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Research Article

Treatment Outcome Among Patients with Atrial Fibrillation: A Systematic Review and Meta-Analysis 2025

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Abstract

Introduction: Due to the aging of the global population, atrial fibrillation has become the most prevalent cause of persistent cardiac arrhythmia, and is associated with significant morbidity, including stroke, heart failure, and increased mortality. Despite advances in diagnostic strategies and therapeutic options, there is variation in treatment outcomes. So this study is aimed evaluating treatment outcomes among patients with atrial fibrillation.

Method and Materials: Both manual and electronic searches were used to extract studies for this meta-analysis from PubMed, Google Scholar, Scopus Web of Science, and Cochrane Library was utilized to identify the eligible articles. The identified articles were exported into EndNote software used to export, organize, and review, the eligible articles. The quality of studies was assessed by using the Joanna Briggs Institute (JBI) quality appraisal tool for prevalence study. A meta-analysis was conducted using a random-effects model in STATA Version 14 software.

Result: Eleven included studies with good methodological quality and with 29, 2691participants enrolled in this study. According to this study the pooled proportion of complication was found to be 11.45% (95% CI: 7.48-15.4) and mortality 16.7% (95% CI: 10.9-22.6). The highest prevalence of complication 17.8 % (95% CI: 9.1- 26.5, I2 = 96.1%) was seen in African region, and the lowest 5.75 % (95% CI: -2.9.-14.4, I2 = 99.9%) was seen in North America region and the highest prevalence of mortality 18.6 % (95% CI: 4.1- 33.2,) was seen in African region, and the lowest 17.4 % (95% CI: 9.7. 25.1) was seen in North America region.

Conclusion: This systematic review and meta-analysis found that there is a substantial burden of adverse outcomes among the studied population. So, strengthening health systems, improving early detection, and enhancing management strategies is essential to reduce complications and mortality associated with the atrial fibrillation.

Keywords: atrial fibrillation; global; meta-analysis; outcome; mortality

Introduction

Due to aging of global population, atrial fibrillation (AF) has become the most prevalent and common cause of persistent cardiac arrhythmia, and is associated with significant morbidity, including stroke, heart failure, and increased mortality [1, 2]. It is characterized by high-frequency excitation of the atrium that results in both dyssynchronous atrial contraction and irregularity of ventricular excitation; whereas AF may occur in the absence of known structural or electrophysiological abnormalities [3].

It can affect cardiac function, functional status, and quality of life, significant increase in thromboembolism and confers a stroke risk [4, 5]. It also worsens heart failure and increases mortality in patients with myocardial infarction, and is an independent risk factor for death [6]. Furthermore, atrial fibrillation increases morbidity and mortality for patients and the lifetime risk for atrial fibrillation developing is 1 in 4 [7].

Once diagnosed, there are four cornerstones to management of AF; these are use of anticoagulants, rate control, rhythm control, and risk factor modifications. Despite advances in therapy the long-term clinical outcomes for many patients with AF remain suboptimal [8-10]. Additional challenges include variability in patient preferences, risk stratification, and comorbidities: many patients decline anticoagulation even when guidelines recommend and existing bleeding risk scores do not fully capture individual risk, potentially leading to under/ over treatment [11-13]. .

Atrial fibrillation imposes a substantial and growing burden on patients, healthcare systems, and public health [14]. Despite advances in diagnostic strategies and therapeutic options, considerable variability remains in how patients respond to treatment, influenced by factors such as comorbidities, risk profiles, and adherence to therapy [15]. These challenges emphasizes the need for comprehensive evaluation of treatment outcomes among individuals with AF and also evaluating treatment outcomes provides valuable insight into the effectiveness and safety of current therapeutic approaches. So this study was conducted to estimate treatment outcome of patients with AF.

Objective of the review

- ✓ To identify the treatment outcomes of patients with atrial fibrillation.

Methods and Materials

The systematic review and meta-analysis was conducted based on the Preferred Reporting Items for Systematic and Meta-analysis (PRISMA) [16].

