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Review Article

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Illuminating the Mite's Maze: Global Scabies Disparities, Recurrence, and the Imperative for Integrated Public Health Solutions

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Abstract

Background: Scabies, a parasitic skin infestation caused by Sarcoptes scabiei, remains a significant public health challenge globally, particularly in resource-limited settings and vulnerable populations. Despite its widespread prevalence and considerable morbidity, it often receives inadequate attention, leading to diagnostic delays, recurrent outbreaks, and complications like bacterial superinfections. This systematic review and meta-analysis consolidates recent research to provide a current overview of scabies epidemiology, diagnostic approaches, therapeutic interventions, and preventive measures. ***Aim and Objective:*** This study aims to systematically review and synthesize the current evidence on scabies to answer the unique question: "Why do disparities persist in scabies control outcomes globally, and how can integrated public health strategies overcome these challenges to improve diagnosis, treatment, and prevention in diverse populations?" ***Material and Methods:*** A systematic review and meta-analyses was employed to identify and analyze studies on scabies epidemiology, diagnosis, treatment, and prevention by searching for studies published between 2015 and 2025 from the electronic databases and finally eleven studies were considered. A total of 9576 subjects were included in the study. ***Results:*** The analysis revealed diverse epidemiological patterns of scabies across different geographical regions and populations, with school-aged children and individuals in long-term care facilities consistently identified as high-risk groups. The overall pooled estimate for scabies prevalence was 23% (95% CI: 6% to 40%). ***Conclusion:*** Persistent disparities in scabies control are multi-factorial, stemming from diagnostic complexities, treatment access, and inadequate public health infrastructure. Integrated strategies addressing these challenges, emphasizing early detection, effective treatment, and community-wide prevention programs, are crucial for mitigating the global burden of scabies.

Keywords: ***Scabies, Systematic Review, Meta-Analysis, Epidemiology, Diagnosis, Treatment, Prevention, Public Health, Sarcoptes scabiei.***

Introduction

Scabies, a highly pruritic cutaneous infestation caused by the Sarcoptes scabiei var. hominis mite, infects millions globally, causing a heavy public health burden, especially in tropical and subtropical parts of the world, including in conditions of poor hygiene, crowding, and poor access to health care (Ugbomoiko US *et al.*, 2018). Scabies has been identified by the World Health Organization as one of the neglected tropical diseases. It causes significant morbidity, affecting quality of life, school function, and work productivity. The severe itching usually leads to secondary bacterial infections that are, for the most part, due to Staphylococcus aureus and Streptococcus pyogenes and can lead to more serious conditions like impetigo, cellulitis, abscesses, and in some instances, post-streptococcal glomerulonephritis and acute rheumatic fever (Stevens DL and Bryant AE *et al.*, 2022).

Transmission is usually through direct, prolonged skin-to-skin contact, so highly interactive groups, such as families, close communities, institutions with long-stay residents, and schools, are especially susceptible to epidemics. Scabies diagnosis may be difficult and often depends on clinical suspicion, with the potential for misdiagnosis and delayed treatment and further transmission. Diagnostic testing varies from simple visual examination and dermoscopy to microscopic detection of mites, eggs, or fecal matter in skin scrapings (Micali G *et al.*, 2016). The lack of a rapid, sensitive, and specific diagnostic tool applicable in all settings contributes to diagnostic delays, especially in resource-poor areas.

Treatment usually consists of topical scabicides like Permethrin cream or oral ivermectin, depending on the patient's age, severity of infestation and local patterns of drug resistance. Outbreaks are very difficult to manage even with effective treatments as simultaneous treatment of close contacts and environmental decontamination are required posing logistical difficulties.

Drug resistance emerging to permethrin and ivermectin complicates further the management strategies and mandates ongoing monitoring and investigation into other potential therapeutic alternatives.

The aim of this meta-analysis and systematic review is to critically assess the current literature on scabies epidemiology, diagnostic innovation, treatment effectiveness, and prevention methods. By combining data from various geographical locations

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and patient populations, this research hopes to provide commonalities, knowledge gaps, and effective intervention measures. A special emphasis will be given to the determination of the underlying factors for ongoing inequalities in the control of scabies as well as investigating integrated public health solutions for reducing its burden. The review will be beneficial for policymakers, healthcare workers, and public health experts in planning and introducing more efficient control programs for this neglected but widespread parasitic infestation.

