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SYSTEMATIC REVIEW

Prevalence of scabies worldwide—An updated systematic literature review in 2022

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Abstract

Scabies is a World Health Organization-defined neglected tropical disease, with continuously rising incidence worldwide in recent years. The aim of this study was to provide an update of the worldwide prevalence and new treatment approaches of scabies in population-based settings. MEDLINE (PubMed), Embase and LILACS databases were reviewed for English and German language population-based studies from October 2014 to March 2022. Two authors independently screened the records for eligibility, extracted all data and one critically appraised the quality of the studies and risk of bias. Systematic review registration: PROSPERO CRD42021247140. Overall, 1273 records were identified through database searching, of which 43 studies were included for the systematic review. Most of the studies ($n = 31$) examined the scabies prevalence in medium or low human development index countries. The highest prevalence of scabies reported in the general population (children and adults) was recorded in five randomly selected communities in Ghana (71.0%), whereas the highest scabies prevalence in studies, which only examined children (76.9%), was recorded in an Indonesian boarding school. The lowest prevalence was recorded in Uganda (0.18%). The systematic review highlights the prevalence of scabies worldwide, showing that scabies is still a serious, increasing disease that occurs globally and is clustered in developing countries. More transparent data on scabies prevalence are needed to identify risk factors to find new prevention measures.

INTRODUCTION

Scabies is an infectious skin disease caused by the mite *Sarcoptes scabiei var. hominis*.[1] It is responsible for 0.21% of the disability-adjusted life years (DALYs, the unit of measure for loss of healthy life-years) worldwide, which is mainly due to severe itch.[2] In addition, systemic complications of scabies like a disrupted skin barrier due to constant scratching can occur, which can serve as a portal of entry for bacteria and lead to superinfections, rheumatic fever or glomerulonephritis.[3] Although the International Alliance for the Control of Scabies (IACS) criteria published a clear algorithm in scabies diagnostics, it remains unclear whether this is continuously applied.[4] Furthermore, studies showed that topical scabicides are often applied incorrectly, causing a longer course of disease and longer infectiousness.[3,5]

Scabies is treated by topical application of permethrin or systemic administration of ivermectin. In the case of crusted scabies or severe courses, a combination of the two drugs is used. It is also important to treat all people in contact with the infected patient and to prepare clothing and furniture appropriately to prevent reinfection.[6]

It is estimated that more than 200 million people are still suffering from scabies worldwide, with scabies being endemic in some subtropical regions.[2] In general, countries with a low human development index (HDI) are more commonly affected by scabies outbreaks.[7] Outbreaks in countries with a higher HDI typically occur in facilities

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where many people are forced to live together like in refugee homes.[8,9]

Demonstrating the international importance of the disease, the World Health Organization (WHO) classified scabies as a 'neglected tropical disease'.[10] In 2015, a systematic review on the global prevalence of scabies was published, which reported that the prevalence of scabies ranged from 0.2% to 71.4%. The authors highlighted the large burden of scabies in countries with medium and low HDI and emphasized the wide variation in diagnostic criteria for scabies.[7] However it is difficult to obtain reliable data on the current prevalence of scabies worldwide.

Accordingly, the aim of this study was to provide an update of the scabies prevalence worldwide and to evaluate the treatment options used to control scabies in recent years.

METHODS

Search strategy and selection criteria

This systematic review adheres to the guidelines from the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA).[11] The databases Medline (via PubMed), Embase and LILACS were searched for publications focusing on the epidemiology of scabies. The initial literature search was conducted in April 2021 and limited to articles published since October 2014 to update the systematic review by Romani et al. published in 2015 (search period 1985 until 2014).[7] The search was repeated in March 2022, with the date limits set to identify any new evidence published since the last search. Search results published in English, Spanish and German were considered. The same keywords were used as in the systematic review by Romani et al. Those were: 'scabies', 'Sarcoptes scabiei', 'skin disease', or 'dermatology', combined with 'incidence', 'prevalence', 'epidemiology', 'public health', 'community', 'population', or 'survey' (the full search strategy for the searches via Medline, Embase and LILACS is shown in Appendix S1). Prior to execution, the underlying protocol was registered in the PROSPERO database for systematic reviews (registration number: CRD42021247140).

Study eligibility and quality assessment

In the first step, the titles and abstracts of all identified publications were screened by two reviewers independently (JW, SS). In the second step, the full texts were reviewed individually for eligibility by the same two authors. Disagreements were resolved through discussion or by consulting a third author (AZ), if necessary.

Only studies that reported the prevalence of scabies in a population-based setting (e.g. randomly assessed villages or schools as seen in the previous systematic review) were included in the systematic review. Thus, studies that, for example, reported the prevalence of scabies among patients of dermatological clinics or facilities in which people live closely together like nursing homes were excluded. Quality and risk of bias assessment were conducted by JW. In accordance with the study of Romani et al., four categories were chosen for quality assessment, which were initially adapted from the Cochrane Collaboration for analytic studies and from the 'Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE)[12] guidelines: (i) definition of sampling frame, (ii) response rate, (iii) quality of scabies assessment and (iv) statistical analysis methods.[7] These criteria were assessed on a three-point numerical scale (0, 1, or 2, see Appendix S1) and involved the evaluation of selection bias through the quality of the sampling frame, attrition through assessment of nonresponse, detection bias through evaluation of the measurement criteria for the diagnosis of scabies and reporting bias by analysing the key population descriptors of the studies.