Inclusion and Exclusion criteria

The inclusion criteria were: (1) participants who are adult, (2) studies which clearly reporting outcome of atrial fibrillation, (3) studies that were conducted in globally, (4) cross-sectional observational studies, and (5) both published and unpublished studies at any time. Articles were excluded if they were: those studies with no clear report of the outcome, and case reports. An attempt was made to contact the corresponding authors using the email address as provided in the published articles.

Searching Strategy

The search strategy was used to explore all relevant published and unpublished studies on the outcomes of atrial fibrillation in the following databases; Pub Med, Scopus, Google Scholar, web of science and Cochrane Library were searched. We reviewed Grey literature using Google. The following core search terms or phrases were used; atrial fibrillation, Atrial flutter OR AF OR Afib OR arrhythmia OR Irregular heart rhythm AND outcome OR prognosis OR mortality OR complication AND global. Search terms were predefined to allow a complete search strategy that included all-important studies. All fields within records and MeSH (Medical Subject Headings) and Boolean operators were used to search in the advanced Pub Med search engine. The gray literature was also searched from institutional repositories.

Study Selection Criteria

The retrieved articles were exported to the reference manager software, EndNote x8, and removed duplicate studies. All reviewers independently screened the title and abstract based on established article selection criteria. The full text of potentially eligible studies was retrieved and assessed in detail against the inclusion criteria. All reviewers independently appraised the quality of the studies by using the Joanna Briggs Institute (JBI) quality appraisal tool for prevalence study [17]. If the quality assessment indicator score was 50% or higher, then the study was considered low risk. Any disagreements that arose between the reviewers were resolved through discussion.

Data Extraction

Data were independently extracted by all authors using a standardized data extraction format. The tool used to extract includes first authors' name, publication year, study setting, study design, sample size, and the proportion of AF outcome. Articles that fulfilled the predefined criteria were used as a source of data for the final analysis. The reviewers were cross-checked it to ensure consistency. Any discrepancy was solved through discussion with other authors and the procedure was repeated to overcome the difference which resulted during extracting every single study.

Data analysis

The data were extracted using Microsoft Excel and STATA V. 14 statistical software was used for all statistical analysis. The pooled prevalence of the outcome was determined with a random effect model. The Heterogeneity among the included studies was checked with forest plot, I2 test, and the p-values. Heterogeneity among the included studies was investigated with subgroup analysis. Publication bias was checked with a funnel plot. Subgroup analysis was done by region of the study conducted. The results were presented in the form of text, tables, and figures. Additionally, a univariate meta-regression model was applied by taking sample size and publication year investigate the sources of heterogeneity. Finally, a forest plot figure was used to present the point proportions with their 95% CI of the primary studies.

Result

Study selection

Initially, 13485 articles were retrieved: 11830 from PubMed, 987 from Scopus, 123 Google Scholar, 421 web of science and 124 Cochrane Library databases. Eight thousand and five hundred eighty-nine remained after removing duplicates and using automation tools. 5798 articles were screened based on their title and abstracts and removed. Then 1512 articles were screened by using the eligibility criteria. Finally, 11 articles met the eligibility criteria and were included in the analysis (Figure 1).