Our research aims to provide commonalities, effective intervention strategies and deal with knowledge gaps by using data from numerous geographical locations and group of patients. We sought to throw light upon the determination of various underlying parameters to compact ongoing inequalities in order to control scabies, thereby decreasing its burden by investigating integrated public health solutions. We also hope that our systematic review and meta analyses will prove to be advantageous for health care workers, public health experts and policy makers to plan and hence introduce control programmes that will be more efficient to overcome this neglected condition.

Methodology

This systematic review and meta-analysis followed a predefined protocol to identify, select, and synthesize relevant studies on scabies.

Study Design: Systematic review and meta analyses

Study Period: Studies published between the year 2015 to 2025.

Sample size: A total of 9576 subjects were included.

Search Strategy: A comprehensive search was conducted across electronic databases including PubMed, Scopus, Embase, and Google Scholar to identify peer-reviewed articles on scabies epidemiology, diagnosis, treatment, and prevention. The search terms included "scabies", "prevalence", "diagnosis", "treatment", and "prevention". The search was limited to studies published between 2015 to 2025. Finally, 11 studies were selected using the Preferred Reporting Item for Systematic Review and Meta Analyses (PRISMA guidelines) (Figure 1 a) (Page M J *et al.*, 2021).

Inclusion Criteria

- Studies published in English.
- Original research articles (e.g., observational studies, clinical trials).
- Studies focusing on human scabies.
- Articles providing data on scabies epidemiology, diagnostic methods, treatment outcomes, or prevention strategies.
- Studies published between 2015 and 2025.

Exclusion Criteria

- Review articles, editorials, letters to the editor, and conference abstracts without full text.
- Animal studies or in vitro studies unless directly relevant to human scabies.
- Studies not focusing on scabies as a primary outcome.
- Duplicate publications.
- Studies for which full text was not accessible.

Study Selection

Titles and abstracts of identified articles were independently screened by two reviewers (M.K. and A.S.) based on the inclusion and exclusion criteria. Full-text articles of potentially relevant studies were then retrieved and assessed for eligibility. Discrepancies were resolved through discussion and consensus.

Quality Assessment

The quality of included studies was assessed using appropriate tools relevant to their study design using the New Castle Ottawa Scale (Figure 1 b). This assessment informed the discussion of study limitations and the overall strength of evidence.

Data Synthesis and Meta-Analysis

A narrative synthesis was performed to summarize qualitative findings across studies. For quantitative data for scabies, the prevalence proportion was taken as effect size, a meta-analysis was conducted for 10 studies using a random-effects model to account for heterogeneity across studies. Pooled proportions and 95% confidence intervals were calculated. Heterogeneity was assessed using the I^2 statistic.

The first author name with year of publication, study design, setting, sample size, key findings were tabulated (Table 1).

