






BMJ Open Quality Patient safety incident reporting systems and reporting practices in African healthcare organisations: a systematic review and meta-analysis

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ABSTRACT

Background Patient safety incident reporting and learning systems are crucial for improving the safety and quality of healthcare. However, comprehensive evidence of their availability and use in African healthcare organisations is lacking. Therefore, this review aims to synthesise the existing literature on these systems and reporting practices within African healthcare organisations.

Methods A systematic review and meta-analysis were conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Five electronic databases, including PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL) via EBSCOhost, Scopus, Web of Science and the Excerpta Medica Database (Embase), were searched to identify relevant records. Peer-reviewed articles and guidelines published in English were included in this review. Quality appraisal was performed using the Joanna Briggs Institute and Quality Assessment with Diverse Studies tool. A random effects model was used to compute the pooled prevalence using Stata V.17.0.

Results A systematic search retrieved 9279 records, of which 39 (36 articles and 3 guidelines) were included in this review. Eight patient safety incident reporting and learning systems were identified, with compliance rates ranging from low (16%) to high (87%) based on the WHO criteria. The pooled prevalence of patient safety incident reporting practices was 48% (95% CI 40% to 56%). However, the studies exhibited high heterogeneity ($I^2=98.75\%$, $p<0.001$).

Conclusion In African healthcare organisations, it is imperative to establish robust patient safety incident reporting and learning systems, as none of the existing systems fully meet WHO criteria. In addition, optimising the existing systems and encouraging healthcare professionals to improve reporting practices will enhance patient safety and outcomes.

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BACKGROUND

Patient safety incidents are defined as deviations from standard healthcare practices that may result in unnecessary harm to patients.¹ These incidents are categorised as harmful, non-harmful or near-misses based on their severity.² They significantly contribute

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Patient safety incident reporting and learning systems are essential for promoting learning from incidents and preventing recurrences.
- ⇒ The WHO has issued guidelines to standardise patient safety incident reporting and learning systems.

WHAT THIS STUDY ADDS

- ⇒ Provides the first comprehensive literature review of patient safety incident reporting and learning systems in African healthcare, revealing low to high levels of compliance with WHO criteria.
- ⇒ Identifies suboptimal reporting rates among healthcare professionals in African healthcare.
- ⇒ Highlights the limited involvement of patients and their families in incident reporting processes within African healthcare.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Recommends that future studies in Africa to evaluate the impact of reporting systems on patient safety and explore strategies for effective patient and family involvement using evidence-based frameworks.
- ⇒ Offers critical insights to inform policies aimed at developing and improving patient safety incident reporting and learning systems in Africa and similar healthcare contexts.

to preventable morbidity, mortality and economic burden in contemporary healthcare systems.^{3 4} Appropriate reporting can transform these incidents into valuable learning opportunities, thereby preventing their recurrence and enhancing safety culture.^{5–7} Patient safety incident reporting and learning systems are essential elements of clinical risk management and quality improvement.⁸ These systems provide a structured approach for collecting and analysing detailed data regarding patient safety incidents, identifying contributing factors and informing targeted interventions to enhance patient safety and healthcare quality.^{9 10}

Furthermore, an effective reporting system strengthens healthcare system resilience, fosters collaboration among healthcare professionals, and enables them to share experiences and address immediate safety concerns.^{5 11}

Reason's Swiss cheese model highlights how latent conditions-flaws or weaknesses that exist within healthcare systems, can align with active failures or errors made by individuals to create conditions where patient harm is more likely to occur.¹² This model emphasises the importance of focusing on system-level improvements rather than attributing blame to individual staff members when addressing healthcare errors.¹³ In 2005, the WHO released the first guidelines for patient safety incident reporting and learning systems, outlining its essential components and standardising their implementation.¹⁴ In 2016, a minimal information model for patient safety was introduced, which specified the requisite information to be included in patient safety incident reports.¹⁵ Consequently, it is imperative to adopt and implement the patient safety incident reporting and learning systems to align with the WHO criteria for effective and efficient utilisation.¹⁴ These systems are widely adopted in various high-income countries (HICs).^{16–20} While deriving insights from the success of these systems in HICs is valuable, it is equally important to design and implement context-sensitive systems in low-resource settings, such as those in Africa.²¹ Additionally, developing and evaluating locally effective, economically viable and evidence-based patient safety solutions are vital in these settings despite the limited available evidence.²²

To the best of our knowledge, only one systematic review has compared the patient safety incident reporting and learning systems with WHO criteria, focusing exclusively on intensive care units in HICs.²³ Although other reviews have estimated the rate of patient safety incident reporting among healthcare professionals, none have included articles from Africa.^{24 25} No systematic review has compared the available patient safety incident reporting systems in African healthcare organisations against WHO criteria or estimated the rate of patient safety incident reporting practices in these settings. Therefore, through this review, we aim to address the following research questions: to what extent do the available patient safety incident reporting and learning systems in African healthcare organisations align with the WHO criteria, and what is the pooled prevalence of patient safety incident reporting practices among healthcare professionals in these settings?

METHODS

A systematic review and meta-analysis was conducted to synthesise the available literature on patient safety incident reporting and learning systems, estimate the pooled prevalence of patient safety incident reporting practices among healthcare professionals in African healthcare organisations, and identify research gaps. This review was guided by the Joanna Briggs Institute (JBI) manual of evidence

synthesis for prevalence data.²⁶ Additionally, other methodological studies informed this review to ensure methodological rigour, minimise biases and enhance the reliability of the findings. Borges Migliavaca *et al* provided specific guidance on handling prevalence data and addressing heterogeneity.²⁷ Muka *et al*'s comprehensive 24-step guide on structured approaches for conducting systematic reviews and meta-analyses, informed handling data synthesis and quality assessment.²⁸ Tawfik *et al*'s step-by-step guide provided valuable insights into data handling and statistical analysis approaches.²⁹ These methodological frameworks complement one another in ensuring comprehensive coverage of different aspects of the review process, from data extraction to synthesis.

