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Prevalence of autism in African countries: a systematic review and meta-analysis

Short Title: Prevalence of autism in African countries

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ABSTRACT

Background: Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by difficulties in communication, deficits in social interaction, and repetitive behavioral patterns. Global prevalence estimates range from 1% to 2%, with variations attributed to cultural, social, and methodological factors. In Africa, research remains limited and highly heterogeneous, largely due to scarce diagnostic resources, persistent stigma, and the absence of consistent public policies.

Methods: A systematic search was conducted across PubMed, Embase, Scopus, and PsycInfo for articles published up to May 2025. Cross-sectional studies conducted in school-based or community populations were included. The analysis followed PRISMA guidelines, and the protocol was registered with PROSPERO (CRD420251138668). A random-effects model using the Freeman-Tukey transformation for variance stabilization was employed for statistical synthesis.

Results: Seven studies from Egypt, Kenya, Uganda, and Nigeria, comprising 71,341 participants, were included. Across included studies, reported ASD prevalence ranged from 0.54% to 23.8%. When pooled and stratified by methodological criteria, clinically confirmed ASD prevalence was 1% (95% CI, 0.0–1.0%), whereas high-risk screening prevalence was 4% (95% CI, 0.0–16.0%), with very high between-study heterogeneity (I^2 = 99.8%).

Conclusions: Despite substantial methodological heterogeneity, ASD prevalence estimates in Africa appear comparable to those reported in high-income countries. The marked disparity between high-risk screening prevalence and confirmed diagnoses highlights the urgent need to expand diagnostic confirmation services and strengthen training for primary healthcare professionals to

bridge the gap between risk identification and definitive diagnosis across the continent**.**

Keywords: Autism Spectrum Disorder; Africa; Epidemiology; Prevalence.

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in communication, deficits in social interaction, and restricted and repetitive behavioral patterns[1]. ASD exhibits substantial interindividual variability in both severity and clinical presentation, posing significant challenges for accurate diagnosis in clinical practice[2].

Scientific studies have reported a marked increase in the prevalence of ASD in recent years, largely attributable to expanded and revised diagnostic criteria, advances in screening methods, and greater public awareness of the disorder[3,4]. Globally, prevalence is estimated at 1% - 2% of the population, though it varies across regions due to social, cultural, and economic factors[5].

Evidence on ASD prevalence in Africa remains limited and inconsistent. Most research on ASD prevalence has been conducted in North America and Europe, with comparatively less representation from low- and middle-income regions, highlighting the global scarcity of data [6,7]. Among the available studies from African contexts, including those from Nigeria, South Africa, and Egypt, prevalence estimates show significant variability. This heterogeneity arises not only from methodological differences but also from systemic barriers, such as a shortage of trained professionals, societal stigma that remains unchanged, and the absence of coordinated public health policies [8–10].

Although previous systematic reviews have assessed ASD prevalence worldwide,[5,11], they often lack data on the African continent, contributing to the underestimation of regional estimates. Furthermore, there is a need to synthesise and evaluate factors influencing the manifestation and lived experience of ASD to improve recognition of the condition as a neurodevelopmental condition.

Given these challenges, this systematic review and meta-analysis provide pooled estimate of ASD prevalence in African populations, based on observational studies using standardized diagnostic criteria.

Methods

Eligibility Criteria

The protocol for this review was registered in PROSPERO (CRD420251138668). The study was conducted in accordance with the Cochrane methodological guidelines [12] and the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement[13].

The inclusion criteria were:

1. Observational cross-sectional studies;
2. Articles published in English;
3. Studies conducted in African countries, in community or school-based settings, that investigated the prevalence of ASD;
4. Studies that used recognized diagnostic instruments, such as the:
    - *Autism Diagnostic Observation Schedule* (ADOS);
    - *Autism Diagnostic Interview – Revised* (ADI-R);
    - *Modified Checklist for Autism in Toddlers* (M-CHAT);
    - or standardized criteria (DSM-IV, DSM-5, ICD-10, ICD-11).