Data extraction

The following data were extracted from each study (if accessible) independently by JW and SS using an extraction form: age range of participants, geographical region, sample size, data collection method and study location including whether the setting was rural or urban. In addition, the United Nation HDI, which measures the life expectancy, literacy, education and standards of living of a country, was used to classified countries from low to high.[13]

RESULTS

In total, 1273 records were identified in the literature search. After removing duplicates, the titles and abstracts of 1231 studies were screened for relevance. Of those, 153 full-text articles were assessed for eligibility. In the systematic review, 43 studies that met the inclusion criteria were included (Figure 1). All of them were written in English. No study written in German, Spanish or French met the inclusion criteria.[14-57]

The quality assessment revealed that 19 studies obtained at least one point in each category, whereas the remaining studies had at least one category with zero points (see Table S4 in Appendix S1). The most common issues were that some studies only reported overall prevalence ($n = 13$) and inconsistently selected scabies diagnostic criteria ($n = 9$). The sampling method varied greatly between studies: In some studies, the prevalence was examined for entire provinces or villages ($n = 29$), whereas in other studies, the focus was on randomly selected schools ($n = 14$). More than half of the studies ($n = 23$) were restricted to children (Figure 2).[15,16,17,19,21,24,25,26,28,29,30,32,34,38,39,40,41,49,50,52,54,55,56]

As Figure 2 shows, 17 studies were performed in Africa,[14,15,16,19,20,21,22,26,28,29,30,34,36,46,48,49,50,57] 12 studies in Oceania,[27,33,35,37,39,42,43,44,45,53,56] and 12 studies in Asia .[17,23,25,32,38,40,41,47,51,52,54,55] For Australia and South America, there was only one study for each region.[24,31] Most of the

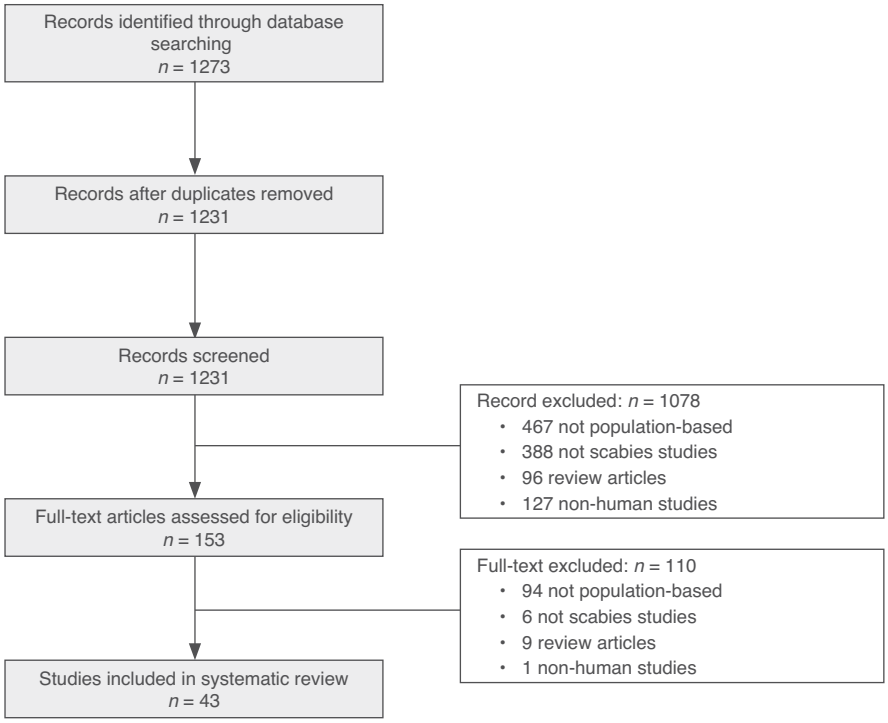

FIGURE 1 Study selection.

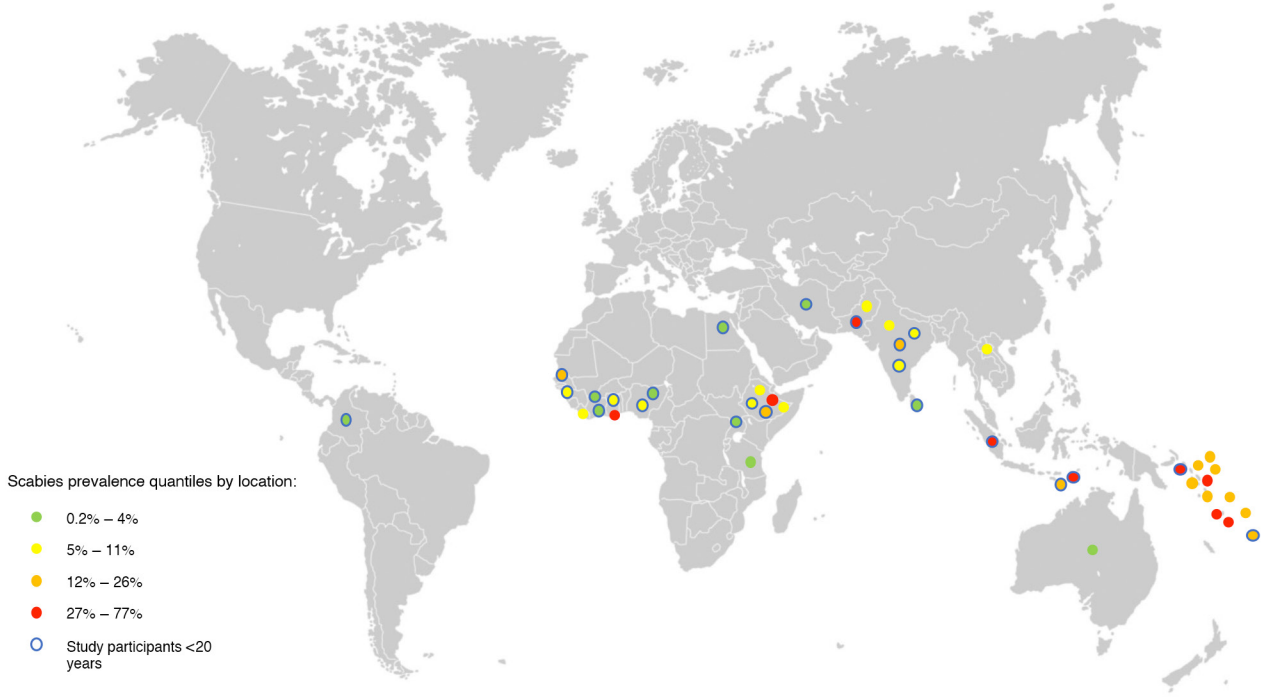

FIGURE 2 Contribution of scabies prevalence in selected populations between 2014 and 2022.[15-57]

studies ($n = 31$) were conducted in either medium or low HDI countries.[14,15,16,17,18,19,20,21,22,23,26,29,30,32,33,34,35,36,37,38,39,40,41,44,46,47,48,49,50,51,52,53,55]