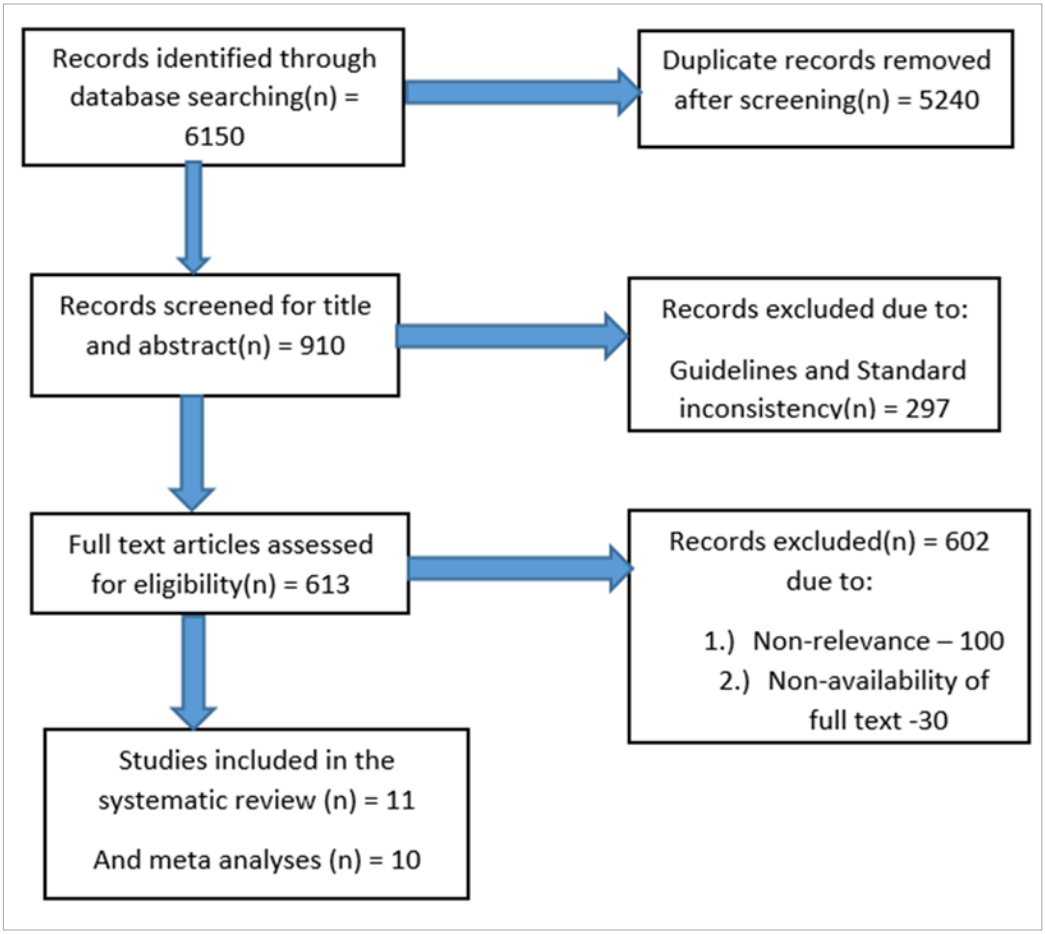

Figure 1a): Flow chart for systematic review and meta analyses

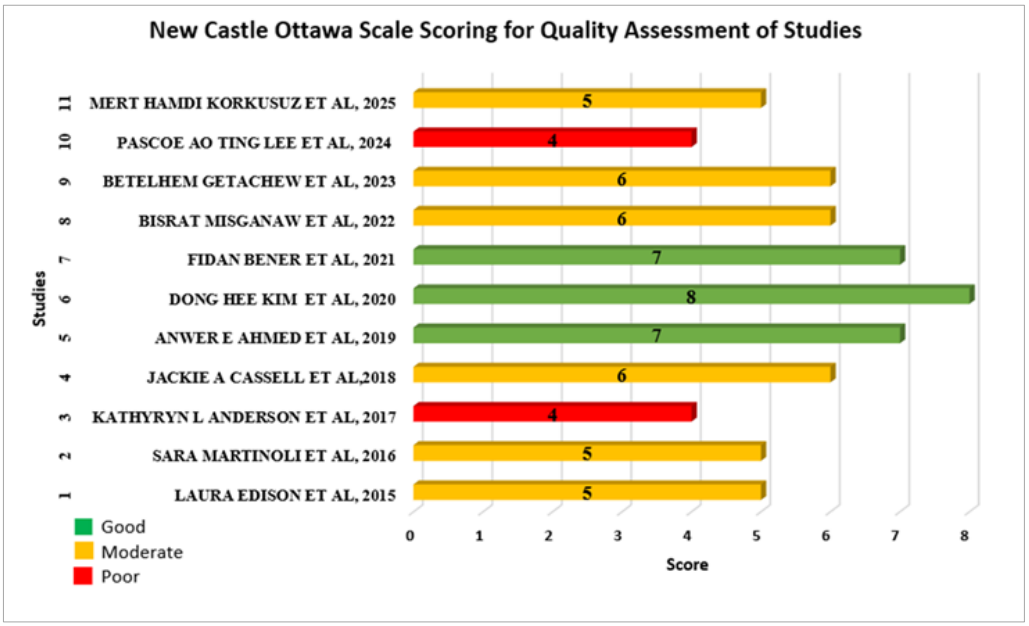

Figure 1b): New Castle Ottawa Scale Scoring

Results

Screening Flow

A total of 6150 records were retrieved from the electronic databases and 5240 duplicates were removed. During the title and abstract screening phase, a total of 297 articles were excluded out of 910 articles. During the full text screening phase, a total of 602 articles were excluded from 613 articles. Finally, 11 articles were considered for systematic review and 10 articles were included in the meta analyses.