The exclusion criteria were:

1. Non-observational studies (e.g., clinical trials, case series or reports, narrative reviews, systematic reviews, and meta-analyses);
2. Research conducted outside of Africa or with African migrant populations without a specific analysis of the local context.
3. Studies lacking prevalence data or based solely on reports from teachers, healthcare professionals, or self-reported information without validated diagnostic instruments.

Publications are limited to abstracts (e.g., conference proceedings) without access to the full text.

Information Sources and Search Strategy

The literature search was conducted in Embase (via Ovid), PsycInfo, PubMed, and Scopus, including publications up to May 2025. The search strategy combined MeSH terms and free-text keywords as follows*: ((autism spectrum disorder) OR*

(Autistic Disorder) OR (Autism)) AND ((prevalence) OR (cross-sectional) OR (cohort) OR (chart)) AND ((Africa)). The strategy was adapted for each database to ensure comprehensiveness and consistency.

Selection Process

All records were imported into the Rayyan software[14] to facilitate duplicate removal. Titles and abstracts were screened independently by two reviewers (I.L.F. and J.V.M.), and full text was assessed following the same procedure. Disagreements were resolved by consensus or, when necessary, by a third reviewer (L.C.Q.). Reference lists of included articles were manually checked (backward snowballing), and citation tracking was performed using the ResearchRabbit tool (forward snowballing). The entire process was transparently documented, with reasons for exclusion reported in the PRISMA flowchart.

Data Extraction

Data were extracted independently by two reviewers (I.L.F. and J.V.M.) using a pre-standardized form, with a third reviewer (L.C.Q.) resolving any discrepancies. Extracted variables included general study characteristics, methodological features, sample details, diagnostic instruments, main outcomes, and methodological quality. Data were organized in spreadsheets **(Table S1)** to ensure traceability.

Risk of Bias Assessment

Study quality was evaluated using an adapted version of the Newcastle-Ottawa Scale[15], supplemented by the Joanna Briggs Institute (JBI) critical appraisal checklist for prevalence studies[16]. The JBI checklist was specifically used to assess risk of bias **(S2, S3)**.

Data Synthesis and Analysis

Data descriptive statistics were calculated using proportions. A .were managed and analyzed using RStudio (version 2025.09.2+418) with R software.

Proportional meta-analyses were conducted using the *meta* package (version 8.23-1), applying the *metaprop* function to estimate pooled prevalence. Variance stabilization was performed using the Freeman–Tukey double arcsine

transformation, and pooled estimates were calculated using random-effects models to account for expected between-study heterogeneity. Forest plots and funnel plots were generated to summarize results and visually assess publication bias. Complementary analyses, including heterogeneity assessment and sensitivity analyses, were conducted using the *metafor* package (version 4.8-0).

Pooled prevalence estimates were reported separately for clinically confirmed diagnoses and high-risk groups, with 95% confidence intervals. Heterogeneity was assessed using Cochran's Q test and the I^2 statistic, with values greater than 50% indicating moderate to high heterogeneity. Subgroup analyses were performed according to geographic region, study quality, and diagnosis classification (confirmed or suspected).

Use of Artificial Intelligence in Manuscript Preparation

AI-assisted tools, including the ChatGPT model (OpenAI, GPT-5), were used exclusively to improve the manuscript's writing, clarity, and linguistic accuracy. The use of these technologies was strictly limited to supporting text revision and translation, without any interference in scientific formulation, data analysis, result interpretation, or the development of conclusions.

The authors declare full responsibility for the entire content of the work, including methodological design, interpretation of findings, and final considerations. In accordance with good scientific publication practices, AI is not acknowledged as a co-author and did not play an intellectual or decision-making role in the research.

