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Magnitude and predictors of mild cognitive impairment among older populations in Africa: a systematic review and meta-analysis

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BACKGROUND: With an increasingly older population, age-related health issues such as mild cognitive impairment and dementia are serious public health concerns. Emerging data suggest that public health and preventative intervention strategies can modify early risk factors for the development of mild cognitive impairment and dementia. However, there is inadequate evidence of mild cognitive impairment in older populations in Africa.Therefore, this review aimed to provide pooled evidence of mild cognitive impairment among older populations and its predictors in Africa.

METHODS: All the available primary studies were searched through Google Scholar, HINARI, PubMed, Psych Info, CINAHL, Embase, Web of Science, and Cochrane Library databases. The quality of the included studies was critically appraised by the Joanna Briggs Institute (JBI) assessment tool adapted for observational studies. All the data were extracted on an Excel spreadsheet and exported to Stata version 17. During critical appraisal, disagreements between the two authors were resolved by the involvement of a third author. Effect sizes were pooled using the random-effects model, and the presence of publication bias was detected from the asymmetry of the funnel plot and statistically significant Egger's test ($p < 0.05$).

RESULTS: The pooled magnitude of mild cognitive impairment among older populations was 29.39% (95% CI:24.73, 34.04, $I^2 = 98.05\%$, $P = 0.00$). Increased age 1.56 (95%CI:1.36, 1.79), being female 2.65 (95%CI:2.06, 3.400), participants who could not read and write 4.66 (95%CI:2.83, 7.67), have no spouse 4.27 (95%CI:1.06, 17.11), having hypertension 2.95 (95%CI:1.67, 5.20), severely dependent 7.66 (95%CI:3.74, 15.68), high level of alcohol intake 2.48 (95%CI:1.49, 4.09), having depression 3.17(95%CI:2.14, 4.68), low income 3.21 (95%CI:1.98, 5.19), poor social support 2.41 (95%CI:1.65, 3.51) and poor nutritional intake 2.77 (95%CI:1.83, 4.19) were significantly associated with mild cognitive impairment.

CONCLUSIONS: The magnitude of mild cognitive impairment among Africa's older populations is significant. This suggests that cognitive disorders should be routinely screened among older people who visit healthcare facilities regarding physical health to enable early detection and treatment of reversible causes of neurocognitive impairment. Furthermore, identifying modifiable factors would inform evidence-based policies to reduce the health and societal burden of cognitive decline.

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INTRODUCTION

The life expectancy of the world population has increased significantly since 1950, with a significant increase in the proportion of older people [1]. The global population aged 60 and older was 901 million in 2015, and it is expected to reach 1.4 billion by 2030 [2].

Over the previous decades, the number of dementia population groups has increased dramatically. According to the World Alzheimer's Report, there were 47.47 million cases in 2015, which is predicted to increase to 75.63 million in 2030 and 135.46 million in 2050 [3]. Dementia is anticipated to increase from 58% in 2010 to 63% in 2030 and 71% by 2050 in low and middle-income countries [4]. Evidence also depicted that Alzheimer's disease doubles every 5 years after age 65 [5]. Moreover, developing countries comprise around 75% of the world's older populations [6], and by 2050, two-thirds of older people with dementia will live in low- and middle-income countries [7].

Dementia and cognitive impairment are among the leading causes of disability and dependence among older populations, and they constitute a major economic burden for public health systems in low-, middle-, and high-income nations [5, 8, 9].

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Mild cognitive impairment refers to a temporary and progressive decline in cognitive abilities that does not meet the diagnostic criteria for dementia. Mild cognitive impairment [10] is regarded as an intermediate phase between normal aging and dementia; a higher percentage of individuals with mild cognitive impairment advance to Alzheimer's disease than those with normal cognition [11]. Every year, it is anticipated that 10–15% of individuals with mild cognitive impairment progress to Alzheimer's disease[12], compared to 1–2% in the cognitively normal older population [13]. Preventing the disease's onset, identifying its early symptoms, and delaying its progression represent urgent challenges [14].