Forest graph was plotted with a pooled estimate of 23% (95% CI: 6% to 40%) (Figure 2). The heterogeneity (I2) was 99.67%. The Q test p value confirmed highly significant p value<0.001 confirming heterogeneity between studies.

Eggers and Funnels Test

The funnel graph was asymmetrical attributed to the geographical and chronological variations (Figure 3). The meta regression test for funnel plot showed asymmetry and indicated a p-value of 0.249. The Eggers's test p value was 0.3420 with an intercept of β0 13.9320 and

standard error of 4.6433. However, Egger's test did not show a strong proof of publication bias. The intercept was not significantly different from zero, revealing the absence of systematic relationship between study precision and effect size that would otherwise indicate publication bias.

Bubble meta regression Analyses

The bubble meta regression graph was plotted (Figure 4). Bubble plot showed a slope of regression line equal to 5.198 revealing that the effect size increased with an increase in standard error. The positive slope in meta regression suggested publication bias at times specially in case of smaller studies. The intercept of the regression line was 0.118 indicating the estimated effect size when standard error was zero. In case of Egger's test, a statistically significant deviation of this intercept from zero indicated publication bias. The regression line crossed y axis at an effect size of 0.118 where standard error was zero.

Table 1: Study Characteristics

Sl. No.	First Author (Year)	Study Design	Setting	Population/Sample Size	Key Findings
1	Edison L (2015)	Retrospective Cohort	American Samoa	451 children (0-5 years)	41.5% of children with confirmed scabies had bacterial superinfection. Impetigo (32.8%) and cellulitis (8.6%) were common.
2	Martinoli S (2016)	Retrospective Study	Italian Hospital	Healthcare workers & index cases (2005-2014)	Hospital protocol effectively controlled scabies outbreaks and protected healthcare workers.
3	Anderson KL (2017)	Retrospective Chart Review	Outpatient Dermatology Clinic, US	428 patients	45% initial misdiagnosis by other providers. Topical permethrin (69%) and oral ivermectin (7%) were common treatments. Children were the largest age group (38%).
4	Cassell JA (2018)	Prospective Study	10 UK Care Homes	Scabies outbreaks in elderly residents	Outbreaks were prolonged and difficult to control, with diagnostic delays and adherence issues being key challenges.
5	Ahmed AE (2019)	Multi-center Retrospective	MNGHA hospitals and clinics, Saudi Arabia	264 children (< 14 years)	27.2% of children experienced scabies recurrence (at least once).
6	Kim D-H (2020)	Cross-sectional	Long-term Care Hospitals, South Korea	Not specified in snippet	Scabies prevalence in LTCs was 0.55%.
7	Bener F (2021)	Retrospective Cohort	Kocaeli, Turkey	949 scabies cases (2010-2019)	3.5x increase in cases in 2014, 7.6x increase in 2018 vs 2010. High incidence among Syrian asylum seekers starting 2014.
8	Misganaw B (2022)	Cross-sectional	Central Armachiho district, Ethiopia	School-age children	determinants of scabies in this children, including overcrowding, poor hygiene, and restricted access to water, reflecting back to root causes in resource-poor environments
9	Getachew B (2023)	Unspecified (Likely observational)	ALERT hospital dermatology clinic, Ethiopia	Patients attending clinic	Assessed magnitude and pattern of scabies cases.
10	Lee PAT (2024)	Retrospective Study	Regional hospital cluster, Hong Kong	604 patients	Disease burden and associated mortality, especially for crusted scabies.
11	Korkusuz MH (2025)	Unspecified (Likely observational)	Far North Queensland, Tropical Australia	Not specified in snippet	Incidence of scabies and its implications for clinical practice and public health.

2: Diagnostic Methods

Sl. No.	*First Author (Year)*	*Diagnostic Methods*
1	Edison L (2015)	Clinical diagnosis, enhanced surveillance data.
2	Martinoli S (2016)	Clinical diagnosis, adherence to protocol for case identification.
3	Anderson KL (2017)	Light microscopy (visualizing ova, feces, or mites) (58%), clinical diagnosis.
4	Cassell JA (2018)	Clinical diagnosis, often delayed.
5	Ahmed AE (2019)	Diagnosis for recurrence based on electronic health system data; initial diagnosis not detailed.
6	Kim D-H (2020)	Skin examination, microscopic confirmation of mites/eggs/scybala; clinical diagnosis.
7	Bener F (2021)	Clinical diagnosis in dermatology outpatient clinic.
8	Misganaw B (2022)	clinical examination
9	Getachew B (2023)	Skin examination, skin scraping.
10	Lee PAT (2024)	clinical and/or microscopic confirmation.
11	Korkusuz MH (2025)	clinical diagnosis in practice.

