683.

19. D. Hegab, A. Kato, I. Kabbash, and G. Dabish, "Scabies Among Primary Schoolchildren in Egypt: Sociomedical Environmental Study in Kafr El-Sheikh Administrative Area," *Clinical, Cosmetic and Investigational Dermatology* 8 (2015): 105–111.

20. D. Landwehr, S. M. Keita, J. M. Pönnighaus, and C. Tounkara, "Epidemiologic Aspects of Scabies in Mali, Malawi, and Cambodia," *International Journal of Dermatology* 37 (1998): 588–590.

21. W. Schmeller and A. Dzikus, "Skin Diseases in Children in Rural Kenya: Long-Term Results of a Dermatology Project Within the Primary Health Care System," *British Journal of Dermatology* 144 (2001): 118–124.

22. W. Wochebo, Y. Haji, and S. Asnake, "Scabies Outbreak Investigation and Risk Factors in Kechabira District, Southern Ethiopia: Unmatched Case Control Study," *BMC Research Notes* 12 (2019): 305.

23. S. A. Belachew and A. Kassie, "Burden and Drivers of Human Scabies Among Children and Adults in Northwestern Ethiopia: The Case of the Neglected Tropical Disease," *International Journal of Infectious Diseases* 73 (2018): 317.

24. M. Sambo, A. Umar, S. Idris, and A. Olorukooba, "Prevalence of Scabies Among School-Aged Children in Katanga Rural Community in Kaduna State, Northwestern Nigeria," *Annals of Nigerian Medicine* 6 (2012): 26.

25. U. S. Ugbomoiko, S. A. Oyedeji, O. A. Babamale, and J. Heukelbach, "Scabies in Resource-Poor Communities in Nasarawa State, Nigeria: Epidemiology, Clinical Features and Factors Associated With Infestation," *Tropical Medicine and Infectious Disease* 3 (2018): 59.

26. E. A. Kouotou, J. R. N. Nansseu, M. K. Kouawa, et al., "Prevalence and Drivers of Human Scabies Among Children and Adolescents Living and Studying in Cameroonian Boarding Schools," *Parasites & Vectors* 9 (2016): 1–6.

27. E. P. Armitage, E. Senghore, S. Darboe, et al., "High Burden and Seasonal Variation of Paediatric Scabies and Pyoderma Prevalence in The Gambia: A Cross-Sectional Study," *PLoS Neglected Tropical Diseases* 13 (2019): e0007801.

28. M. Marks, T. Sammut, M. G. Cabral, et al., "The Prevalence of Scabies, Pyoderma and Other Communicable Dermatoses in the Bijagos Archipelago, Guinea-Bissau," *PLoS Neglected Tropical Diseases* 13 (2019): e0007820.

29. M. Nazari and A. Azizi, "Epidemiological Pattern of Scabies and Its Social Determinant Factors in West of Iran," *Health* 06 (2014): 1972–1977.

30. A. Sanei-Dehkordi, M. Soleimani-Ahmadi, M. Zare, and S. A. Jaberhashemi, "Risk Factors Associated With Scabies Infestation Among Primary Schoolchildren in a Low Socio-Economic Area in Southeast of Iran," *BMC Pediatrics* 21 (2021): 249.

31. F. Balcha, H. Bizuneh, and F. Hunduma, "Scabies Outbreak Investigation and Its Risk Factors in Gumbichu District, East Shewa Zone, Central Ethiopia: Unmatched Case-Control Study," *Journal of Clinical Rheumatology Research* 2 (2022): 20–29.

32. A. Girma and A. Genet, "Magnitude and Determinants of Intestinal Parasites Among Children Under Five in Ethiopia During 2010–2023: A Systematic Review and Meta-Analysis," *Fetal and Pediatric Pathology* 43 (2024): 47–65.

33. A. G. Azene, A. M. Aragaw, and G. T. Wassie, "Prevalence and Associated Factors of Scabies in Ethiopia: Systematic Review and Meta-Analysis," *BMC Infectious Diseases* 20 (2020): 380.

34. M. J. Page, J. E. McKenzie, P. M. Bossuyt, et al., “The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews,” *BMJ* 372 (2021).

35. Z. Munn, S. Moola, K. Lisy, et al., “Systematic Reviews of Prevalence and Incidence,” *Joanna Briggs Institute Reviewer's Manual* 5 (2017): 1–5.

36. S. Moola, Z. Munn, C. Tufanaru, et al., “Chapter 7: Systematic Reviews of Etiology and Risk,” *JBI Manual for Evidence Synthesis JBI* 10 (2020).