The overall prevalence of scabies ranged from 0.18% to 76.9% in the included studies, with both values measured in child populations. The highest prevalence was found in Indonesia, where 81 of 105 randomly selected children from a boarding school had scabies.[41] With a described prevalence of 6 of 3265 participants, a study investigating three urban primary schools in western and northern

Uganda showed the lowest scabies prevalence in children (Figure 3).[19]

Five studies assessing age-specific scabies prevalence showed that the prevalence was always higher among children than among adults in randomly selected villages (Figure 4).[18,20,37,42,53]

The study with the largest study population was conducted in Ethiopia in 2018, with a prevalence of 9.7% among the 9,057,427 participants.[22] In contrast, the study with the fewest participants was conducted in Indonesia, which examined 105 randomly selected school children (detected scabies prevalence: 76.9%).[41] Studies examining prevalence in the general population of Indonesia were not found after considering the inclusion criteria.

The highest prevalence of scabies among the general population was found among randomly selected volunteers in five different communities in Ghana, with 71.0% (200/283 participants) of participants being affected.[14] With a prevalence of 4.2% (42/1002 participants), an Australian study reported the lowest prevalence among a remote aboriginal community, not considering age-specific groups (Figure 5).[31]

One study from Guinea-Bissau compared the prevalence during wet and dry season. The authors found a higher scabies prevalence in the dry season (5.2%, 56/1062 participants) than in the wet season (1.9%, 6/320 participants).[34]

Six of the included studies provided information about scabies prevalence by investigating the impact of mass drug administration (MDA) campaigns on the prevalence of scabies. The MDA campaigns were conducted in (i) one remote island community in Australia,[31] (ii) three island communities of Fiji,[43] (iii) six villages in one province[33] and (iv) 10 villages being randomly picked out of a whole province in the Solomon Islands where MDA was performed,[35] (v) eight villages in Tanzania[36] and (vi) 12 villages in India.[51] In all studies, the scabies prevalence was substantially lower after the MDA campaigns. In Australia, for example, the prevalence of scabies reduced from 4.2% before the campaign to 2.0% after the campaign.[31] In Malaita province of Solomon Islands, the prevalence decreased from 11.8% and 9.2% to 1.0% and 0.7% after the MDA with ivermectin and ivermectin + azithromycin, respectively.[35] In 10 villages of the Solomon Islands, the consistent implementation of an MDA campaign with a combination of ivermectin and azithromycin led to a reduction in the prevalence from 18.7% to 2.3%.[33] However, a follow-up study showed that the prevalence of scabies increased slightly from 2.3% to 4.7%, 3 years after the MDA campaign.[33] This was also noted in Tanzania,[36] where a slight increase in scabies prevalence was reported from 0.84% after one round of MDA to 2.5% after 3 and 2.9% after 4 years after the campaign. In India, a slight increase in scabies prevalence was reported 1 year after the campaign (2.8% post-intervention to 7.3% 1-year follow-up).[51] The greatest