We adhered to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for reporting of this study.³⁰

Information source and search strategy

A systematic search strategy was formulated in collaboration with specialist health science librarians. Five electronic databases, PubMed, Cumulative Index to Nursing and Allied Health Literature via EBSCOhost, Scopus, Web of Science and Embase, were searched to identify potentially eligible articles. The initial search was conducted on 17 September 2023, and the follow-up search was conducted on 13 February 2024. A combination of keywords and Medical Subject Headings linked with Boolean operators “AND/OR” was used (online supplemental file 1). A comprehensive manual search for the patient safety incident reporting and learning systems guidelines were conducted using search engines such as Google and relevant government websites. The search involved specific terms such as ‘patient safety incident reporting systems guidelines’, ‘patient safety reporting and learning system policies’ and ‘protocol for patient safety incident reporting and learning’, combined with the names of each African country. Articles that met the eligibility criteria after a full-text review underwent a backwards citation search to identify additional relevant articles.

Inclusion and exclusion criteria

Articles were included if they described and examined patient safety incident reporting and learning systems and/or practices among healthcare professionals in African healthcare organisations. Articles published in English, regardless of the publication year or study design, were considered. Additionally, guidelines related to patient safety incident reporting and learning systems published in English were included. Exclusion applied to articles and guidelines addressing adverse drug reactions or immunisation side effects. Commentaries, expert opinions, letters to editors, abstracts from scientific meetings, and study protocols were excluded.

Selection process

Following the systematic search, all retrieved records were imported into Covidence software (Covidence,

Melbourne, Victoria), which automatically removed duplicates. Any remaining duplicates that were not captured during this process were removed manually. Titles and abstracts were independently screened by two authors, GF and MTE, based on the predefined eligibility criteria. Discrepancies were resolved through consultation with APM. A full-text review of the selected articles was independently performed by GF and APM, adhering to the same eligibility criteria. Any disagreements were addressed in consultation with either RM or GT.

Data extraction

For the first review question, 'To what extent do available patient safety incident reporting and learning systems in African healthcare organisations align with WHO criteria?'. A custom data extraction template was developed by the study team drawing on the research questions, the systematic review by Brunsveld-Reinders *et al.*,²³ the WHO's 'Draft guidelines for adverse event reporting and learning systems',¹⁴ and the 'Advanced minimal information model for patient safety incident reporting and learning systems: user guide'.¹⁵ For simplicity, both sets of guidelines are referred to as 'WHO criteria' in this study. To address the second review question 'What is the pooled prevalence of patient safety incident reporting practices among healthcare professionals in African healthcare organisations?', the data extraction template was prepared based on the review questions. Both templates were piloted with five articles each, refined to capture all pertinent data, and then used for full data extraction. An accuracy of 20% of the extracted data was verified by GT or RM, after which GF made the necessary revision based on the feedback received.

Quality appraisal

The JBI quality appraisal tools were used to assess the articles with qualitative and quantitative methods.³¹ Additionally, the Quality Assessment with Diverse Studies tool was used to evaluate articles with mixed methods.³² GF primarily conducted the quality appraisal with GT or RM verifying 20% and providing feedback. Articles were categorised into three groups based on the percentage of quality criteria met: low (<50% of criteria met), moderate (50%–75% of criteria met) and high quality (>75% of criteria met). The outcomes of the quality assessments were used to describe the quality of the articles included in the review. However, no articles were excluded based on these scores.

Synthesis methods and statistical analysis

The extent to which the available patient safety incident reporting and learning systems in African healthcare organisations align with the WHO criteria was textually described, and the level of compliance was calculated as high (>80% of criteria met), medium (50%–80% of criteria met) and low (<50% of the criteria met). To determine the pooled prevalence of patient safety incident reporting practices, the extracted data were imported to

Stata/MP V.17.0 (Stata Corp, Texas) for meta-analysis. The pooled prevalence was calculated using a random effects model (events/sample size) to account for the variability among the included articles and displayed in a forest plot. Heterogeneity was assessed using the I^2 statistic. Owing to the high heterogeneity observed, a subgroup analysis was conducted based on study design and country. Publication bias was assessed using a funnel plot for asymmetry and Egger's statistical test ($p < 0.05$).

RESULTS

Selection of articles and guidelines

Overall, the search identified 9279 records. After screening by title and abstract and then full text, 39 records (36 articles and 3 guidelines) were included in the review, as illustrated in figure 1.

Characteristics of articles and guidelines

Geographically, the records were from nine African countries, with one article being multinational. Of these, 31 (79.4%) were from Ethiopia, Egypt, Nigeria and South Africa. The majority (86%) of articles were quantitative in design (figure 2). Of the 36 articles, 28 (77.7%) were included in the meta-analysis to estimate the pooled prevalence of patient safety incident reporting practices. These articles represented the perspectives of 10 324 healthcare professionals working in more than 103 hospitals with various capacities in Africa, as depicted in table 1.

Quality appraisal

Study quality varied, and based on the quality appraisal scores, 19 articles (52.8%) were of high quality, 15 articles were of moderate quality and 2 articles (5.5%) were of low quality. A summary of the quality appraisal scores is provided in online supplemental file 2.

Assessment of the patient safety incident reporting and learning systems against WHO criteria

Eight articles^{33–40} and three guidelines^{41–43} provided details on eight patient safety incident reporting and learning systems available in African healthcare organisations. None of these systems completely fulfilled all WHO criteria. Of the eight systems, five focused on specific clinical units or incident types, while three were broad, covering multiple clinical units and incident types (table 2).