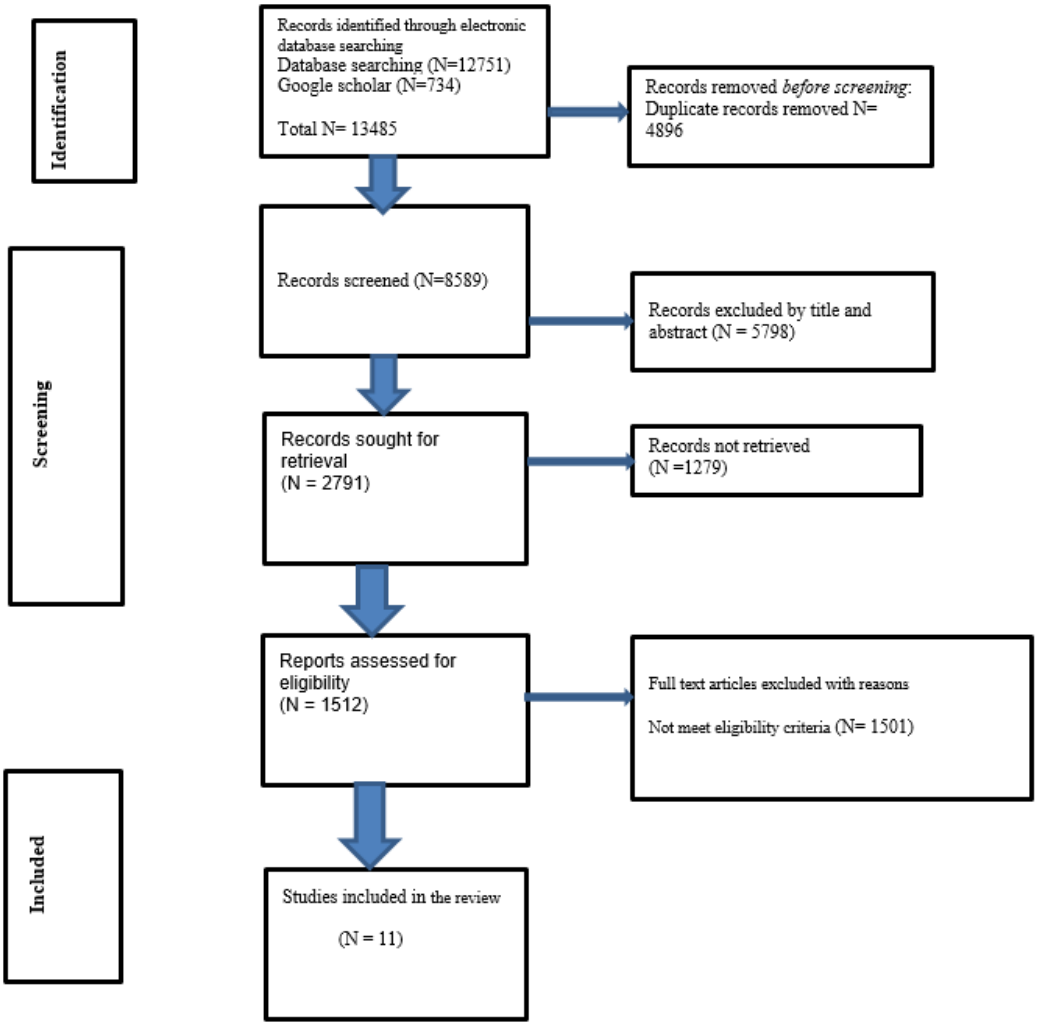

Figure 1: PRISMA flowchart diagram of the study selection.

Characteristics of study

The 11 studies [18-28] included 29, 2691 participants. Majority of studies were cross-sectional. The sample size ranged from 133 [18] to 260492 [28]. Most studies were conducted in Africa regions. From the included studies, the prevalence of mortality and complication ranged from 0.8[18] to 26.5 [28] and 1.3[26] to 48.9 [18] respectively (Table 1 & 2).

Author Name	Publication Year	Study area	Study design	sample size	Prevalence of complication with 95% CI
Desalegn S,	2025	Addis Ababa	cross-sectional	133	48.9(40.4-57.3)
Mwita JC,	2019	Botswana	cross-sectional	138	11.4(6.09-16.7)
Ahmed I,	2022	Pakistan	cross-sectional	636	8.6(6.42-10.7)
Oyediran IO,	2021	Tanzania	cross-sectional	681	7.1(5.17-9.02)
D'Anna L	2024	Uk	cross-sectional	959	2.8(1.75-3.84)
Greffie ES,	2016	Gonder	cross-sectional	240	9(5.37-12.6)
Addisu ZD,	2023	Amhara	cohort	378	17.2(13.3-21.0)
Golwala H,	2016	Usa	cross-sectional	9542	10.2(9.59-10.8)
Piccini JP,	2016	USA	cross-sectional	9743	1.3(1.07-1.52)