Results

Study Selection

The search and selection process is illustrated in the PRISMA 2020[13] flowchart (Figure 1). A total of 855 records were identified from PubMed, Embase, Scopus, and Psycinfo. After removing 297 duplicate records, 558 records remained for screening.

During title and abstract screening, 547 records were excluded for not meeting the eligibility criteria. Consequently, 11 articles were selected for full-text assessment. Of these, one full-text article could not be retrieved despite attempts to contact the authors, and three were excluded - two due to low methodological

quality and one because it reported only the first phase of an already included study. Ultimately, seven studies met all inclusion criteria and were included in the systematic review. No ongoing studies or related reports were identified. As recommended by PRISMA, all records were manually assessed by independent reviewers.

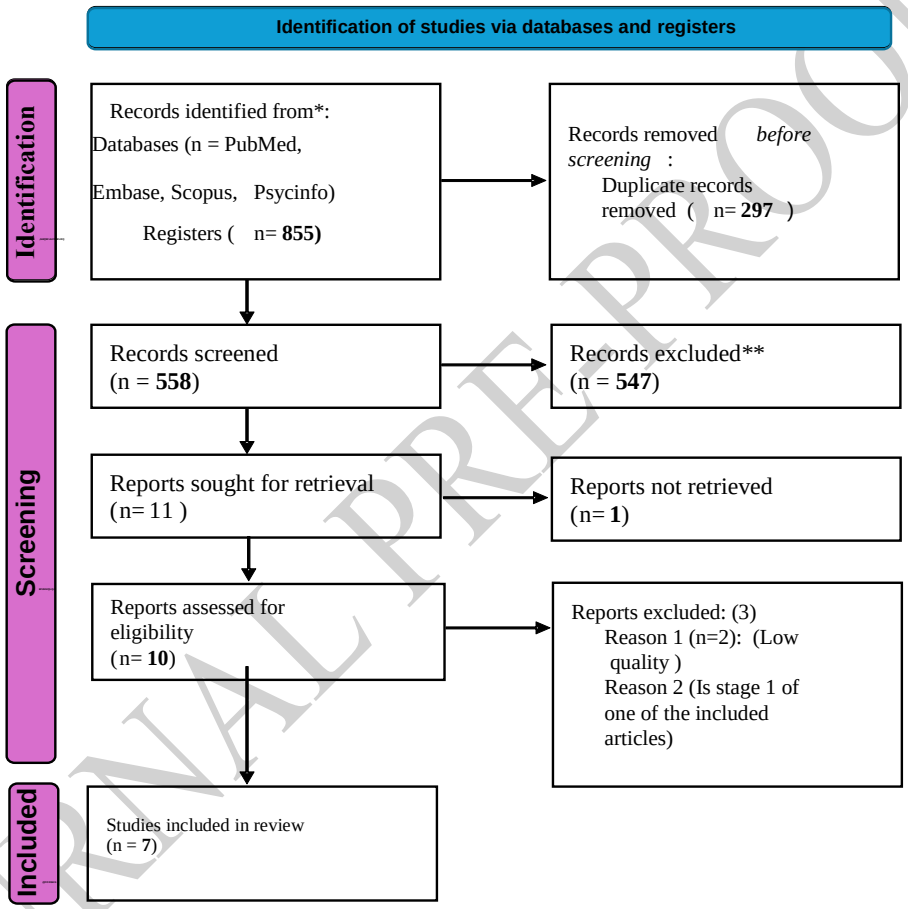

Figure 1. Flow diagram of the study selection.
Source: Adapted from: Page MJ et al. (2021).

Study Characteristics

Seven studies conducted across four African countries (Egypt, Kenya, Uganda, and Nigeria) included a total of 71,341 participants, with individual study samples ranging from 721 to 41,640. Among studies reporting sex distribution, there were 5,271 males and 4,902 females. All studies employed a cross-sectional design, recruiting participants from school-based or community

populations, with ages ranging from 1 to 25 years (Table 1).