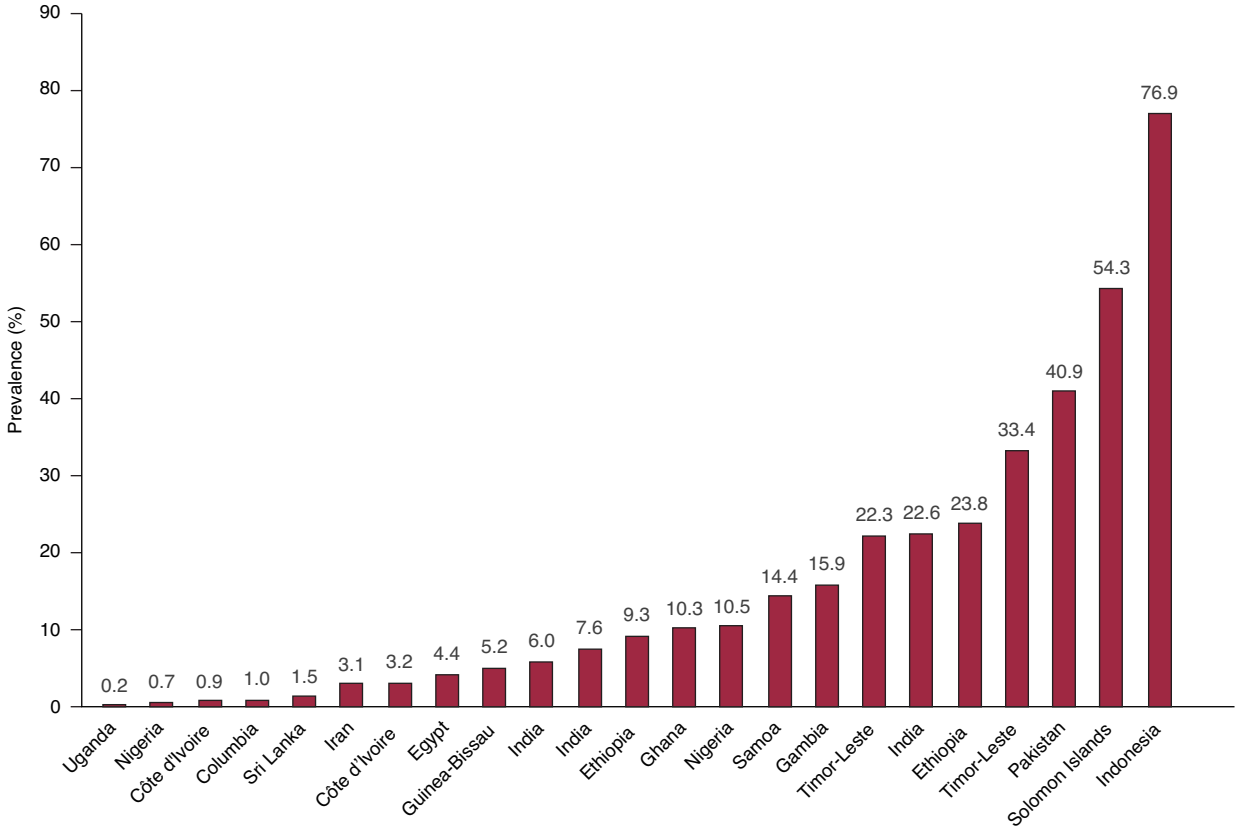

FIGURE 3 Scabies prevalence in studies focusing on children (<20 years old) only.[16,17,18,20,22,25,26,27,29,30,31,33,35,39,40,41,42,50,51,53,55,56,57]

effect of MDA was observed in Fiji,[43] where the scabies prevalence of patients treated with Ivermectin decreased from 32.1% to 1.9% after 12 months and 3.6% after 24 months (Figure 6).

Three of those six studies focusing on MDA compared different therapy regimens.[35,43,51] Figure 6 shows that topical antiscabicide therapy alone led to a lower reduction in scabies prevalence compared to an oral systemic therapy.

DISCUSSION

In this systematic review, 43 studies using a cross sectional population-based setting were included and reported a scabies prevalence between 0.18% in Uganda, in three urban primary schools and 79.6% in an Indonesian boarding school, with children being more frequently affected than adults. It was revealed that MDA campaigns could substantially lower the prevalence of scabies, but it was also shown that the prevalence could rise again several years after the intervention. Most of the studies were conducted in Africa, Asia and Pacific Island countries, whereas no study could be identified from Europe or North America. Data were therefore collected primarily from countries with low or medium socioeconomic status data. In general, diagnostic criteria varied widely between the studies and only little information was provided regarding scabies prevalence for different age groups and settings.

The systematic review on scabies prevalence in 2014 of Romani et al.[7] reported a large discrepancy in the global scabies prevalence in population-based settings, varying from 0.2% in Iraq to 71.4% in Papua New Guinea, which was comparable to the findings of this review. The authors concluded that one reason for this wide range was missing standardized diagnostics algorithms. They therefore recommended that this problem be addressed by the development of a consensus and evidence-based diagnostic criteria for scabies under the leadership of the IACS.[4] However, the present systematic review demonstrated that uniform diagnostic criteria have still not been applied 6 years later. For example, in some cases, itching at typical sites was sufficient for diagnosis. Accordingly, standardized criteria for the diagnosis of scabies, such as those published by the IACS in their latest report, should be applied in future studies.[4]

Overall prevalence of scabies shown in this review remains high and similar to that shown in the systematic review from Romani et al.[7] For example, they mentioned a

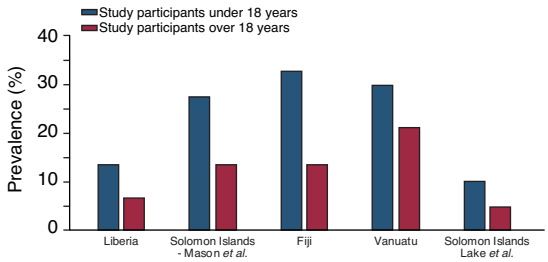

FIGURE 4 Studies with age-specific scabies prevalence data.[18,20,37,42,53]

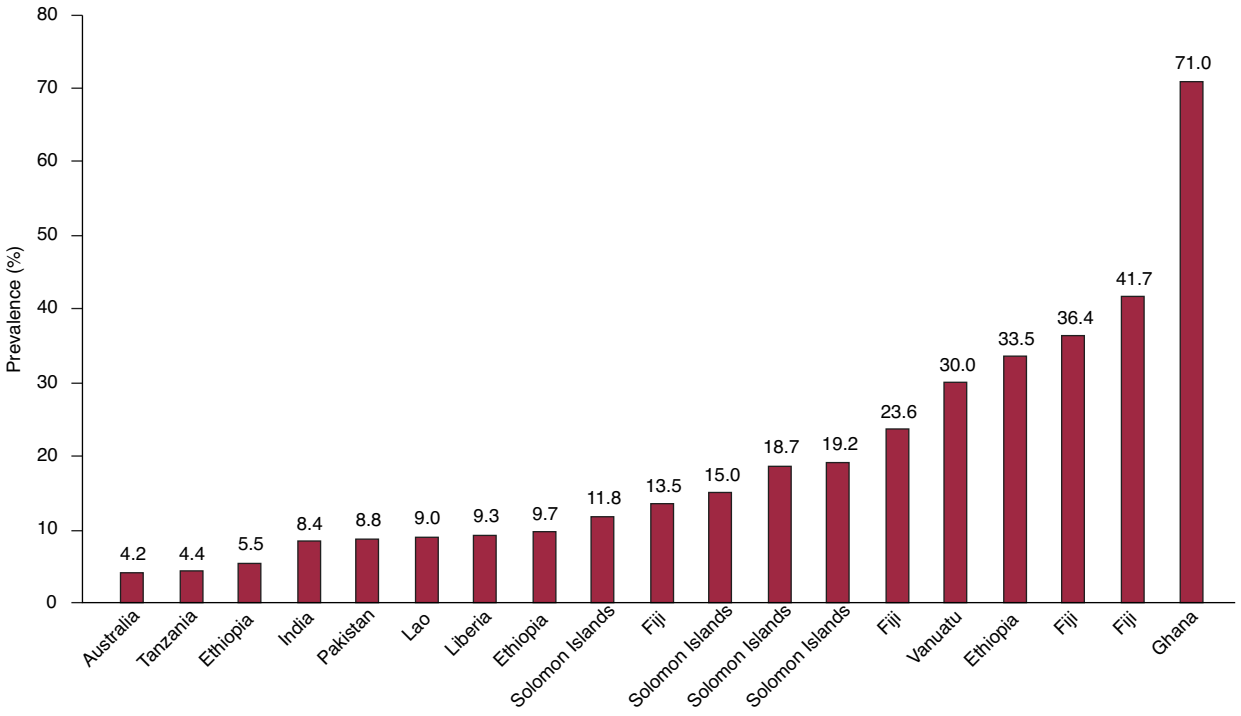

FIGURE 5 Scabies prevalence in studies focusing on the general population.[15,19,21,23,24,28,32,34,35,36,37,38,43,44,47,48,49,52,54]