Studies conducted among the older populations in the United States, Australia, Bulgaria, Mexico, and Japan revealed that the prevalence of mild cognitive impairment ranged from 6.5–39.1% [15–20].

Moreover, the prevalence of mild cognitive impairment varied by region in Africa from 6.1–69.86% [21–54].

Cognitive dysfunction has health, psychological, social, and financial consequences. It increases rates of hospitalisation, disability, and the risk of falling [55, 56]. Furthermore, individuals with cognitive impairment have higher mortality rates, a lower quality of life, lower emotional well-being, and spend more time in the hospital [55, 57]. Stigma, dependency, and discrimination are common psychological and social problems among individuals with cognitive impairment [58, 59]. Cognitive impairment also impacts health and social care staff, families, and society as a whole [60].

In an aging population, reliable estimates of the prevalence of dementia and cognitive impairment are needed to guarantee efficient healthcare and social welfare policymaking, planning, and resource allocation. Furthermore, identifying modifiable risk factors and diagnosing cognitive impairment earlier could lead to more efficient screening and care and lower healthcare costs [4].

Even though different primary studies were conducted on cognitive impairment in different regions in Africa, there are great discrepancies and inconsistent results across the regions. Therefore, this systematic review and meta-analysis aimed to synthesise the pooled magnitude of mid-cognitive impairment and its predictors in Africa.

METHODS

Reporting and registration protocol

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses 20 (PRISMA-20) statement guideline [61] was used to report the results of this systematic review and meta-analysis (Supplemental File 1-Table 1). The review protocol was registered with the Prospero database (PROSPERO, 2024: CRD42024498420).

Database and search strategy

A literature search was conducted using Google Scholar, PubMed, Hinari, PsycInfo, CINAHL, Embase, WOS, and Cochrane Library. All studies conducted on cognitive impairment and its predictors among older populations in Africa were included. To search relevant data about mild cognitive impairment and associated factors in older populations, a thorough search was undertaken through the listed databases using the following search terms and phrases, which were combined using the "OR" and "AND" Boolean operators: "Prevalence" OR "magnitude" OR " Burden" OR "Incidence" AND "Cognitive impairment" OR "Dementia" OR "Mild cognitive impairment" OR "Severe cognitive impairment" AND "factors" OR "determinants" OR "predictors" AND "old age" OR "elderly" OR "late life" OR "geriatric" OR "aged" AND "Africa" OR " Central Africa" OR "Cameroon" OR "Central African Republic" OR "Chad" OR "Congo" OR "Democratic Republic of Congo" OR "Equatorial Guinea" OR "Gabon" OR "Sao Tome and Principe" OR "Eastern Africa" OR "Burundi" OR "Djibouti" OR "Eritrea" OR "Ethiopia" OR "Kenya" OR "Rwanda" OR "Somalia" OR "South Sudan" OR "Sudan" OR "Tanzania" OR "Uganda" OR "Southern Africa" OR "Angola" OR "Botswana" OR "Eswatini" OR "Lesotho" OR "Malawi" OR "Mozambique" OR "Namibia" OR "South Africa" OR "Zambia" OR "Zimbabwe" OR "Western Africa" OR "Benin" OR "Burkina Faso" OR "Cabo Verde" OR "Cote d'Ivoire" OR "Gambia" OR "Ghana" OR "Guinea" OR "Guinea-Bissau" OR "Liberia" OR "Mali" OR "Mauritania" OR "Nigeria" OR "Senegal" OR "Sierra Leone" OR "Togo" OR "Northern Africa" OR "Egypt" OR "Libya" Or "Morocco" OR "Tunisia" OR "Algeria".

A literature search was undertaken from January 4–March 23 /2024. All articles identified in the search were reviewed based on their title, abstract, and full text. Two separate researchers (Authors 1 & 5) conducted the literature search, and differences were resolved by discussion and consensus.