The instruments used for ASD screening or diagnosis were heterogeneous, encompassing screening questionnaires (M-CHAT, Ten Questions Questionnaire, AQ, WERCAP), DSM-5 criteria, and clinical interviews. Among the studies that reported mean and standard deviation (SD) of age, values ranged from 1.7 ± 0.6 years (Egypt) [17] to 21.45 ± 2.30 years (Kenya) [18]. Mean ages of 6.7 ± 3.11 years (Egypt) [19,] and 21.2 ± 2.0 years (Kenya) [20]were also reported. The studies by Yousef et al. [21], Kakooza-Mutebi et al. [22], and Chinawa et al. [23] did not provide mean or SD data.

Table 1: Characteristics of the included studies

Author (Year)	Country (Region)	Study Design	Sample Size	M/F	Age Range (Years)	Population (Community/School-based)	Diagnostic Criteria / Instruments	Autism/Suspected ASD Prevalence (%)	Mean Age (SD)	Associated Factor	Outcome
Yousef et al., 2021[21]	Egypt (Sharki)	Cross-sectional	3,722	1,887 / 1,835	2–5	School-based	M-CHAT / DSM-5	0.54	NA	Congenital anomalies	Confirmed diagnosis
Metwally et al., 2025[19]	Egypt (8 provinces)	Cross-sectional	41,640	21,437 / 20,202	1–12	Community-based	DSM-5	1.1	6.7 (3.11)	Problems during gestation	Confirmed diagnosis
Mohamed, E.A. (2016)[17]	Egypt (8 provinces)	Cross-sectional	5,545	2,830 / 2,716	1–2.9	Community-based	M-CHAT	23.8	1.7 (0.6)	Consanguinity	High-risk suspicion
Mamah, D. (2022)[20]	Kenya (4 provinces)	Cross-sectional	8,918	4,731 / 4,123	15–25	School–Community	AQ + WERCAP	0.63	21.2 (2.0)	Psychosocial stress	High-risk suspicion
Mutiso et al., 2023[18]	Kenya (Nairobi)	Cross-sectional	9,626	5,111 / 4,446	18–24	Community-based	AQ	0.56 (High risk)	21.45 (2.30)	Psychiatric disorder	High-risk suspicion
Kakooza-M. et al., 2014[22]	Uganda (3 provinces)	Cross-sectional	1,169	536 / 633	2–9	School-based	Ten Questions Questionnaire	0.68	NA	Neurodevelopmental disorder	Confirmed diagnosis
Chinawa et al., 2016[23]	Nigeria (2 provinces)	Cross-sectional	721	363 / 358	3–18	School-based	Questionnaire	2.90 (High risk)	12.71 (3.3)	Sociodemographic	High-risk suspicion

DSM = **Diagnostic and Statistical Manual of Mental Disorders; M-CHAT** = Modified Checklist for Autism in Toddlers; AQ + WERCAP = Autism Quotient – Washington Early Recognition Center Affectivity and Psychosis; NA = not available.