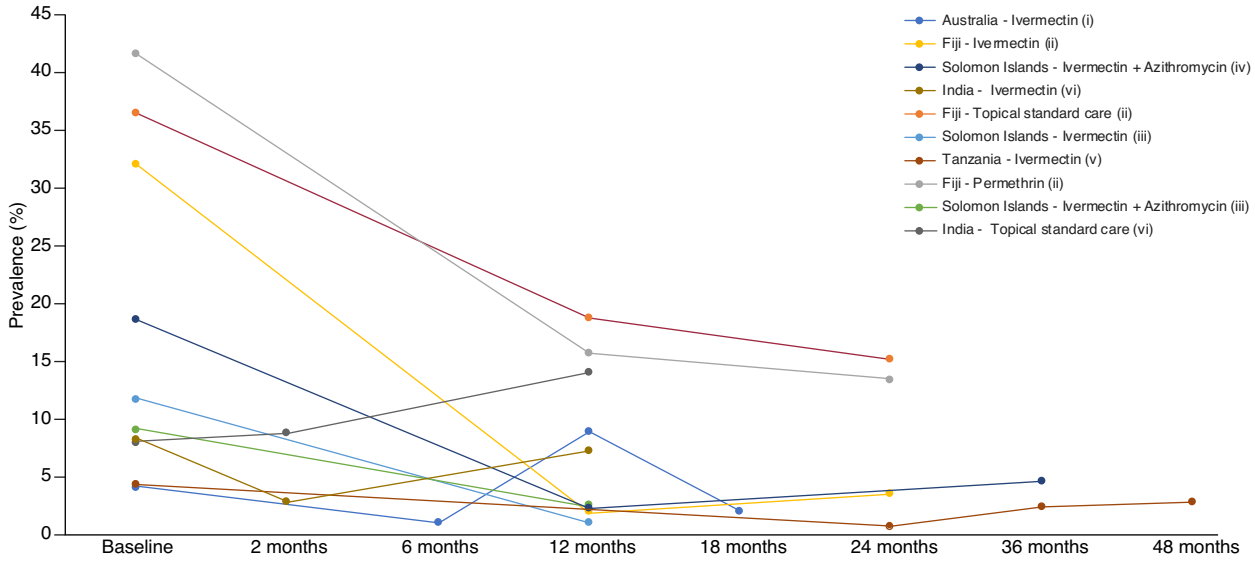

FIGURE 6 Figure shows that an oral systemic therapy led to a higher reduction in scabies prevalence compared to a topical antiscabicide therapy alone.[32,34,36,37,44,52]

study from Vanuatu[58] from 1989 that examined the prevalence of scabies among participants from all age groups in a yaws program, identifying a prevalence of 16% (2915/18,223). In comparison, we were able to find a recent study from Vanuatu[18] that examined scabies prevalence in 30 random villages among 1879 residents in 2020, revealing a scabies prevalence of 30% (563/1879) among the residents. This illustrates that in some regions the prevalence of scabies is not only high but also has increased in recent years, reflecting an unmet need in the prevention and treatment of scabies on a global level.

In addition, Romani et al.[7] recommended that future studies assess age-specific differences in the prevalence to identify age groups with a higher risk of developing scabies. They identified 10 out of 48 studies that investigated age-specific prevalence of scabies. In all examined studies, the prevalence of scabies was higher in children than in adults. However, as only 5 of the 43 included studies collected age-specific data, this review demonstrated that the recommendations for more age-specific investigations were not followed.[18,20,37,42,53] Nevertheless, it was observed in those studies that did include age-specific data that children always had a higher scabies prevalence than adults. This underlines findings by Romani et al.,[7] who identified children as a more frequently affected group. Future public health programs should therefore pay particular attention to children.

Romani et al.[7] identified only a few ($n = 4$) studies reporting the scabies prevalence in Europe in a population-based setting and no studies in North America. In this systematic review, however, no data from these continents were found. One possible explanation for this could be that the health care systems in these regions are increasingly becoming digitalized, with studies tending to rely on data from hospitals and health insurances rather than interview-based, door-to-door consultations. However, a major disadvantage of not using population-based settings is that a large proportion of scabies cases might not be recorded, as not every individual consults a doctor. This is in accordance with a recent study on Internet search behaviour, which showed that a high proportion of search requests, and thereby public interest in a topic, were about alternative therapy options.[59] However, as recent studies conducted in European and North American hospitals reported an increasing scabies prevalence,[60] population-based studies are needed to obtain a comprehensive overview of the scabies burden in European and North American countries to fully quantify the medical need of the disease.