Table 1: Characteristics of the included studies in the systematic review and meta-analysis who developed complication

Author Name	Publication Year	Study area	Study design	sample size	Prevalence of death with 95% CI
Desalegn S,	2025	Addis Ababa	cross-sectional	133	0.8(-0.7-2.31)
Mwita JC,	2019	Botswana	cross-sectional	138	14.5(8.62-20.3)

Ahmed I,	2022	Pakistan	cross-sectional	636	6.7(4.75-8.64)
Oyediran IO,	2021	Tanzania	cross-sectional	681	34(30.4-37.5)
D'Anna L	2024	UK	cross-sectional	959	6.4(4.8-7.9)
Greffie ES,	2016	Gonder	cross-sectional	240	31.2(25.3-37.0)
Addisu ZD,	2023	Amhara	cohort	378	13.22(9.8-16.6)
Golwala H,	2016	USA	cross-sectional	9542	15.91(15.1-16.6)
Piccini JP,	2016	USA	cross-sectional	9743	11.2(10.5-11.8)
Inohara T,	2018	USA	cohort	9749	25.2(24.3-26.0)
Ngo LT,	2024	Australia & New Zealand	cross-sectional	260492	26.5(26.3-26.6)

Table 2: Characteristics of the included studies in the systematic review and meta-analysis who were died.

Treatment outcome of atrial fibrillation

In this study two outcomes were extracted namely mortality and development of complication. Eleven studies reported death as the treatment outcome with a total participant of 26, 0492 and nine studies reported development of complication with a total participant of 22450. The pooled proportion of complication was found to be 11.45% (95% CI: 7.48-15.4) with a heterogeneity index of 99.2%, with a P-value of less than 0.001(Figure 2). The pooled proportion of mortality was found to be 16.7% (95% CI: 10.9-22.6) with a heterogeneity index of 99.8%, with a P-value of less than 0.001(Figure 3).

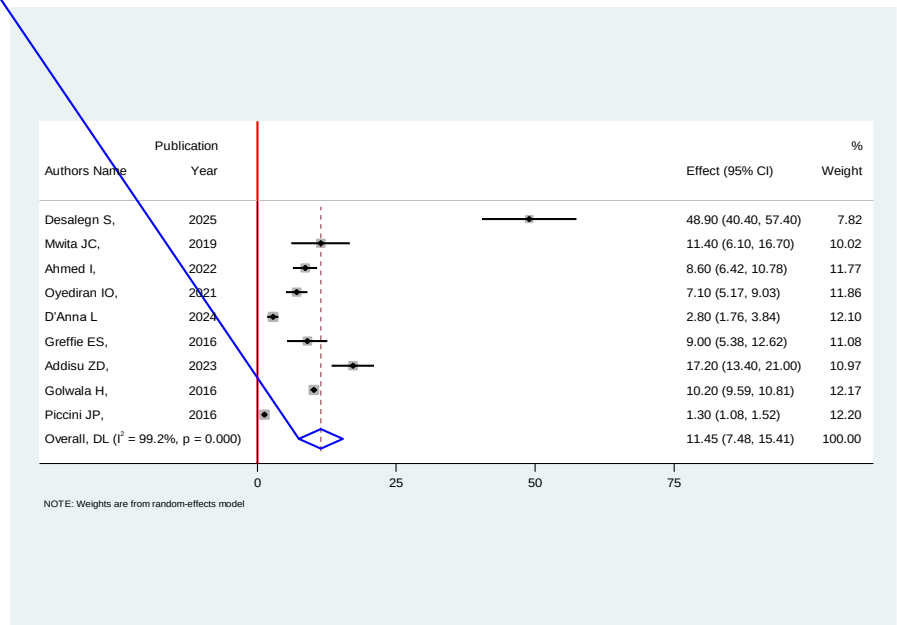

Figure2: Forest plot showing pooled global prevalence of complication as treatment outcome of patients with atrial fibrillation.