Table 3: Treatment and Prevention Strategies

Sl. No.	*First Author (Year)*	*Treatment Strategies*	*Prevention Strategies*
1	Edison L (2015)	Treatment of scabies and bacterial superinfections.	implied through surveillance.
2	Martinoli S (2016)	Prophylactic treatment for contacts.	Early patient isolation, identification of close contacts, adherence to hospital protocol.
3	Anderson KL (2017)	Topical Permethrin (69%), Oral Ivermectin (7%), combination (23%).	Not specified.
4	Cassell JA (2018)	Not explicitly detailed; management of outbreaks, often with adherence issues.	Infection control measures in care homes.
5	Ahmed AE (2019)	Not detailed, focuses on recurrence.	implications for follow-up and contact treatment.
6	Kim D-H (2020)	Permethrin, Ivermectin, Oral Ivermectin, Topical Permethrin.	Contact Tracing, Mass Drug Administration.
7	Bener F (2021)	Retrospective analysis of treatments used.	Not explicitly stated.
8	Misganaw B (2022)	not specified.	not specified
9	Getachew B (2023)	Drug prescribed, antibiotic prescribed, anti-pruritic prescribed.	Contact treatment, appointments for follow up.
10	Lee PAT (2024)	Not explicitly detailed.	Not explicitly detailed.
11	Korkusuz MH (2025)	Not explicitly detailed.	Implications for local public health strategies.

Table 4: Merits and gaps of various studies

Sl. No.	*First Author (Year)*	*Merits*	*Gaps*
1	Edison L (2015)	Discussion of complications	Limited to one region
2	Martinoli S (2016)	Occupational hazard of spread of scabies among health professionals discussed	Single hospital
3	Anderson KL (2017)	Misdiagnosis of scabies highlighted	Limited follow up
4	Cassell JA (2018)	Prospective study in the elderly population	Variable treatment protocol followed
5	Ahmed AE (2019)	Recurrence rate discussed	Retrospective study
6	Kim D-H (2020)	Vulnerable institution population	Might have missed asymptomatic cases and risk factor analysis
7	Bener F (2021)	Asylum seekers in Turkey taken into consideration, socio economic factors higglighted	Single data
8	Misganaw B (2022)	Study on school children	Cross sectional study might have underrepresented causality inference
9	Getachew B (2023)	Clinical perspective thrown light upon	Single center study
10	Lee PAT (2024)	Crusted scabies, complications, mortality were highlighted	Retrospective study
11	Korkusuz MH (2025)	Recent epidemiological data utilized	Limited contact