The focused systems demonstrated low to medium levels of adherence with WHO criteria. The Egyptian Neonatal Safety Training Network (E-NSTN)³⁴ and the Tunisian Adverse Event Reporting Systems (T-AERS), designed for intensive care units,³⁹ achieved medium compliance levels of 79% and 66%, respectively. The Zimbabwe Critical Incident Reporting Systems (Z-CIRS) targeted the operating theatre and anaesthesia units in two teaching hospitals, reaching a medium (53%) compliance level.³³ For medication error reporting, the Egyptian National Online Medication Error Reporting System (E-NOMERS)³⁷ and Zambian Medication Error

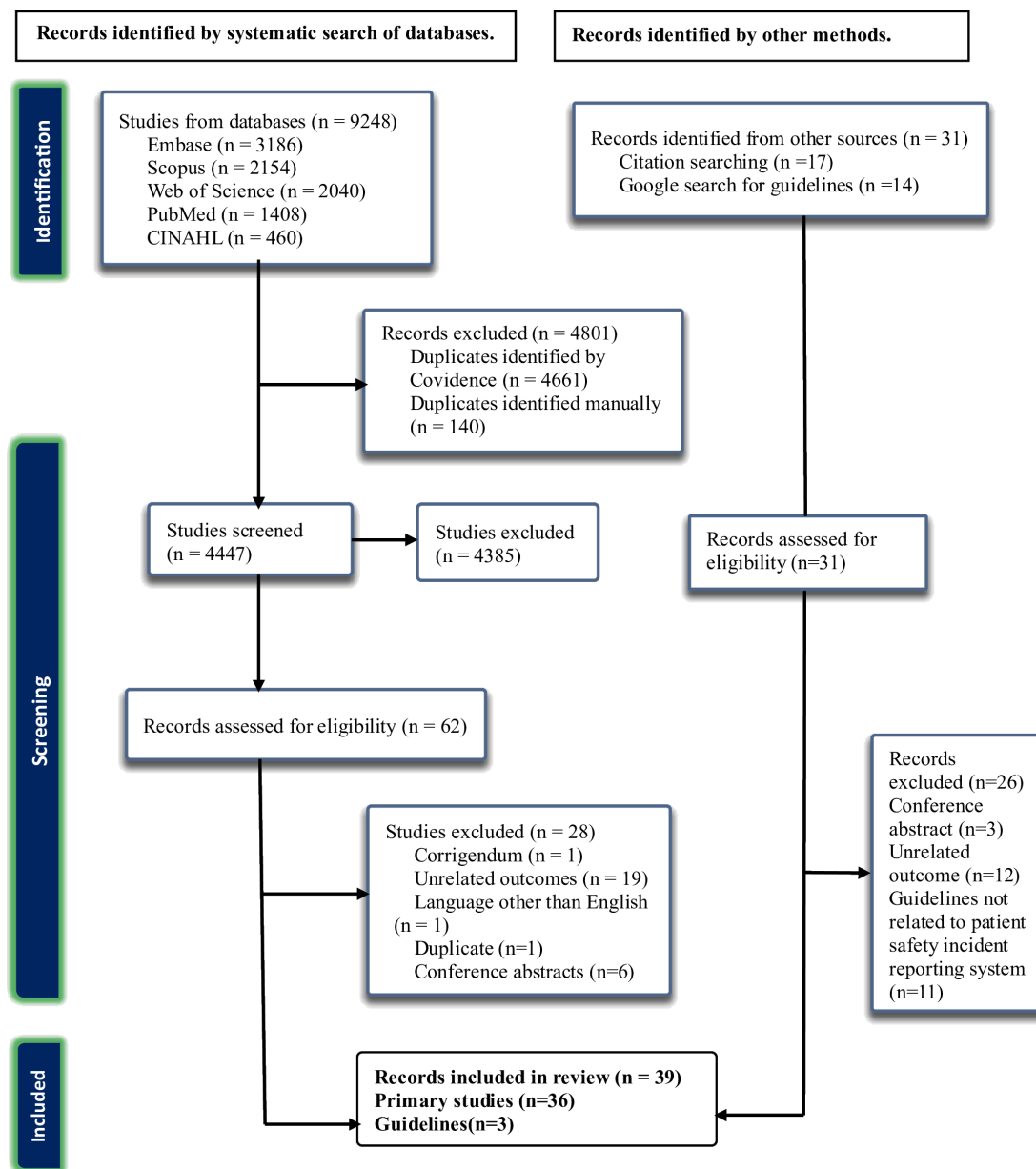


Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.

Reporting Systems (Z-MERS),³⁵ achieved medium (58%) and low (16%) levels of compliance, respectively.

Among the three broader-based reporting systems, the South African Patient Safety Incident Reporting and Learning Systems (SA-PSIRLS) exhibited varying levels of compliance. Earlier guidelines and published articles met 34%–39% of the WHO criteria,^{38 43 44} while the updated guidelines demonstrated a significantly high compliance rate of 87%.⁴¹ The Médecins Sans Frontières Medical Error Reporting Systems (MSF-MERS), implemented in 11 African countries, achieved a medium compliance level of 74%.³⁶ In contrast, the Ethiopian Hospital Services Transformation Guidelines (E-HSTG) achieved a lower compliance rate of 26%.⁴² The primary objective of all the systems is to promote learning and improve patient safety.

Two guidelines from South Africa and one from Ethiopia were identified through manual searches. These include the adverse event monitoring and reporting guidelines of the KwaZulu National Department of Health,⁴³ national guidelines for SA-PSIRLS,⁴¹ and E-HSTG.⁴² The national guidelines for SA-PSIRLS are currently in use, and the country has formal reporting systems.⁴¹ In contrast, the E-HSTG emphasises the need for hospitals to implement reporting systems but lacks detailed procedures and frameworks. As a result, there is no evidence of the implementation of patient safety incident reporting systems or the publication of related reports from Ethiopian healthcare.⁴²

The patient safety incident reporting and learning systems incorporate various criteria mentioned in WHO guidelines.^{14 15} These are grouped as data input, data