In the previous systematic review by Romani et al.,[7] the authors identified the importance of MDA campaigns for controlling scabies. Similarly, this review also included studies showing that the prevalence was substantially lower after an MDA campaign. However, studies from the Solomon Islands[35] and Tanzania[36] indicated that the prevalence increased again a few years after the campaigns. On the one hand, this can be attributed to the MDA campaigns not reaching all inhabitants of a region, so that there are inhabitants who have not received the drug and can infect other people. On the other hand, the rebound in prevalence can be explained by migration of people to the studied region, who might have scabies and could serve as a source of infection. Another explanation could be that many MDA studies rely on only topical therapy, which has shown to have weaknesses in application. In addition, individual studies report resistances to permethrin. This could be a reason for the increase in prevalence in the MDA studies mentioned above, which only treat topically using permethrin.[61] In comparison, an MDA study in Fiji showed that ivermectin, an oral scabicide, achieved a higher reduction in scabies prevalence than topical therapy alone.[43] Similar results were found by a study in Zanzibar from 2012, where the oral administration of

Ivermectin once a year as part of an MDA campaign led to a long-term reduction in the prevalence of scabies.[62] Therefore, future MDA studies should rely on an oral therapy ideally in combination with a topical therapy, which is the current gold standard in Europe, and should be conducted over several years in a row. However, it is important to note that the systematic review did not really focus on MDA studies, and this was only exploratory and should be further investigated like it was done by a recent published systematic review by Lake et al. on MDA in scabies and impetigo.[63] In addition to Lake et al., we have highlighted the different treatment arms in these studies and could thus show that systemic therapy seems to be superior to purely topical therapy. Also, we were able to show with the mentioned study by Behera et al. that MDA strategies already could have been used to successfully reduce the prevalence of scabies in Asian countries.[51]

In 2018, Marks et al.[34] studied the scabies prevalence in relation to the time of the year in Guinea-Bissau, Africa, comparing between the dry (February–March) and wet (June–July) phase. The prevalence was higher in the dry phase (5.2%) than in the wet phase (1.9%), which was contrary to previous results from Taiwan showing a positive correlation between scabies incidence and humidity.[64] A plausible explanation for this difference is to date still missing. Further studies should be conducted to clarify the effect of season on scabies prevalence.

There are some study limitations. The study designs and methods are heterogeneous. Since there are no standardized internationally defined criteria for the diagnosis of scabies, the criteria vary from study to study. In addition, there is a considerable variation in sample size. Some studies examined the prevalence of scabies for example, only in individual schools, while others analysed prevalence in several villages. Similarly, many studies report only an overall scabies prevalence instead of for individual groups, like gender or age-related prevalence. Another limitation of the present study is that very high prevalence may have been caused by local outbreaks and thus cannot always be extrapolated to the general population. In contrast, a very low prevalence cannot necessarily be transferred to the entire population either, as this also represents only a momentary snapshot in the context of the respective survey.

This updated systematic review highlights current trends in the prevalence of scabies worldwide. The past systematic review by Romani et al. discussed the relevance of MDA campaigns to reduce the prevalence of scabies. The current analysis shows that MDA campaigns can considerably lower the prevalence of scabies. Nevertheless, scabies remains a common problem and especially in developing countries. Furthermore, the prevalence was shown to increase again after some years after intervention, which indicated that more MDA attempts are needed to mitigate the disease. Additionally, studies using population-based settings in Europe and North America should be conducted to provide a comprehensive overview of the global prevalence of scabies. More precise information on study design and the identification of vulnerable groups are needed for future identification of risk factors for new prevention approaches. Widespread awareness campaigns are urgently needed.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, SS, upon request.

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REFERENCES

1. Heukelbach J, Feldmeier H. Scabies. Lancet. 2006;367:1767–74.
2. Karimkhani C, Colombara DV, Drucker AM, Norton SA, Hay R, Engelman D, et al. The global burden of scabies: a cross-sectional analysis from the global burden of disease study 2015. Lancet Infect Dis. 2017;17:1247–54.
3. Chandler DJ, Fuller LC. A review of scabies: an infestation more than skin deep. Dermatology. 2019;235:79–90.
4. Engelman D, Yoshizumi J, Hay RJ, Osti M, Micali G, Norton S, et al. The 2020 International Alliance for the Control of Scabies consensus criteria for the diagnosis of scabies. Br J Dermatol. 2020;183:808–20.
5. Nemecek R, Stockbauer A, Lexa M, Poeppl W, Mooseder G. Application errors associated with topical treatment of scabies: an observational study. J Dtsch Dermatol Ges. 2020;18:554–9.
6. Sunderkötter C, Wohlrab J, Hamm H. Scabies: epidemiology, diagnosis, and treatment. Dtsch Arztebl Int. 2021;118:695–704.
7. Romani L, Steer AC, Whitfeld MJ, Kaldor JM. Prevalence of scabies and impetigo worldwide: a systematic review. Lancet Infect Dis. 2015;15:960–7.
8. Cox V, Fuller L, Engelman D, Steer A, Hay RJ. Estimating the global burden of scabies: what else do we need? Br J Dermatol. 2021;184:237–42.
9. Sunderkötter C, Aebischer A, Neufeld M, Löser C, Kreuter A, Bialek R, et al. Increase of scabies in Germany and development of resistant mites? Evidence and consequences. J Dtsch Dermatol Ges. 2019;17:15–23.
10. Casulli A. New global targets for NTDs in the WHO roadmap 2021-2030. PLoS Negl Trop Dis. 2021;15:e0009373.
11. 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. Syst Rev. 2021;10:89.
12. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet. 2007;370:1453–7.
13. United Nations Development Program (UNDP). Human development report 2020. New York, NY: UNDP; 2020.
14. Amoako YA, Phillips RO, Arthur J, Abugri MA, Akowuah E, Amoako KO, et al. A scabies outbreak in the North East Region of