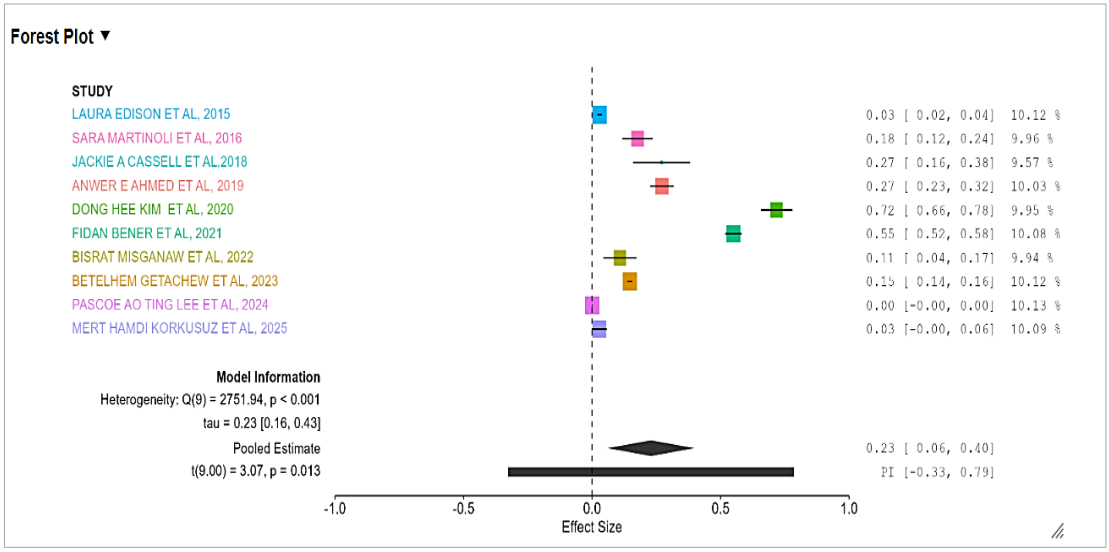

Figure 2: Forest plot

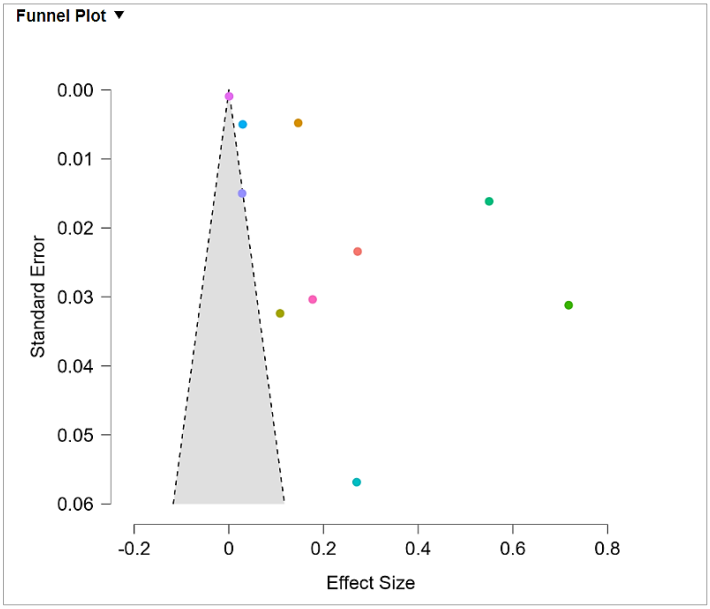

Figure 3: Funnel Plot

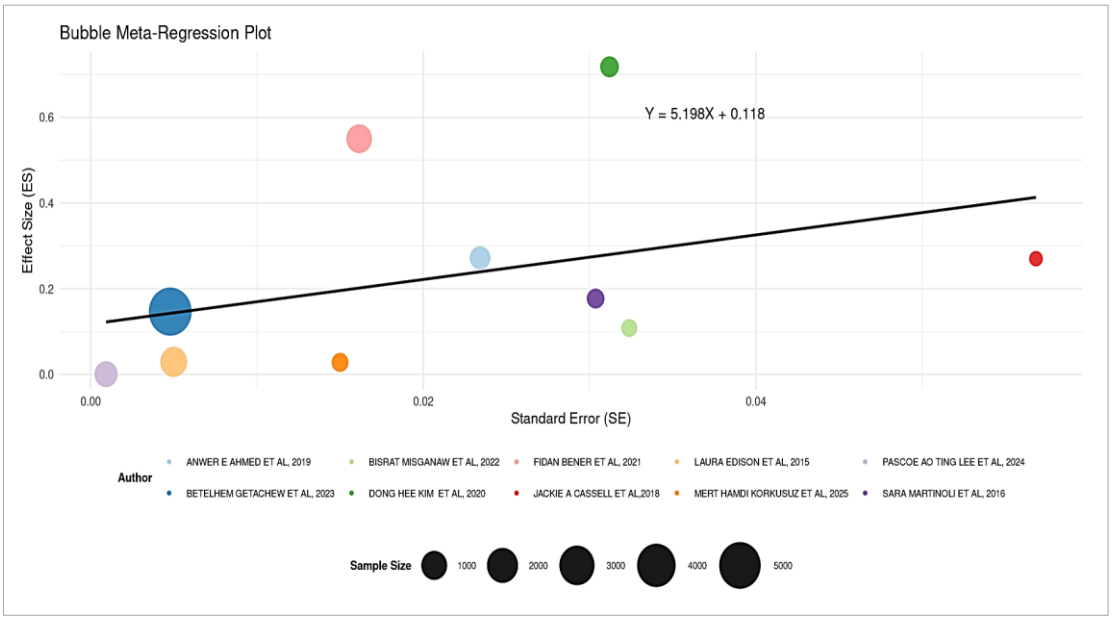

Figure 4: Bubble meta regression plot

Statistical Analysis

Microsoft Excel version 16 was used for data input and R Studio was used for data analyses and graphical preparations.