37. Y. Lulu, G. Tolesa, and J. Cris, “Prevalence and Associated Factors of Skin Diseases Among Primary School Children in Illuababorzone, Oromia Regional State, South West Ethiopia,” *Indo American Journal of Pharmaceutical Research* 7 (2017): 7374–7383.

38. S. L. Walker, E. Lebas, V. De Sario, et al., “The Prevalence and Association With Health-Related Quality of Life of Tungiasis and Scabies in Schoolchildren in Southern Ethiopia,” *PLoS Neglected Tropical Diseases* 11 (2017): e0005808.

39. K. Ejigu, Y. Haji, A. Toma, et al., “Factors Associated With Scabies Outbreaks in Primary Schools in Ethiopia: A Case–Control Study,” *Research and Reports in Tropical Medicine* 10 (2019): 119–127.

40. H. Dagne, A. Dessie, B. Destaw, W. W. Yallew, and Z. Gizaw, “Prevalence and Associated Factors of Scabies Among Schoolchildren in Dabat District, Northwest Ethiopia, 2018,” *Environmental Health and Preventive Medicine* 24 (2019): 67.

41. S. Tefera, M. Teferi, A. Ayalew, et al., “Prevalence of Scabies and Associated Factors Among Primary School Children in Raya Alamata District, Tigray, Ethiopia, 2017/2018,” *Journal of Infectious Diseases and Epidemiology* 6 (2020): 154.

42. M. W. Reta, B. T. Derseh, and B. Y. Sahilu, “Determinants of Scabies Among Primary School Children in Habru District: A Case-Control Study,” 2020, https://doi.org/10.21203/rs.2.20670/v1.

43. H. H. Amare and B. Lindtjorn, “Risk Factors for Scabies, Tungiasis, and Tinea Infections Among Schoolchildren in Southern Ethiopia: A Cross-Sectional Bayesian Multilevel Model,” *PLoS Neglected Tropical Diseases* 15 (2021): e0009816.

44. Y. K. Hassen, M. M. Ame, B. A. Mummed, et al., “Magnitude and Factors Associated With Scabies Among Primary School Children in Goro Gutu Woreda, East Hararghe Zone, Ethiopia,” *International Journal of Medical Parasitology and Epidemiology Sciences Volume* 3 (2022): 84.

45. A. J. Ferede and T. A. Walle, “Prevalence of Scabies and Associated Factors Among Governmental Elementary School Students in Gondar Town Northwest Ethiopia,” *Journal of Practical & Professional Nursing* 7 (2023): 046, https://doi.org/10.24966/PPN-5681/100046.

46. J. P. T. Higgins and S. G. Thompson, “Quantifying Heterogeneity in a Meta-Analysis,” *Statistics in Medicine* 21 (2002): 1539–1558.

47. M. Egger, G. D. Smith, M. Schneider, and C. Minder, “Bias in Meta-Analysis Detected by a Simple, Graphical Test,” *BMJ* 315 (1997): 629–634.

48. M. Tasani, S. Y. C. Tong, R. M. Andrews, et al., “The Importance of Scabies Coinfection in the Treatment Considerations for Impetigo,” *Pediatric Infectious Disease Journal* 35 (2016): 374–378.

49. M. H. Osti, O. Sokana, S. Phelan, et al., “Prevalence of Scabies and Impetigo in the Solomon Islands: A School Survey,” *BMC Infectious Diseases* 19 (2019): 803.

50. B. Terry, “*Sarcoptes scabiei* Infestation Among Children in a Displacement Camp in Sierra Leone,” *Public Health* 115 (2001): 208–211.

51. Y.-H. Wu, H.-Y. Su, and Y.-J. Hsieh, “Survey of Infectious Skin Diseases and Skin Infestations Among Primary School Students of Taitung County, Eastern Taiwan,” *Journal of the Formosan Medical Association=Taiwan yi zhi* 99 (2000): 128–134.

52. D. K. Yeoh, A. Anderson, G. Cleland, and A. C. Bowen, “Are Scabies and Impetigo ‘Normalised’? A Cross-Sectional Comparative Study of Hospitalised Children in Northern Australia Assessing Clinical Recognition and Treatment of Skin Infections,” *PLoS Neglected Tropical Diseases* 11 (2017): e0005726.