Ghana: the necessity for prompt intervention. PLoS Negl Trop Dis. 2020;14:e0008902.
15. Armitage EP, Senghore E, Darboe S, Barry M, Camara J, Bah S, et al. High burden and seasonal variation of paediatric scabies and pyoderma prevalence in The Gambia: a cross-sectional study. PLoS Negl Trop Dis. 2019;13:e0007801.
16. Birjandi MM, Oroei M, Emadi SN, Peyvandi AA, Anang AK. Scabies among high school students in Accra, Ghana: risk factors and health literacy. Iran Red Crescent Med J. 2019;21:e92510.
17. Burman AK, Bansal R, Sharma S, Krishna A, Ahmad S. An epidemiological study of prevalence of skin diseases among secondary school going children in District Meerut. Indian J Public Health Res Dev. 2020;11:41–7.
18. Callum J, McDiarmid D, Gao Y, Armstrong M, Iavro E, Steer A. Prevalence of scabies in Sanma Province, Vanuatu. Trans R Soc Trop Med Hyg. 2019;113:500–2.
19. Chang AY, Scheel A, Dewyer A, Hovis I, Sable C, Maurer T, et al. Prevalence of skin conditions in schoolchildren in urban western and northern Uganda. In: *American Journal of Tropical Medicine and Hygiene Conference 66th Annual Meeting of the American Society of Tropical Medicine and Hygiene*, Vol. 97. 2017; 159.
20. Collinson S, Timothy J, Zayzay SK, Kollie KK, Lebas E, Candy N, et al. The prevalence of scabies in Monrovia, Liberia: a population-based survey. PLoS Negl Trop Dis. 2020;14:e0008943.
21. Dagne H, Dessie A, Destaw B, Yallew WW, Gizaw Z. Prevalence and associated factors of scabies among schoolchildren in Dabat district, northwest Ethiopia, 2018. Environ Health Prev Med. 2019;24:1–8.
22. Enbiale W, Baynie TB, Ayalew A, Gebrehiwot T, Getanew T, Ayal A, et al. "Stopping the itch": mass drug administration for scabies outbreak control covered for over nine million people in Ethiopia. J Infect Dev Ctries. 2020;1972:28S–35S.
23. Farooq BR, Sikander I, Akhtar HS, Hassan F. Prevalence and knowledge of scabies among the rural area of Lahore. Pak J Med Health Sci. 2019;13(2):481–3.
24. García E, Halpert E, Borrero E, Ibañez M, Chaparro P, Molina J, et al. Prevalence of skin diseases in children 1 to 6 years old in the city of Bogota, Colombia. World Allergy Organ J. 2020;13:100484.
25. Gunathilaka N, Chandrasena N, Udayanga L. Prevalence of ectoparasitic infections and other dermatological infections and their associated factors among school children in Gampaha District, Sri Lanka. Can J Infect Dis Med Microbiol. 2019;2019:1–10.
26. Haile T, Sisay T, Jemere T. Scabies and its associated factors among under 15 years children in Wadila district, Northern Ethiopia, 2019. Pan Afr Med J. 2020;37:224.
27. Hardy M, Samuela J, Kama M, Tuicakau M, Romani L, Whitfeld MJ, et al. The safety of combined triple drug therapy with ivermectin, diethylcarbamazine and albendazole in the neglected tropical diseases co-endemic setting of Fiji: a cluster randomised trial. PLoS Negl Trop Dis. 2020;14:e0008106.
28. Hegab DS, Kato AM, Kabbash IA, Dabish G. Scabies among primary schoolchildren in Egypt: sociomedical environmental study in Kafr El-Sheikh administrative area. Clin Cosmet Investig Dermatol. 2015;8:105.
29. Henshaw EB, Olasode OA. Prevalence of skin infections, infestations, and papular urticaria among adolescents in secondary schools in Calabar, Nigeria. Ghana Med J. 2019;53:287–93.
30. Kalu EI, Wagbatsoma V, Ogbaini-Emovon E, Nwadike VU, Ojide CK. Age and sex prevalence of infectious dermatoses among primary school children in a rural South-Eastern Nigerian community. Pan Afr Med J. 2015;20:182.
31. Kearns TM, Speare R, Cheng AC, McCarthy J, Carapetis JR, Holt DC, et al. Impact of an ivermectin mass drug administration on scabies prevalence in a remote Australian Aboriginal community. PLoS Negl Trop Dis. 2015;9:e0004151.
32. Korte LM, Bowen AC, Draper AD, Davis K, Steel A, Teodora I, et al. Scabies and impetigo in Timor-Leste: a school screening study in two districts. PLoS Negl Trop Dis. 2018;12:e0006400.
33. Marks M, Romani L, Sokana O, Neko L, Harrington R, Nasi T, et al. Prevalence of scabies and impetigo 3 years after mass drug administration with ivermectin and azithromycin. Clin Infect Dis. 2020;70:1591–5.
34. Marks M, Sammut T, Cabral MG, Teixeira da Silva E, Goncalves A, Rodrigues A, et al. The prevalence of scabies, pyoderma and other communicable dermatoses in the Bijagos Archipelago, Guinea-Bissau. PLoS Negl Trop Dis. 2019;13:e0007820.
35. Marks M, Toloka H, Baker C, Kositz C, Asugeni J, Puiahi E, et al. Randomized trial of community treatment with azithromycin and ivermectin mass drug administration for control of scabies and impetigo. Clin Infect Dis. 2019;68:927–33.
36. Martin D, Wiegand R, Goodhew B, Lammie P, Mkocha H, Kasubi M. Impact of ivermectin mass drug administration for lymphatic filariasis on scabies in eight villages in Kongwa District, Tanzania. Am J Trop Med Hyg. 2018;99:937–9.
37. Mason DS, Marks M, Sokana O, Solomon AW, Mabey DC, Romani L, et al. The prevalence of scabies and impetigo in the Solomon Islands: a population-based survey. PLoS Negl Trop Dis. 2016;10:e0004803.
38. Matthews A, Le B, Amaral S, Arkell P, Monteiro M, Clarke N, et al. Prevalence of scabies and impetigo in school-age children in Timor-Leste. Parasit Vectors. 2021;14:1–9.
39. Osti MH, Sokana O, Phelan S, Marks M, Whitfeld MJ, Gorae C, et al. Prevalence of scabies and impetigo in the Solomon Islands: a school survey. BMC Infect Dis. 2019;19:1–7.
40. Qasim MM. Epidemiology of scabies among primary school children in Quetta. Skin. 2015;5:12.8.
41. Rihatmadja R, Miranda E, Wicaksono MM, Widaty S. Why are they hard to treat? A preliminary survey to predict important factors causing persistent scabies among students of religion-affiliated boarding schools in Indonesia. Dermatol Reports. 2019;11:41–3.
42. Romani L, Koroivueta J, Steer AC, Kama M, Kaldor JM, Wand H, et al. Scabies and impetigo prevalence and risk factors in Fiji: a national survey. PLoS Negl Trop Dis. 2015;9:e0003452.
43. Romani L, Whitfeld MJ, Koroivueta J, Kama M, Wand H, Tikoduadua L, et al. Mass drug administration for scabies control in a population with endemic disease. N Engl J Med. 2015;373:2305–13.
44. Romani L, Whitfeld MJ, Koroivueta J, Kama M, Wand H, Tikoduadua L, et al. Mass drug administration for scabies—2 years of follow-up. N Engl J Med. 2019;381:186–7.
45. Romani L, Whitfeld MJ, Koroivueta J, Kama M, Wand H, Tikoduadua L, et al. The epidemiology of scabies and impetigo in relation to demographic and residential characteristics: baseline findings from the skin health intervention Fiji trial. Am J Trop Med Hyg. 2017;97:845–50.
46. Walker SL, Lebas E, De Sario V, Deyasso Z, Doni SN, Marks M, et al. The prevalence and association with health-related quality of life of tungiasis and scabies in schoolchildren in southern Ethiopia. PLoS Negl Trop Dis. 2017;11:e0005808.
47. Wootton C, Bell S, Philavanh A, Phommachack K, Soukavong M, Kidoikhammouan S, et al. Assessing skin disease and associated health-related quality of life in a rural Lao community. BMC Dermatol. 2018;18:1–10.
48. Yeshanehe W, Ayalew A. Investigation of drought associated Scabies outbreak in Ethiopia. In: *American Journal of Tropical Medicine and Hygiene Conference 66th Annual Meeting of the American Society of Tropical Medicine and Hygiene*, Vol. 99. 2018; 155.
49. Yotsu RR, Akpa A, N'Guessan K, Yao A, N'Guetta A, Yeboue E, et al. Integrated prevalence survey of skin ntds and common skin diseases among schoolchildren in Gagnoa, Cote D'Ivoire: diagnosis and risk factor analysis. In: *American Journal of Tropical Medicine and Hygiene Conference 66th Annual Meeting of the American Society of Tropical Medicine and Hygiene*, Vol. 97. 2017; 13.
50. Yotsu RR, Kouadio K, Vagamon B, N'guessan K, Akpa AJ, Yao A, et al. Skin disease prevalence study in schoolchildren in rural Cote d'Ivoire: implications for integration of neglected skin diseases (skin NTDs). PLoS Negl Trop Dis. 2018;12:e0006489.