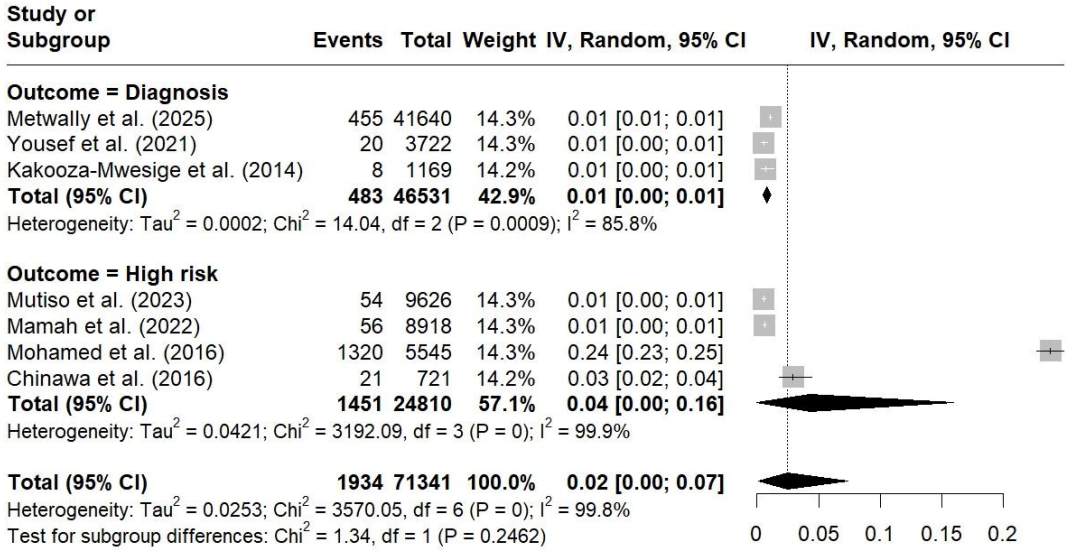

Figure 2. Prevalence of confirmed diagnosis versus screening/high risk

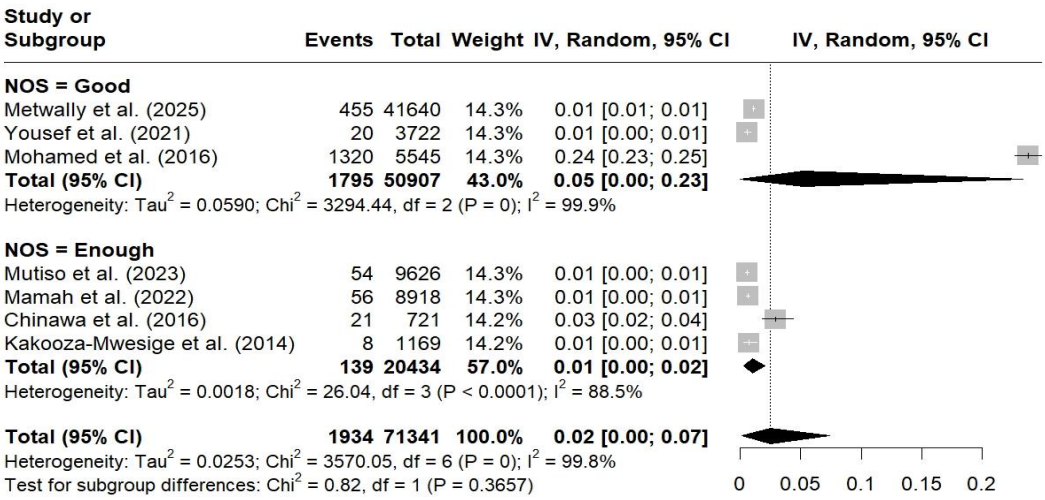

Figure 3. Prevalence across studies by methodological quality

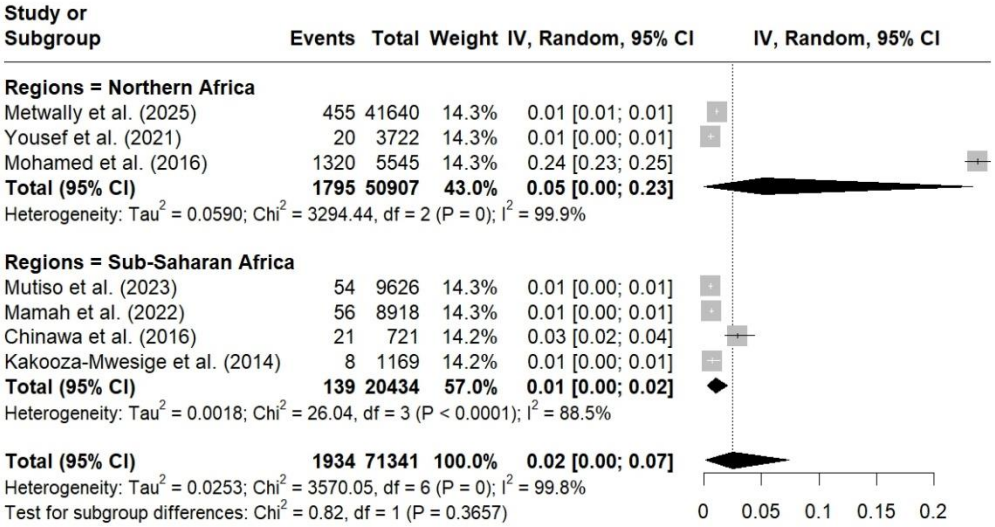

Figura 4. Prevalence of ASD by region on the African continent.

Study Title	Author(s) and Year of Publication	Data Collection Period	Country	Cities	Target Population	Study Method	Sampling Method	Sample Size	Patients with ASD	Prevalence of Autism (%)	Fatores Associados	Male/Female	Age Group	95% CI	Mean (Standard Deviation)	Inclusion Criteria	Exclusion Criteria	Diagnostic Criteria	Assessment Instruments	Note

The meta-analysis included seven studies, divided into two subgroups based on the diagnostic approach. The pooled prevalence for the 'Diagnosis' subgroup was 1% (0.01; 95% CI: 0.00-0.01), while the 'High Risk' subgroup showed a higher pooled prevalence of 4% (0.04; 95% CI: 0.00-0.16). The overall estimated prevalence of autism across all studies was 2% (0.02; 95% CI: 0.00-0.07). However, the analysis revealed a high level of heterogeneity (I^2 = 99.8%), and the difference between subgroups was not statistically significant (P = 0.246).

The sensitivity analysis highlighted the role of Mohamed et al[17]. as an outlier—this study reported a much higher prevalence compared to the other included works. Its exclusion confirmed greater homogeneity and stability in the aggregated results, demonstrating the robustness of the findings.

Subgroup analyses based on methodological quality (NOS score) did not identify substantial differences in prevalence estimates, suggesting that the quality of the considered studies did not compromise the consistency of the results. Similarly, stratification by geographic region yielded similar estimates for both North Africa and Sub-Saharan Africa, showing no relevant discrepancies across different regional contexts. Other analyses are attached (Supplemental S4, S5).