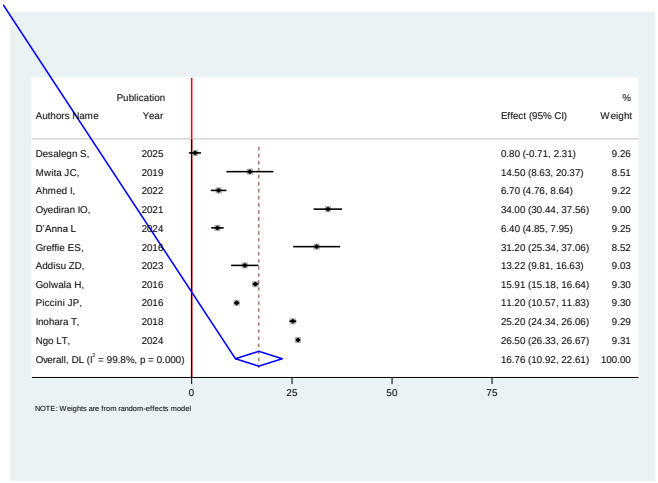

Figure 3: Forest plot showing pooled global prevalence of mortality as treatment outcome of patients with atrial fibrillation.

Sub-group analysis

The subgroup analysis was conducted based on region of the studies conducted. The highest prevalence of complication 17.8 %(95% CI: 9.1- 26.5, I2 = 96.1%) was seen in African region, and the lowest 5.75 %(95% CI: -2.9.-14.4, I2 = 99.9%) was seen in North America region (Fig. 4). Also, prevalence of mortality 18.6 %(95% CI: 4.1- 33.2, I2 = 98.9%) was seen in African region, and the lowest 17.4 %(95% CI: 9.7. 25.1, I2 = 99.7%) was seen in North America region (Fig.5).

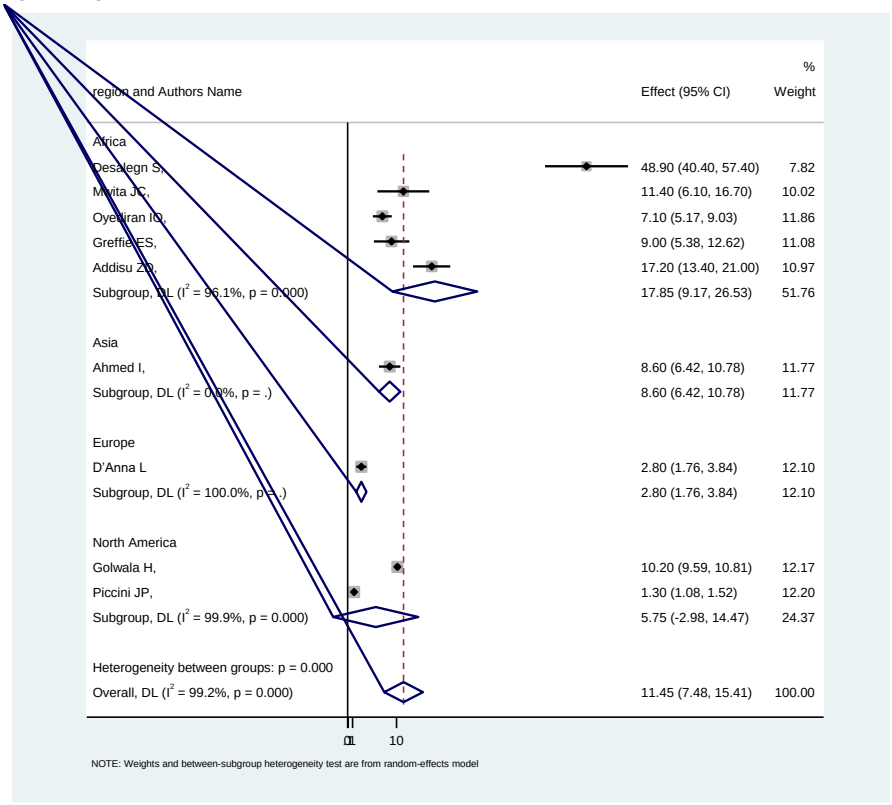

Fig 4: Subgroup analysis of global prevalence of complication patients with atrial fibrillation by region.