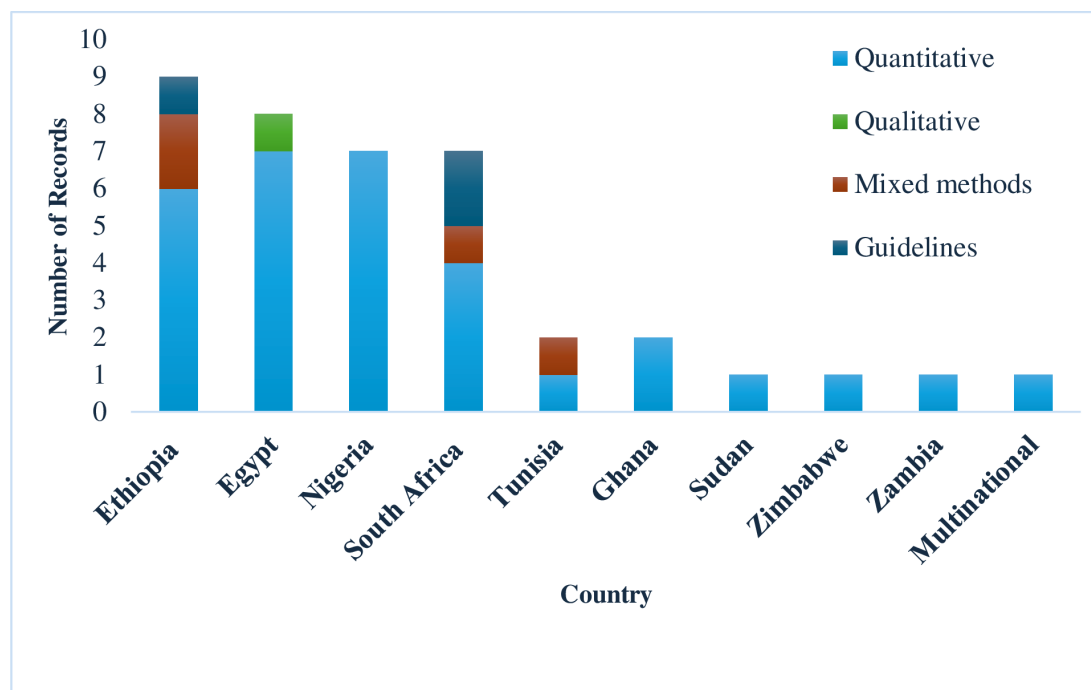


Figure 2 Geographical distribution of records included in a systematic review and meta-analysis on patient safety incident reporting systems and practices in African healthcare organisations.

collection, implementation, data analysis and feedback, as outlined in [table 2](#).

Data input

According to the WHO criteria, reporting incidents should be voluntary, which was explicitly mentioned in seven of eight (87.5%) reporting systems.^{33–37 39 41} Confidentiality, a crucial aspect of WHO criteria, was ensured for patients, reporters and organisations in E-NSTN³⁴ and SA-PSIRLS.^{38 40 41} Z-CIRS,³³ MSF-MERS³⁶ and T-AERS,³⁹ guaranteed confidentiality only for patients and reporters. E-NOMERS³⁷ and E-HSTG emphasised the confidentiality of reporters.⁴² Regarding methods of reporting, E-NSTN³⁴ and E-NOMERS³⁷ used relational databases. SA-PSIRLS incorporated both online and human receivers.^{38 40 41 43} The Z-CIRS,³³ MSF-MERS,³⁶ T-AERS³⁹ and E-HSTG⁴² outlined human receivers.

Data collection

The systems included in this review used various terms to describe the reported patient safety incidents. For instance, the E-NSTN³⁴ and SA-PSIRLS used the terms ‘incidents’ and ‘errors’.^{38 40 41 43} Z-CIRS mentioned ‘critical incidents’,³³ E-NOMERS³⁷ and Z-MERS³⁵ specifically focused on ‘medication errors’, while T-AERS³⁹ and E-HSTG used the term ‘adverse events’.⁴² The MSF-MERS,³⁶ specifically focused on ‘medical error’. Healthcare professionals could report in all systems, whereas only SA-PSIRLS,⁴¹ E-NSTN³⁴ and Z-MERS³⁵ involved patients and families as reporters.

Implementation

Implementation approaches, such as providing training, introducing the patient safety incident reporting and

learning systems to staff, and promoting the use of systems have been reported in five (62.5%) systems; specifically, Z-CIRS,³³ E-NOMERS,³⁷ SA-PSIRLS,⁴¹ MSF-MERS³⁶ and T-AERS.³⁹

Data analysis

Multiple data analysis approaches are described in the WHO criteria as detailed in [table 2](#). Classification by event type, risk and causation were included in the E-NSTN,³⁴ Z-CIRS,³³ MSF-MERS³⁶ and T-AERS.³⁹ E-NOMERS³⁷ and SA-PSIRLS⁴¹ include classifications by event type only. Data analysis approaches, including data summaries and descriptions, causal analysis, system-oriented analysis and contributing factors, have been reported in E-NSTN.³⁴ Two articles highlighted the use of root cause analysis within SA-PSIRLS.^{38 40} Expert evaluation of the reported data was explicitly addressed within only four (50%) of eight systems: E-NSTN,³⁴ SA-PSIRLS,⁴¹ MSF-MERS³⁶ and T-AERS.³⁹ Two guidelines from South Africa described the timeframe, varying from 24 hours⁴¹ to 48 hours⁴³ for the analysis of severe incidents. However, detailed data analysis procedures have not been outlined in the E-HSTG.⁴²

Feedback

The WHO guidelines underlined the importance of feedback on reports, which were addressed in five systems (62.5%): E-NSTN,³⁴ Z-CIRS,³³ SA-PSIRLS,⁴¹ MSF-MERS³⁶ and T-AERS³⁹ through alerts, forum presentations and review meetings. In E-NSTN³⁴ and SA-PSIRLS,⁴¹ agencies receiving reports offered recommendations for improvement based on data analysis. MSF-MERS further discussed system improvements, including protocol changes and enhanced field-level practices, such as training for staff,

Table 1 Summary of articles included meta-analysis of pooled prevalence of patient safety incident reporting practices in African healthcare organisations.