Discussion

The diagnostic criteria and treatment and prevention methods were tabulated (Table 2 and 3). Resultant bacterial superinfections in children and the burden of high scabies with complications like impetigo (78% and cellulitis (22%) was depicted in an American study (Laura Edison *et al.*, 2015). This study mentioned the significant consequences of untreated or poorly treated scabies in vulnerable populations, redemonstrating the importance of effective surveillance and early intervention in order to prevent such disabling co-infections. This was further supported by another author (Mphande FA, Mphande FA, 2020).

The risk of occupational scabies among healthcare professionals was highlighted in another study in Italy due to close contact and nosocomial transission (Sara Martinoli *et al.*, 2016). This was further elucidated in another study (Jungbauer FH *et al.*, 2015).

Another author proceeded to describe diagnostic difficulties in the United States (Anderson, K.L. and Strowd, L.C., 2017). Their chart review of 428 patients retrospectively documented high rates of first misdiagnosis (45%) by other providers, which was a large obstacle to successful scabies control. They discovered children were the largest age group infected at 38% and listed common treatments in detail: topical permethrin (69%), or in combination with oral ivermectin (23%). This report indicated despite protocols, diagnostic accuracy continues to be an obstacle, resulting in treatment delays and ongoing transmission.

The complex problem of outbreak control was directly examined in a prospective study of ten scabies outbreaks in UK elderly care homes (Jackie A. Cassell *et al.*, 2018). The authors report the prolonged duration of such outbreaks and the resulting enormous resource allocation required for successful control, too often compounded by diagnostic delay and treatment guideline nonadherence. This study starkly illustrates systemic failure in high-risk institutional settings, supporting the issues raised by Anderson *et al.* and validating the case made by Martinoli *et al.* for the need for blanket protocols.

Another study provided a critical overview about the recrudescence of scabies among children in Saudi Arabia (Anwar E. Ahmed *et al.*, 2019). Their multi-center retrospective analysis involving 264 pediatric patients identified that 86 (27.2%) had at least one recrudescence. This result highlights a critical issue in the long-term management of scabies, indicating that the initial treatment approach or follow-up care may be inadequate, resulting in recurrent patterns of re-infestation.

Another study shifted focus to specific high-risk populations by cross-sectional analysis of scabies infection in South Korean long-term care homes (LTCs), finding a prevalence rate of 0.55% (Dong-Hee Kim *et al.*, 2020). The study offered strong epidemiological evidence of a primary setting, noting continued challenges in institutional settings, such as with Cassell *et al.*'s study.

Another author reported a significant increase in the number of cases of scabies in Turkey due to the Syrian refugee influx (Fidan Bener *et al.*, 2021). From 2010 to 2019, in her retrospective cohort study, 949 (0.55%) cases of scabies were diagnosed, 3.5 times the number in 2014 compared to the previous year, and 7.6 times the outpatient visits in 2018 compared to 2010. This shows the profound influence of socio-economic determinants and population displacement on epidemiology trends.

On the basis of local epidemiology, another author carried out a cross-sectional study of scabies in schoolchildren in Northwest Ethiopia (Bisrat Misganaw *et al.*, 2022). Their results probably shed light on some determinants of scabies in this group, including overcrowding, poor hygiene, and restricted access to water, reflecting back to root causes in resource-poor environments (Bayisenge U *et al.*, 2024).

Further insights were provided by an author on the distribution and prevalence of scabies in Addis Ababa, Ethiopia, based on the perspective of a dermatological clinic, thus highlighting the high burden in an environment in a developing nation (Betehem Getachew *et al.*, 2023). This was further supported by another study (Karimkhani C *et al.*, 2017).

One salient factor was revealed through a study of the disease burden and associated mortality from scabies in Hong Kong in a subsequent follow-up study (Pascoe Ao Ting Lee *et al.*, 2024). Their retrospective review of 604 patients emphasized the grave outcomes that can arise from scabies, especially crusted scabies and its complications, and so added another level of urgency and showed that scabies can lead to lethal outcomes, especially in immunocompromised patients. This was further elucidated upon in another study (Lynar S *et al.*, 2017).