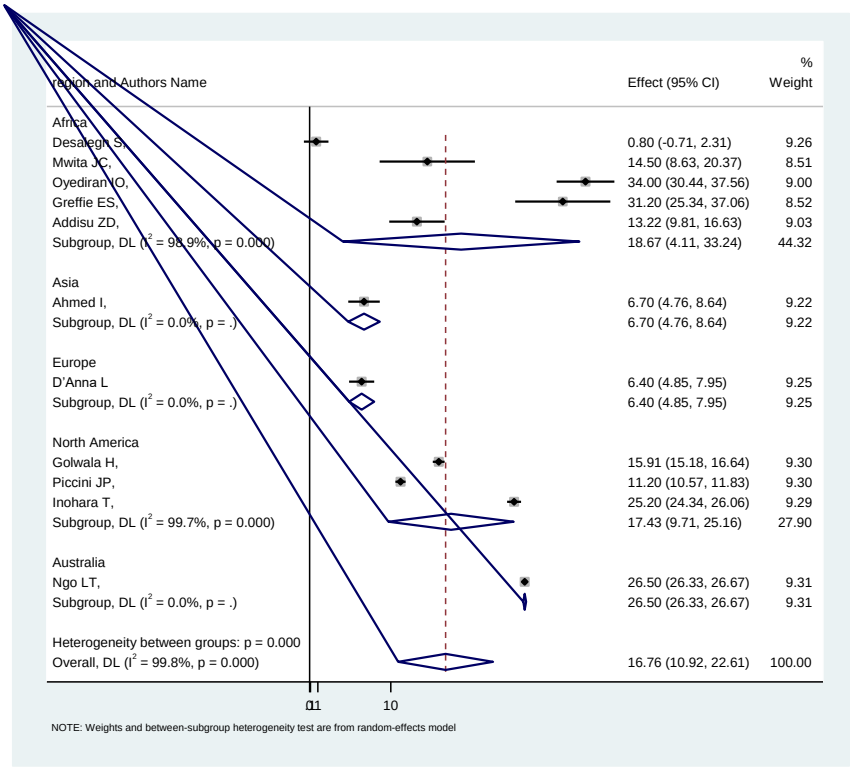

Fig 5: Subgroup analysis of global prevalence of mortality patients with atrial fibrillation by region.

Meta-regression and publication bias

The heterogeneity index values (99.2 %and 99.8%) indicated that the studies were heterogeneous. Therefore, meta-regression was conducted using year of publication and sample size as a covariates. The analysis showed that publication year and sample size didn't have a significant effect on heterogeneity between studies for mortality, with a P- value of 0.417 and 0.053 respectively and for complication a P- value of 0.212 and 0.372 respectively. Publication bias was assessed using a funnel plot and the Egger regression test with a significance threshold of <0.05. Statistical evidence of publication bias was not observed for both mortality and complication. The funnel plot displayed some asymmetry in the distribution (Fig. 6 & 7) and the Egger test yielded a statistically non-significant result with a P-value of 0.057 and 0.080 for complication and mortality respectively.