Altogether, these analyses indicate the uniformity of the observed low prevalence rates, regardless of methodological quality or geographic location of the studies. The findings underscore the need to strengthen screening strategies, diagnostic capacity, and epidemiological surveillance for ASD across the African continent.

Discussion

This systematic review and meta-analysis stratified ASD prevalence data in Africa into two distinct subgroups: studies based on **Clinical Diagnosis** and those based on **High-Risk** indicators. This division is essential to understanding the data variability found among the 71,341 participants analyzed across countries such as Egypt, Kenya, Uganda, and Nigeria.[3,5]

The **High-Risk** subgroup showed a prevalence of **4%**, a figure four times higher than that found in the **Diagnosis** subgroup (**1%**). Although this difference did not reach statistical significance (*P = 0.246*), it points to a complex clinical scenario. The high prevalence in risk-based studies can be attributed to the high sensitivity of

screening instruments like the M-CHAT, which, while effective for initial identification, possess low specificity and may generate a significant number of false positives[18].

Conversely, the 1% prevalence in the formal diagnosis subgroup may underestimate the true burden of the condition on the continent.This data suggests the existence of severe barriers to accessing diagnostic confirmation, such as a shortage of specialized professionals and healthcare infrastructure. The massive heterogeneity observed (I^2= 99.8 %), exemplified by studies reporting anywhere from 1% to 24%[17], reinforces that geographic factors and social determinants, such as poverty and developmental delays mimicked by child health issues, prevent a uniform conclusion, requiring each subgroup to be interpreted within its methodological limitations[24].