No.	Author, publication year	Country	Study design	Hospitals (n)	Sample size	Rates of patient safety incident reporting
1	Abdalla <i>et al</i> (2020) ⁷⁸	Sudan	CS	01	191	153 (80%)
2	Abuosi <i>et al</i> (2022) ⁷⁹	Ghana	CS	13	1651	1149 (69.6%)
3	Afolalu <i>et al</i> (2021) ⁸⁰	Nigeria	CS	01	230	115 (50%)
4	Alemu <i>et al</i> (2017) ⁸¹	Ethiopia	CS	02	141	35 (24.7%)
5	Alhassan <i>et al</i> (2022) ⁸²	Ghana	CS	03	210	78 (37.3%)
6	Aouicha <i>et al</i> (2022) ⁸³	Tunisia	MM	02	297	42 (14.1%)
7	Asefa <i>et al</i> (2021) ⁸⁴	Ethiopia	CS	03	224	85 (37.5%)
8	Balogun <i>et al</i> (2019) ⁸⁵	Nigeria	CS	01	92	74 (80.4%)
9	Bifftu <i>et al</i> (2106) ⁸⁶	Ethiopia	CS	01	282	82 (29.1%)
10	Blignaut <i>et al</i> (2022) ⁸⁷	South Africa	MM	08	295	198 (67.1%)
11	Ragab Dorgham and Khamis Mohamed (2012) ⁸⁸	Egypt	CS	01	90	66 (73.3%)
12	El-Sayed <i>et al</i> (2022) ⁸⁹	Egypt	QE	01	100	42 (42%)
13	Eshete <i>et al</i> (2021) ⁹⁰	Ethiopia	CS	04	288	92 (31.9%)
14	Gqaleni and Bhengu (2020) ⁴⁴	South Africa	CS	10	224	188 (84%)
15	Eltaybani <i>et al</i> (2019) ⁹¹	Egypt	Q	02	112	61 (54.3%)
16	Ogunleye <i>et al</i> (2016) ⁹²	Nigeria	CS	10	2386	847 (35.5%)
17	Oshikoya <i>et al</i> (2013) ⁹³	Nigeria	CS	07	50	15 (30%)
18	Wami <i>et al</i> (2016) ⁹⁴	Ethiopia	MM	04	596	185 (31%)
19	Yalew and Yitayew (2021) ⁹⁵	Ethiopia	MM	01	291	36 (12.4%)
20	Youssef Elshoura and Mosallam (2022) ⁹⁶	Egypt	CS	19	112	68 (60.7%)
21	Zoghby <i>et al</i> (2021) ⁹⁷	South Africa	CS	01	100	43 (43%)
22	Agegnehu <i>et al</i> (2019) ⁹⁸	Ethiopia	CS	UC	579	176 (30.4%)
23	Araby <i>et al</i> (2018) ⁹⁹	Egypt	CS	01	257	62 (66.7%)
24	Brotobor <i>et al</i> (2021) ⁴⁵	Nigeria	CS	01	416	416 (100%)
25	Aly <i>et al</i> (2013) ¹⁰⁰	Egypt	CS	01	204	80 (39.2%)
26	Jember <i>et al</i> (2018) ¹⁰¹	Ethiopia	CS	03	397	288 (57.4%)
27	Udi <i>et al</i> (2019) ¹⁰²	Nigeria	CS	01	259	195 (75.3%)
28	Ilesanmi <i>et al</i> (2016) ¹⁰³	Nigeria	CS	01	250	158 (63.2%)

CS, cross-sectional; MM, mixed method; Q, qualitative; QE, quasi-experimental; UC, unclear.

supervision, staffing adjustments and medication procedures, such as double-checking medications and reorganising pharmacy stock³⁶ as specified in [table 2](#).

Pooled prevalence of patient safety incident reporting practices

28 articles were included to generate the pooled prevalence of patient safety incident reporting practices among healthcare professionals in Africa, while one article⁴⁵ with an SE of zero was excluded from the analysis (online supplemental file 3). In the random effects model (which accounts for variability among

the included studies), the pooled prevalence was 48% (95% CI 40% to 56%), with significant heterogeneity observed among the studies ($I^2=98.75\%$, $p<0.001$). This finding indicates substantial differences in reporting practices beyond what would be expected by chance. The pooled prevalence in the fixed effects model was consistent at 46% (95% CI 45% to 47%), with no heterogeneity (0%). However, given the considerable heterogeneity detected in the random-effects model, the fixed-effects model may not be the most appropriate for interpreting these data ([figure 3](#)).

Table 2 WHO criteria and patient safety incident reporting and learning systems in African healthcare organisations.

Name of reporting systems and citations		SA-PSIRLS								MSF-MERS ³⁶	T-AERS ³⁹	Z-MERS ³⁵	E-HSTG ⁴²
		E-NSTN ³⁴	Z-CIRS ³³	E-NOMER ³⁷	40	38	41	43					
Data input	Is reporting voluntary?	Y	Y	Y	–	–	Y	–	Y	Y	Y	–	
	Confidentiality held for*	P, R, O	P, R	R	–	–	P, R, O	–	P, R	P, R	U	R	
	Technical infrastructure†	1	2	1	2	–	1 and 2	1 and 2	2	2	U	2	
Data collection	What is reported?‡	I&E	CI	ME	I&E	I&E	I&E	–	MedE	AE	ME	AE	
	Reporters§	HP, F	HP	HP	HP	HP	HP, P, F	–	HP	HP	HP, P, F	HP	
	Reporting format¶	S, E	S, P	S, E	S, P	–	S, E, P	–	S, E	S, E	P	–	
Advanced minimal information model	Patient identification	+	–	+	+	+	+	+	+	+	U	–	
	Incident date and time	+	–	–	+	+	+	+	+	+	U	+	
	Incident location	+	–	+	–	+	+	+	+	+	U	+	
	Causes of incident	+	–	+	+	–	+	–	+	+	–	–	
	Contributing factors	+	+	–	+	+	+	–	+	+	–	–	
	Mitigating factors	+	+	–	+	–	+	–	–	–	–	–	
	Incident type	+	+	+	–	+	+	+	+	+	–	+	
	Incident outcome	+	–	–	+	+	+	–	+	+	–	–	
	Resulting actions	–	+	+	–	+	+	–	+	–	–	+	
	Reporter's role	+	+	+	–	+	+	+	+	–	–	+	
	Severity of harm	+	–	–	+	+	+	+	+	–	–	–	
	Free text part	–	+	+	–	–	+	–	+	–	–	+	
Implementation		–	+	+	–	+	–	–	+	+	–	–	
Data analysis	Approach to classification**	1, 3	1–3	1	–	1	1	1	1–3	1–3	–	–	
	Approach to analysis††	1–4	1	1, 5	2	1, 2	2, 3, 6	2, 4	1, 2	4, 6	–	–	
	Systematic recommendations	Y	N	Y	N	N	Y	Y	Y	Y	–	N	
	Expert evaluation	Y	N	N	N	N	Y	N	Y	Y	–	N	
	Prompt analysis	N	N	N	N	N	Y	Y	U	U	–	N	
Feedback	Feedback to reporters	Y	Y	N	N	N	Y	N	Y	Y	N	N	
	Issue recommendations	U	N	N	N	N	U	N	Y	U	U	U	
Percentage of compliance		79%	53%	58%	34%	39%	87%	34%	74%	66%	16%	26%	

+: included, –: not included, Y: yes, N: no, U: unclear.