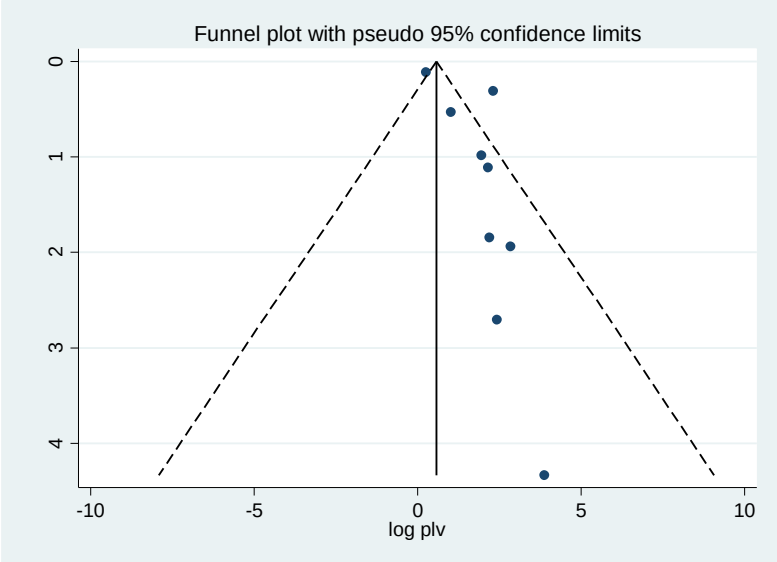

Fig 6. Funnel plot to test the publication bias in 9 studies with 95% Confidence limits.

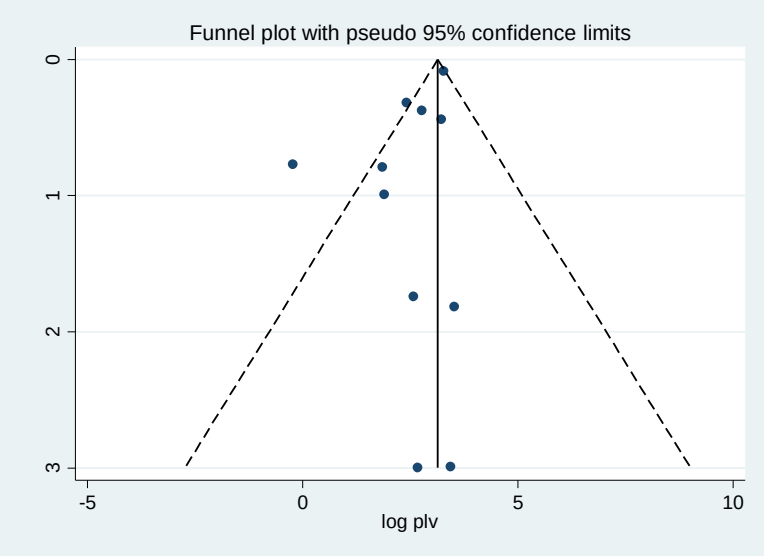

Fig 7. Funnel plot to test the publication bias in 11 studies with 95% Confidence limits.

Sensitivity analysis

Sensitivity analysis was performed to determine how various sources of uncertainty contribute to the overall uncertainty among the studies, but the results indicated that uncertainty has an insignificant influence on pooled prevalence (Fig 8 &9).

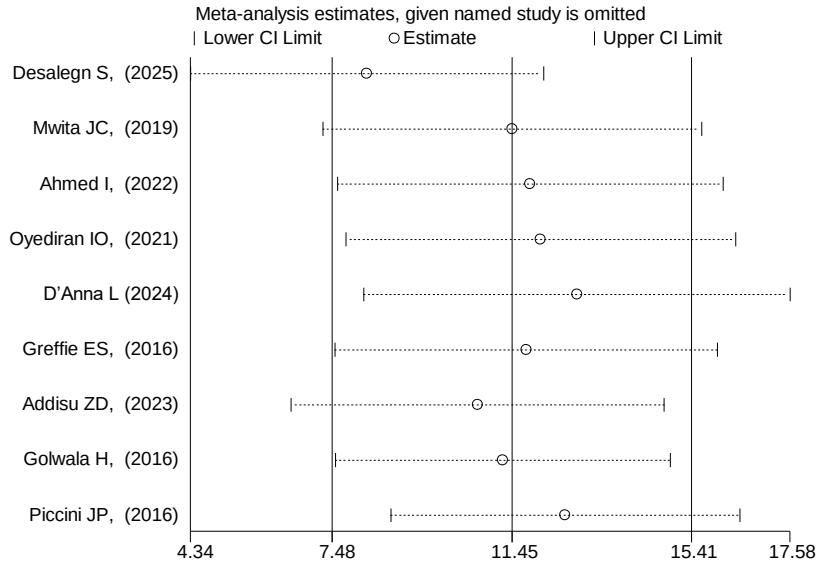

Figure 8: Sensitivity analysis of pooled global prevalence complication among patients with atrial fibrillation for each study being removed one at a time.