Cultural aspects also warrant consideration. Behaviors commonly interpreted as indicative of ASD in Western societies, such as reduced eye contact or delayed speech, may carry different meanings in African contexts, influencing both caregiver perceptions and evaluator interpretation. Moreover, the lack of representative samples of urban populations in most studies further limits the generalizability of the findings[5,25].

The substantial heterogeneity observed across studies also reflects differences in design and age ranges. For instance, Mohamed et al[18], reported a prevalence of 23.8% among children aged 1 to 2 years, likely related to the use of the M-CHAT in very young populations, when its specificity is lower. Conversely, studies that applied more rigorous diagnostic criteria, such as those by Yousef et al.[21] and Metwally et al.[19], found prevalence rates below 1.2%. Research involving younger children tends to report higher rates, whereas studies involving adolescents showed lower figures[20], possibly reflecting both developmental features of ASD and diagnostic challenges in older age groups.

The risk factors associated with ASD identified in the African studies are consistent with findings from international literature. Mohamed et al.[17] highlighted consanguinity as a potential risk factor, while Metwally et al.[19] identified gestational complications. Other studies emphasized socioeconomic and psychosocial stressors[21], aligning with evidence from high-income countries[4,26]. Additionally, Kakooza-Mwesige et al.[22] reported a high frequency of psychiatric comorbidities and other neurodevelopmental conditions, underscoring the clinical complexity

of ASD and the need for an integrated care approach.

Limitations and Future Directions

Although this review provides valuable insights, it has several important limitations. The geographical concentration of the included studies, particularly in Egypt, limits the generalizability of the findings to the entire continent. The extremely high statistical heterogeneity and the asymmetry observed in the funnel plot suggest publication bias and substantial methodological variability, respectively. .

Conclusion

This review suggests that although ASD may be as prevalent in Africa as in other parts of the world, it still suffers from low research investment, as evidenced by the near-absence of studies across vast areas of **North Africa** and **Sub-Saharan Africa**. The results highlight significant methodological heterogeneity among the analyzed studies. Furthermore, the review demonstrated that most investigations focus on assessing individuals at high risk for ASD, which reveals weaknesses in the ASD diagnostic processes within the region.

These figures highlight the urgent need to strengthen early screening initiatives, train primary healthcare professionals, and, above all, expand diagnostic confirmation services. Culturally validating diagnostic tools and promoting community awareness campaigns are urgent prioritiesto bridge the gap between risk identification and final diagnosis on the continent.

Implications

The study's findings are of interest to both clinical practice and policy development. Relatedly, from a healthcare perspective, the results demonstrate the role of early and culturally evidence-based screening tools for early ASD detection programs, facilitated through streamlined referral pathways to specialized assessment. For example, from a health policy standpoint, there is clearly an urgent need to spend money on epidemiological surveillance systems for mental health, which can track prevalence trends by region of the continent.

In the educational and social spheres, the identified prevalence underscores the urgent need to implement inclusive policies that ensure access to adapted

education, support for families, and continuous training for teachers. Finally, in the scientific realm, it is a priority to develop multicenter, longitudinal studies that consider African sociocultural specificities and reduce the current data gap.

Registration and Protocol

This systematic review is registered on the PROSPERO – International Prospective Register of Systematic Reviews, under the number CRD420251138668. The protocol that guided the study's conduct can be accessed on PROSPERO via the link https://www.crd.york.ac.uk/prospero/. To date, there have been no modifications to the information presented in the initial registration. Should any future amendments be necessary, they will be duly reported, including a description of the change, the justification, and the stage of the review process at which they occurred.

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Availability of Data and Materials

The instruments used for data collection, the data extracted from the included studies, and the datasets organized for statistical analysis will be made available in a public, open-access repository upon publication of the article. The code used for the analyses will also be made available upon request to the corresponding author. Additionally, the PRISMA flowchart and relevant supplementary materials will be attached to the final manuscript, ensuring the study's transparency and reproducibility.

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