*Patient (P), reporter (R), organisation (O).

†1: relational database, 2: human receiver.

‡I&E: incidents and errors, CI: critical incident, ME: medication error, MedE: medical error, AE: adverse event.

§Healthcare professionals (HP), patients (P), families (F).

¶Structured form (S), open questions (O), electronic (E), paper (P).

**Approach to classification: 1: event type (eg, wrong drug), 2: risk (severity or probability), 3: causation (by contributing factor).

††Approach to analysis: 1: summaries and descriptions, 2: causal analysis, 3: systems analysis, 4: risk analysis, 5: trend and cluster analysis, 6: hazard identification.

E-HSTG, Ethiopian Hospital Services Transformation Guidelines; E-NOMERS, Egyptian National Online Medication Error Reporting Systems; E-NSTN, Egyptian Neonatal Safety Training Network; MSF-MERS, Médecins Sans Frontières Medical Error Reporting Systems; SA-PSIRLS, South African Patient Safety Incident Reporting and Learning Systems; T-AERS, Tunisian Adverse Event Reporting Systems; Z-CIRS, Zimbabwe Critical Incident Reporting Systems; Z-MERS, Zambian Medication Error Reporting Systems.

Handling heterogeneity

In the random-effects model, the pooled estimate revealed considerable heterogeneity ($I^2=98.75\%$, $p<0.001$). To identify the source of this heterogeneity, a funnel plot, small study effect (Egger's test) and subgroup analysis using study-level variables (study design and country) were performed. However, no definitive source of heterogeneity was identified. This observation is common in meta-analyses of point prevalence studies, where variations may stem from unmeasured factors or may be inherent to the nature of the included studies. Our analysis found no evidence of publication bias or small-study

effects, as indicated by a symmetrical funnel plot and non-significant Egger's test ($p=0.6603$) (figure 4). Additionally, sensitivity analysis (leave-one-out method) showed that no individual study significantly influenced the overall pooled estimates of patient safety incident reporting. When one study was eliminated at a time, the pooled patient safety incident reporting estimate from the remaining articles varied between 47% and 49%, which is consistent with the overall pooled prevalence of 48% (95% CI 40% to 56%) as shown in online supplemental file 4). This consistency underscores the reliability of the findings.