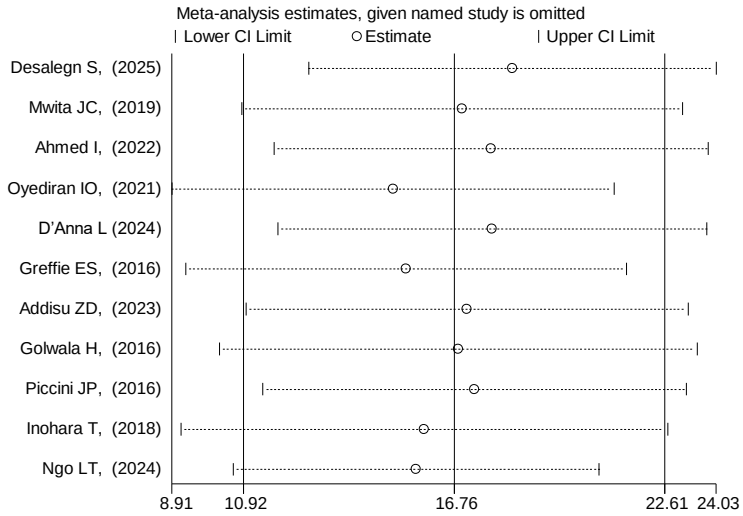

Figure 9: Sensitivity analysis of pooled global prevalence of mortality among patients with atrial fibrillation for each study being removed one at a time.

Discussion

Evidence shows that early rhythm controlling in patients with atrial fibrillation significantly improves clinical outcomes. This will reduces the composite of cardiovascular death, stroke, hospitalization for heart failure, or acute coronary syndrome. Furthermore, in patients with recent ischemic stroke and AF early initiation of DOAC anticoagulation did not significantly increase bleeding risk and was associated with a trend toward reduced recurrent ischemic events at 90 days [29-32].

The pooled proportion of complication was found to be 11.45% (95% CI: 7.48-15.4). The pooled proportion of mortality was found to be 16.7% (95% CI: 10.9-22.6). A study indicated that on newly diagnosed AF patients, the annual death rate was reported around ~5% and among most patients early after diagnosis, mortality and complications are higher [33, 34]. Different studies shows the outcomes in AF vary strongly depending on age, comorbidities (frailty, heart failure, and renal disease), use of anticoagulation, and whether patients undergo procedures [35, 36].

According to sub-group analysis the highest prevalence of complication 17.8 % (95% CI: 9.1- 26.5,) was seen in African region, and the lowest 5.75 % (95% CI: -2.9.-14.4) was seen in North America region. The discrepancy might be due to disparities in healthcare infrastructure, access to anticoagulation and advanced AF treatment, comorbidity burden and late presentation, and differences in study populations.

Additionally, the prevalence of mortality 18.6 % (95% CI: 4.1- 33.2) was seen in African region, and the lowest 17.4 % (95% CI: 9.7. 25.1) was seen in North America region. This variation explained as limited access to advanced cardiovascular Care, underuse and Limited availability of anticoagulation, variation in burden of comorbidities, delayed diagnosis, differences in study populations and clinical settings.

Conclusion

This systematic review and meta-analysis found that the overall pooled proportion of complications among the included studies was 11.45%, while the pooled proportion of mortality reached 16.7%, indicating a substantial burden of adverse outcomes among the studied population. So, strengthening health systems, improving early detection, and enhancing management strategies is essential to reduce complications and mortality associated with the atrial fibrillation.

Strength and limitation of the study

There are certain limitations to be considered. First the lack of limited studies from most regions may impact the generalizability of the findings, secondly we are unable to compare with other findings due to there is no systematic review and meta-analysis conducted globally and regionally.

Declaration

Ethics approval and consent to participant

Not applicable

Consent for publication

Not applicable

Availability of data and materials

All the data analyzed during the current systematic review and meta-analysis is fully available with request from corresponding author.

Competing interests

all the authors declare that they have no competing interests

Funding

Not applicable.

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