51. Behera P, Munshi H, Kalkonde Y, Deshmukh M, Bang A. Control of scabies in a tribal community using mass screening and treatment with oral ivermectin-a cluster randomized controlled trial in Gadchiroli, India. PLoS Negl Trop Dis. 2021;15:e0009330.
52. Devidas J, Mohpatra J, Dehury P, Dehury RK. Socio-demographic and morbidity pattern among under-five children in rural areas of Adilabad District of Telangana, India. J Clin Diagn Res. 2021;15:17–21.
53. Lake SJ, Engelman D, Sokana O, Nasi T, Boara D, Grobler AC, et al. Defining the need for public health control of scabies in Solomon Islands. PLoS Negl Trop Dis. 2021;15:e0009142.
54. Sanei-Dehkordi A, Soleimani-Ahmadi M, Zare M, Jaberhashemi SA. Risk factors associated with scabies infestation among primary schoolchildren in a low socio-economic area in southeast of Iran. BMC Pediatr. 2021;21:249.
55. Satyamanasa Gayatri Vinay AS, Pandi K, Mookkappan S. Prevalence of skin disorders (SD) among school going children of semi-urban areas in Puducherry. Curr Pediatr Rev. 2021;25(4):509–13.
56. Taiaroa G, Matalavea B, Tafuna'i M, Lacey JA, Price DJ, Isaia L, et al. Scabies and impetigo in Samoa: a school-based clinical and molecular epidemiological study. Lancet Reg Health West Pac. 2021;6:100081.
57. Marks M, Taotao-Wini B, Satorara L, Engelman D, Nasi T, Mabey DC, et al. Long term control of scabies fifteen years after an intensive treatment Programme. PLoS Negl Trop Dis. 2015;9:e0004246.
58. Harris M, Nako D, Hopkins T, Powell DM, Kenny C, Carroll C, et al. Skin infections in Tanna, Vanuatu in 1989. PNG Med J. 1992;35:137–43.
59. Wu J, Tizek L, Rueth M, Wecker H, Kain A, Biedermann T, et al. The national burden of scabies in Germany: a population-based approach using internet search engine data. Infection. 2022;50:915–23.
60. Elsner E, Uhlmann T, Krause S, Uhlmann T, Krause S, Hartmann R. Increase of scabies and therapy resistance among German military personnel: an 8-year follow-up study in the Department of Dermatology of the Armed Forces Hospital Berlin, Germany (2012-2019). Hautarzt. 2020;71:447–54.
61. Mazzatenta C, Piccolo V, Argenziano G, Bassi A. Is scabies becoming less sensitive to permethrin therapy? J Eur Acad Dermatol Venereol. 2021;35(9):e607–9.
62. Mohammed KA, Deb RM, Stanton MC, Molyneux DH. Soil transmitted helminths and scabies in Zanzibar, Tanzania following mass drug administration for lymphatic filariasis—a rapid assessment methodology to assess impact. Parasit Vectors. 2012;5:299.
63. Lake SJ, Kaldor JM, Hardy M, Engelman D, Steer AC, Romani L. Mass drug administration for the control of scabies: a systematic review and meta-analysis. Clin Infect Dis. 2022;75(6):959–67.
64. Liu JM, Wang HW, Chang FW, Liu YP, Chiu FH, Lin YC, et al. The effects of climate factors on scabies. A 14-year population-based study in Taiwan. Parasite. 2016;23:54.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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