53. E. I. Kalu, V. Wagbatsoma, E. Ogbaini-Emovon, V. U. Nwadike, and C. K. Ojide, “Age and Sex Prevalence of Infectious Dermatoses Among Primary School Children in a Rural South-Eastern Nigerian Community,” *Pan African Medical Journal* 20 (2015): 182, https://doi.org/10.11604/pamj.2015.20.182.6069.

54. A. Girma, I. Abdu, and K. Teshome, “Prevalence and Determinants of Scabies Among Schoolchildren in Africa: A Systematic Review and Meta-Analysis,” *SAGE Open Medicine* 12 (2024), https://doi.org/10.1177/20503121241274757.

55. A. Tunje, C. Churko, D. Haftu, et al., “Prevalence of Scabies and Its Associated Factors Among School Age Children in Arba Minch Zuria District, Southern Ethiopia, 2018,” *bioRxiv* (2020), https://doi.org/10.1101/2020.03.16.993576.

56. A. S. Kumar, B. N. Devi, K. Jahnavi, et al., “A Study on Prevalence of Skin Infections Among School Children in Hyderabad, Telangana State,” *International Journal of Contemporary Medical Research* 3 (2016): 1862–1864.

57. S. A. Karim, K. S. Anwar, M. A. H. Khan, et al., “Socio-Demographic Characteristics of Children Infested With Scabies in Densely Populated Communities of Residential Madrashas (Islamic Education Institutes) in Dhaka, Bangladesh,” *Public Health* 121 (2007): 923–934.

58. H. Feldmeier, A. Jackson, L. Ariza, et al., “The Epidemiology of Scabies in an Impoverished Community in Rural Brazil: Presence and Severity of Disease Are Associated With Poor Living Conditions and Illiteracy,” *Journal of the American Academy of Dermatology* 60 (2009): 436–443.

59. B. Stanton, S. Khanam, H. Nazrul, S. Nurani, and T. Khair, “Scabies in Urban Bangladesh,” *Journal of Tropical Medicine and Hygiene* 90 (1987): 219–226.

60. G. Ararsa, E. Merdassa, T. Shibiru, and W. Etafa, “Prevalence of Scabies and Associated Factors Among Children Aged 5–14 Years in Meta Robi District, Ethiopia,” *PLoS One* 18 (2023): e0277912.

61. S. Yasmin, H. Ullah, M. I. U. Khan, et al., “Epidemiological Study of Scabies Among School Going Children in District Haripur, Pakistan,” *Arthropods* 6 (2017): 59–66.

62. B. Misganaw, S. G. Nigatu, G. N. Gebrie, and A. A. Kibret, “Prevalence and Determinants of Scabies Among School-Age Children in Central Armachiho District, Northwest, Ethiopia,” *PLoS One* 17 (2022): e0269918.

63. Z. J. Yassin, A. F. Dadi, H. Y. Nega, et al., “Scabies Outbreak Investigation Among ‘Yekolo Temaris’ in Gondar Town, North Western Ethiopia, November 2015,” *Electronic Journal of Biology* 13 (2017): 203–209.

64. J. Sara, Y. Haji, and A. Gebretsadik, “Scabies Outbreak Investigation and Risk Factors in East Badewacho District, Southern Ethiopia: Unmatched Case Control Study,” *Dermatology Research and Practice* 2018 (2018): 1–10.

65. W. Enbiale, T. B. Baynie, A. Ayalew, et al., “‘Stopping the Itch’: Mass Drug Administration for Scabies Outbreak Control Covered for Over Nine Million People in Ethiopia,” *Journal of Infection in Developing Countries* 14 (2020): 28S–35S.

66. D. Engelman, L. C. Fuller, A. C. Steer, et al., “Consensus Criteria for the Diagnosis of Scabies: A Delphi Study of International Experts,” *PLoS Neglected Tropical Diseases* 12 (2018): e0006549.

67. D. Engelman, M. Marks, A. C. Steer, et al., “A Framework for Scabies Control,” *PLoS Neglected Tropical Diseases* 15 (2021): e0009661.

68. M. A. Irvine, W. A. Stolk, M. E. Smith, et al., “Effectiveness of a Triple-Drug Regimen for Global Elimination of Lymphatic Filariasis: A Modelling Study,” *Lancet Infectious Diseases* 17 (2017): 451–458.

69. K. E. Mounsey, H. C. Murray, M. King, and F. Oprescu, "Retrospective Analysis of Institutional Scabies Outbreaks From 1984 to 2013: Lessons Learned and Moving Forward," *Epidemiology and Infection* 144 (2016): 2462–2471.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.