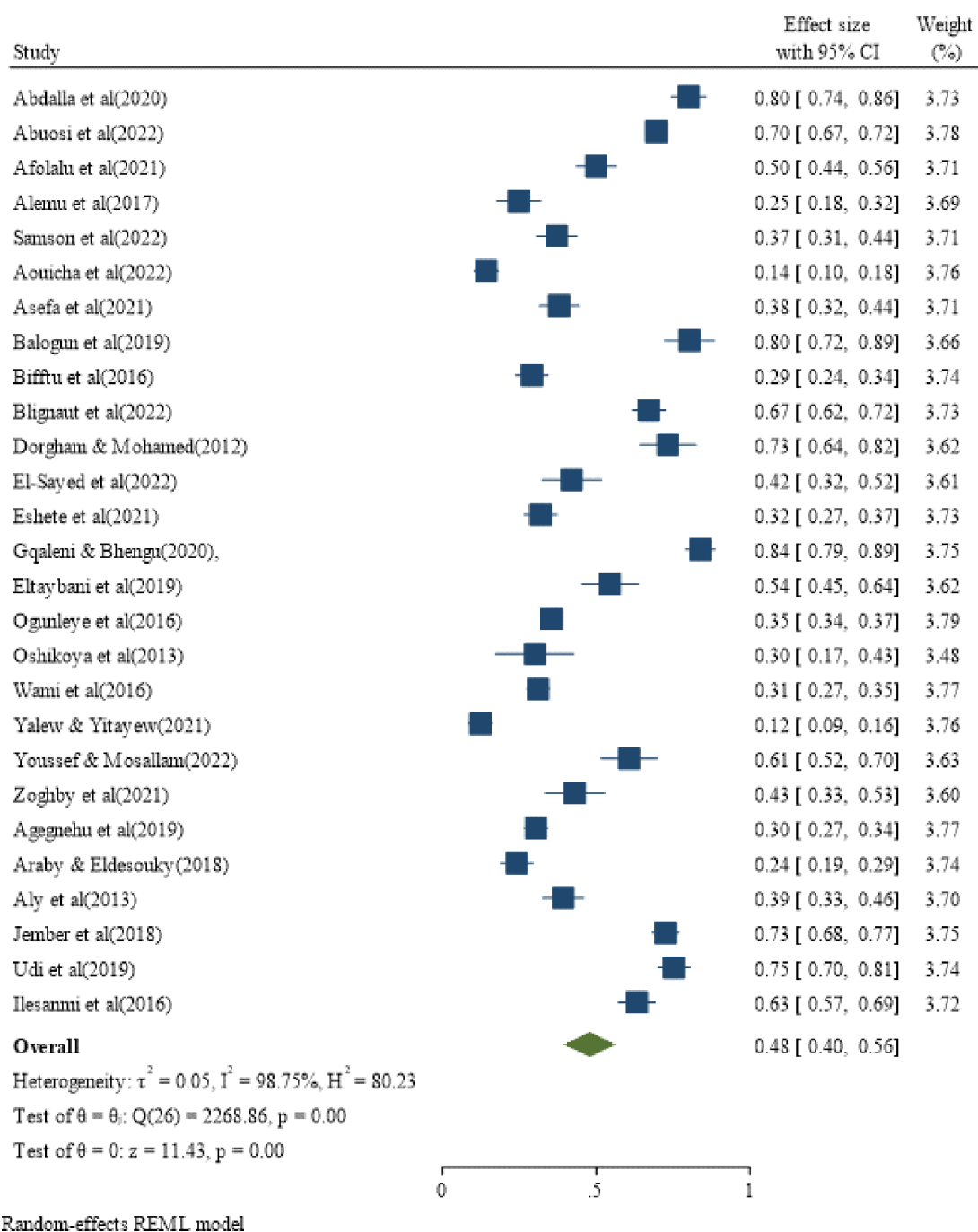
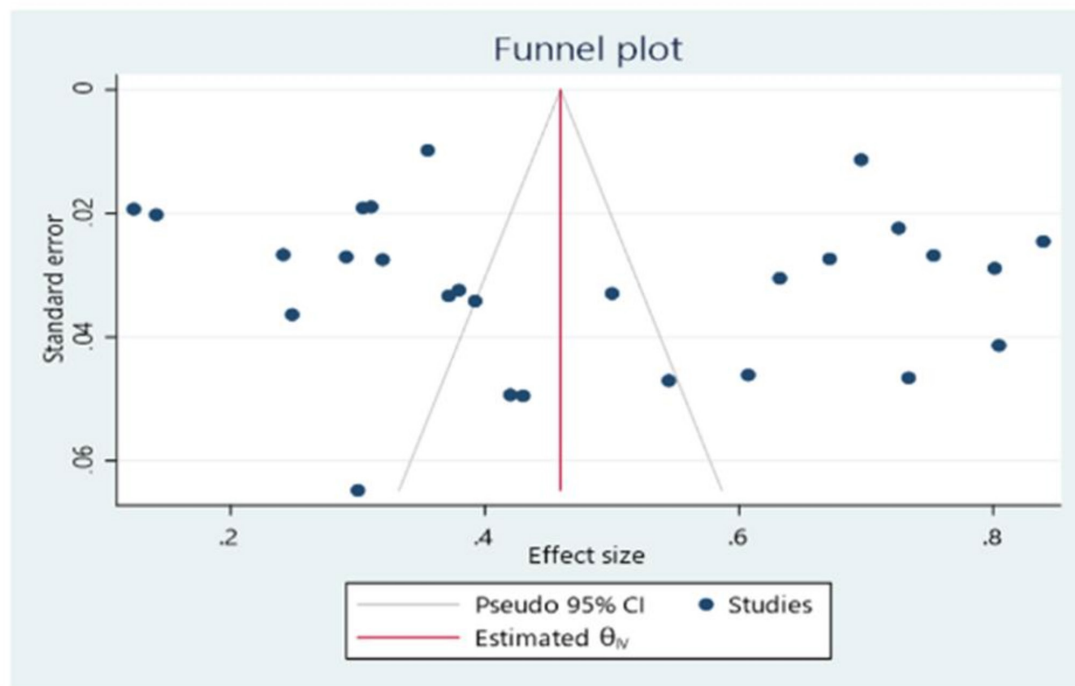


Figure 3 Forest plot showing the pooled prevalence of patient safety incident reporting practices in African healthcare organisations.

DISCUSSION

The aim of this systematic review and meta-analysis was to synthesise the available evidence on patient safety incident reporting and learning systems and estimate reporting rates in African healthcare organisations. This review, the first of its kind in Africa, emphasises the importance of aligning incident reporting systems with standardised criteria.¹⁴ Eight reporting systems with low to high levels of adherence to WHO criteria were identified. This finding aligns with the previous review, which found that none of the identified systems have fully complied with WHO criteria.²³ A recent report indicated that only

36% of WHO member states have established sentinel event reporting systems,⁴⁶ reflecting insufficient global coverage with most reporting systems being concentrated in HICs.^{16–20} In Africa, among the identified reporting systems, SA_PSIRLS showed a higher level of compliance with the WHO criteria, potentially serving as a model for other African countries. This success underscores the positive impact of consistent policy updates and the coordinated approach to guideline development. In contrast, the remaining reporting systems exhibited only low-to-moderate compliance levels. These may be attributed to limited funding and low awareness, which can contribute



Egger's test: $H_0: \beta_{\text{eta1}} = 0$; no small-study effects, $\beta_{\text{eta1}} = 1.50$, $SE \text{ of } \beta_{\text{eta1}} = 3.407$, $z = 0.44$,
 $Prob > |z| = 0.6603$

Figure 4 Funnel plot displaying the symmetrical distribution of articles indicating the absence of publication bias.

to disparities in patient safety outcomes.^{47 48} Therefore, addressing these challenges requires adequate financial investment, and the adoption of context-sensitive reporting systems.

The patient safety incident reporting and learning systems included in this review mainly focused on data entry and collection, often overlooking critical elements such as implementation strategies and limiting the ability of healthcare organisations to effectively adopt and use the systems.⁴⁹ Using evidence-based frameworks such as RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) may enhance seamless implementation and address contextual factors, facilitate stakeholder engagement, and enhance the reproducibility of the systems.^{50–52} In addition, long-term sustainability can be ensured through continuous monitoring and cost-effective evaluations to track the progress and identify areas of improvement.⁵³ Practical measures such as establishing dedicated local, national and regional oversight bodies and integrating the reporting systems into routine healthcare practices can further strengthen these systems.^{54 55} These are vital for achieving the global goal of eliminating preventable patient harm by 2030.⁵⁶ Furthermore, it is essential to go beyond mere reporting by establishing teams of experts to review and analyse reports, identify patterns and recommend interventions to enhance learning from incidents.⁴⁹ Health policymakers across Africa should develop national policies and guidelines according to WHO criteria, that are contextually appropriate and sensitive to resource constraints on

the continent.^{14 57} These may need strong collaboration among policymakers, healthcare leaders, frontline staff, patients and their families, and potentially international partners.^{58–60}