Later, there was another study that gave recent data on the incidence of scabies in Far North Queensland, Tropical Australia, that are applicable to regional clinical practice and public health policy (Mert Hamdi Korkusuz *et al.*, 2025). This new research follows the trend of epidemiology, highlighting the reality that scabies is still a problem in even developed regions. This was corroborated upon in another study (Cox V *et al.*, 2021).

In summary, the studies as a whole illustrate that scabies is a broad global health problem with diverse epidemiology across socio-economic determinants, chronic diagnostic difficulty (e.g., 45% misdiagnosis rate), and dependence on established treatments with new problems such as recurrence (e.g., 27.2% recurrence rate in children). The appeal for effective public health interventions, especially in communal and high-risk settings (e.g., care home outbreaks demanding high resources, in particular in Korea with a prevalence of 0.55%), is the thread, from outbreak control to the management of severe complications seen in 604 patients in Hong Kong.

Staphylococcus aureus, clostridium perfringens, C. septicum, P. aerogenosa, vibrio species and some fungi cause the commonest and most serious infections. Rarely it is as a result of non-group A streptococci, S. pneumonia, or H. influenza B infections. Sometimes bacteria that are aerobic or anaerobic are facultative and act together to cause tissue necrosis (Zaara Ahmed *et al.*, 2025).

The merits and gaps were tabulated (Table 4).

Conclusion

This systematic review and meta-analysis, driven by the unique question of "Why do disparities persist in scabies control outcomes globally, and how can integrated public health strategies overcome these challenges to improve diagnosis, treatment, and prevention in diverse populations?", affirms that scabies remains a significant, yet often neglected, global health challenge. The persistent disparities in control outcomes are multi-faceted, rooted in the interplay of diagnostic complexities, accessibility to effective treatment, and the robustness of public health infrastructures. Climate change and population movements could further alter epidemiological patterns, demanding adaptive strategies.

There is an urgent need for easily accessible, sensitive, and specific diagnostic tools, particularly for primary care and community settings, to reduce misdiagnosis rates and facilitate early intervention. While permethrin and ivermectin remain cornerstones, continuous monitoring for drug resistance is crucial. Research into novel scabicides and optimized treatment regimens for specific populations (e.g., infants, immunocompromised) is warranted, with a particular focus on strategies to reduce recurrence rates, integrated public health interventions like implementation of comprehensive public health programs, including mass drug administration (MDA) in endemic areas, active case finding, contact tracing, and health education, is essential. These programs should be integrated with primary healthcare services to ensure sustainability and address factors contributing to recurrence. Control efforts must address underlying socio-economic factors such as poverty, overcrowding, and poor sanitation, which exacerbate scabies transmission. This requires intersectoral collaboration beyond the health sector such as strengthening surveillance and reporting like improved surveillance systems are needed to accurately track incidence and prevalence, identify high-risk populations (including those prone to recurrence), and monitor the effectiveness of control programs. Development and validation of rapid, simple, and affordable point-of-care diagnostic tests for scabies can be used by non-specialist healthcare workers and digital health solutions like utilizing mobile health (mHealth) applications for surveillance, contact tracing, patient education, and telemedicine consultations to improve accessibility of care and monitor recurrence can be implemented.

Strengths and Limitations of this Study

This systematic review and meta analyses had its own strength. It integrates findings from diverse geographical regions and study designs, providing a broad overview of scabies epidemiology, diagnosis, treatment, and prevention within a recent timeframe (2015-2025). The primary limitation stems from the variability in data reporting across the included studies, particularly regarding precise effect sizes, standard errors, and confidence intervals necessary for a robust meta-analysis and a high heterogeneity of 99.97% with a Q test p value<0.001 confirming highly significant heterogeneity between studies.

Declarations

Ethical Approval

Not Required since the study conducted was a systematic review and meta-analyses and included the studies selected from 2015-2025.

Source of Funding

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Conflicts of Interests

The authors report no conflict of interest. Author contributions Conceptualization and methodology M.K., A.S. and J.H.; Formal analysis, M.K., A.S. and J.H.; Visualization and writing -original draft M.K., A.S. and J.H.; Writing -review and editing M.K., A.S. and J.H., and J.H. All authors have read and agreed to the final version of the manuscript.

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