Our review found that the pooled prevalence of patient safety incident reporting practices among healthcare professionals in Africa was 48% (95% CI 40% to 56%), with substantial heterogeneity across studies. This variation reflects the diverse landscape of patient safety incident reporting practices across the continent, influenced by differences in healthcare infrastructure, types of patient safety incidents and the characteristics of study participants. Higher heterogeneity is expected in a meta-analysis of prevalence data, especially when studies differ in sample size, location and period.^{61 62} Our findings are consistent with a previous review from Iran, which reported a patient safety incident reporting rate of 47.3%,²⁴ and a review focused on the Asian continent and North America, indicating a reporting rate of 48%.²⁵ This suggests that challenges in reporting patient safety incidents may be widespread. The low reporting rates observed in African healthcare organisations may be linked to the region's underdeveloped patient safety culture, which ranges from 12.4% to 44.8%.⁶³ These may discourage healthcare professionals from reporting incidents because of fear of blame, lack of trust in the system or perceived inefficacy of reporting.^{64 65} To address these barriers, it is essential to implement user-friendly reporting systems (eg, mobile apps or online platforms), provide training for healthcare professionals to raise

awareness of the importance and methods of reporting, foster a non-punitive reporting culture and promote the adoption of anonymous reporting systems.^{66 67} Additionally, leadership commitments such as recognising staff for reporting incidents and providing timely feedback would increase the reporting rates.⁵

Patient and family engagement in patient safety incident reporting is essential in fostering transparency, ensuring patient safety and sharing responsibility in healthcare delivery.^{59 60 68} However, only three of the eight identified reporting systems permitted patients and families to report incidents, indicating a significant gap in their engagement.⁶⁹ This concern is particularly pressing in Africa, where lower health literacy among the general population is common.^{70 71} Therefore, healthcare systems should empower patients and families through tailored awareness creation campaigns and by establishing accessible, culturally appropriate, multi-lingual and user-friendly reporting systems.⁷² Furthermore, implementing patient advice and liaison services (PALS), which can assist patients in navigating healthcare systems, addressing complaints and enhancing communication between patients and healthcare professionals, is essential.^{73 74} Incorporating patient and family representatives into PALS and other patient safety initiatives can encourage their active involvement and ensure that their perspectives are considered in decision-making. These strategies may foster a supportive and inclusive environment, ultimately enhancing both patient safety and healthcare quality.⁷⁵

Overall, enhancing patient safety incident reporting systems in African healthcare settings requires a multifaceted approach tailored to the region-specific challenges. Addressing gaps such as lower compliance levels of reporting systems with standard criteria and low reporting rates among healthcare professionals is essential for building resilient systems.^{76 77} Patient safety incident reporting rates can be increased through regular training of healthcare professionals, strong leadership commitment and recognition of staff who report incidents. Furthermore, clear policies that guide the reporting process along with a multidisciplinary team of experts to review and act on incidents are necessary to promote accountability. Additionally, using evidence-based implementation frameworks and a user-friendly approach can enhance seamless reporting and accessibility of the system, whereas offering anonymous reporting options can reduce the pervasive fear of blame. However, where digital platforms are not feasible, maintaining paper-based systems can be an essential alternative. Integrating the patient safety incident reporting and learning systems into routine clinical practice and quality improvement measures is vital for sustainability. Moreover, continuous monitoring and evaluation and establishing key performance indicators to track reporting trends and outcomes will help to measure the successes. Additionally, tailoring global best practices to local contexts, promoting regional collaborations for knowledge sharing

and addressing sociocultural barriers through awareness creation campaigns and empowerment initiatives such as the establishment of PALS are essential for enhancing reporting practices. This comprehensive approach may assist African healthcare systems to increase reporting rates, promote a culture of learning and move towards the goal of eliminating preventable patient harm by 2030.

Strengths and limitations

This systematic review and meta-analysis have several strengths, including a comprehensive search strategy, rigorous quality assessment, the inclusion of patient safety incident reporting and learning systems-related guidelines, and the use of meta-analysis to generate a pooled estimate of incident reporting rates. These strengths enhance the reliability and robustness of our findings. However, there are also limitations to consider. The heterogeneity among the included articles may limit the generalisability of the results. Despite the predominance of medical and public health research publications in English in Africa, the exclusion of non-English articles may have narrowed the scope of the review, potentially omitting relevant evidence. The word count limitations and restrictions imposed by journals may have constrained the inclusion of detailed information about incident reporting systems, potentially resulting in the omission of certain criteria.

Recommendations for future research

Future research should focus on understanding the key components of incident reporting, such as data analysis, implementation, feedback mechanisms, analysis and corrective measures. Longitudinal studies will be essential for evaluating the impact and sustainability of these systems, using evidence-based implementation frameworks. In addition, exploring ways to enhance patient and family engagement in patient safety incident reporting will offer valuable insights for improving patient safety and healthcare quality in Africa and other low- and middle-income countries. In addition, we recommend that future reviews on this subject should consider publications in non-English and indigenous African languages for a comprehensive exploration of the patient safety incident reporting systems and practices in Africa.

CONCLUSION

Effective patient safety incident reporting and learning systems are essential for enhancing patient safety and healthcare quality. This review emphasises the need to align system adoption and implementation with WHO criteria. Additionally, there is an urgent need for standardised guidelines for patient safety incident reporting systems in Africa that consider local contexts. Policy-makers, healthcare leaders and researchers must prioritise the development and refinement of the systems to foster safety culture, encourage reporting and facilitate learning from incidents. In addition, the utilisation of evidence-based implementation frameworks such as

RE-AIM enhances the seamless implementation and sustainability of the system. Frontline healthcare professionals, patients and families play a vital role in advocating for and reporting patient safety incidents. Therefore, empowering them through education and training can significantly enhance the system's effectiveness. Improving patient safety goes beyond implementing reporting systems; it requires addressing systemic issues, overcoming cultural barriers and adapting solutions to the specific challenges and resource constraints of African healthcare organisations.

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