Eligibility criteria

We searched all accessible primary studies. Initially, all observational studies measuring cognitive impairment and its predictors among Africa's older populations aged 50 and above and written in English were included [62]. We had no time limit for the start of the paper publication. Qualitative, case series and case report studies were excluded.

Study selection

All the retrieved studies were exported to the EndNote version 7 reference manager, and the duplicated studies were removed using "find duplicates". Then, there were two phases involved in the screening and selection of the studies. First, the abstract and title were screened, and then the full text was reviewed. Through title and abstract screening by two independent researchers, studies that reported the magnitude of cognitive impairment and its predictors among Africa's older populations were selected for full-text review. Any article deemed potentially eligible by either reviewer was regarded as full-text and individually screened by both reviewers. In the case where the researchers were unable to agree, a third researcher (Author 6) reviewed and resolved the disagreements.

Data extraction

The data was extracted using a standardised data abstraction form, developed in an Excel spreadsheet. For each study, the following data were extracted including the author's name, publication year, study region, study setting, study design, sample size, response rate, and magnitude of cognitive impairment.

For each study, data extraction was carried out by two researchers (Authors 1 and 5), and the extracted data were then cross-checked for inconsistencies. The involvement of a third reviewer (Author 6) helped to resolve disagreements.

The primary outcome measure of interest

The primary outcome of interest was the magnitude of mild cognitive impairment among the older populations and its predictors in Africa.

Data analysis

All the statistical analysis was performed using STATA version 17. A weighted inverse-variance random-effects model [63] was used to calculate the overall pooled magnitude of mild cognitive impairment and its predictors. The presence of publication bias was checked by observing the symmetry of the funnel plot, and Egger's test with a p-value of <0.05 was also employed [64]. The percentage of total variation across studies due to heterogeneity was assessed using I^2 statistics [65]. The values of I^2 25,50, and 75% represented low, moderate, and high heterogeneity, respectively [65]. A p-value of I^2 statistic <0.05 was used to declare a significant heterogeneity [66, 67]. To identify the

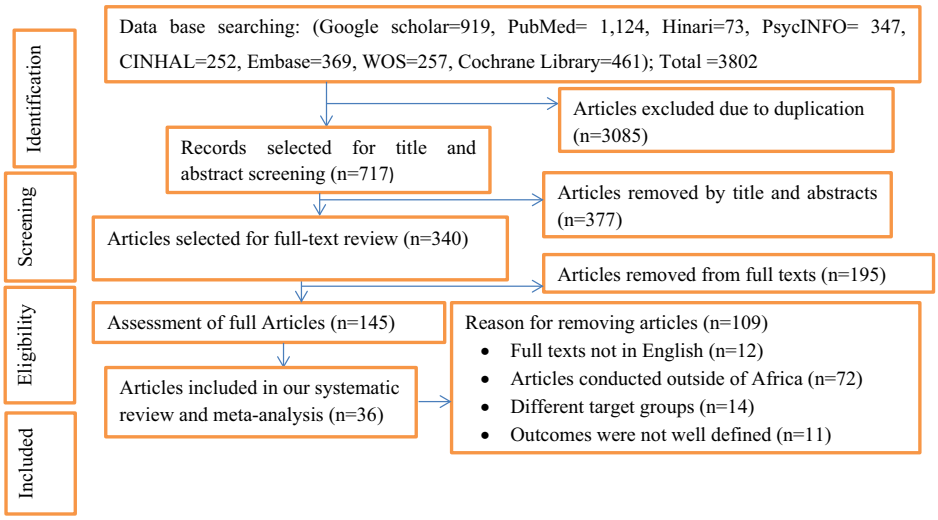


Fig. 1 PRISMA flow diagram showing the literature search results. The diagram illustrates the number of articles identified, screened, assessed for eligibility, and included in the final analysis, along with reasons for exclusions at each stage.

influence of a single study on the overall meta-analysis, a sensitivity analysis was performed. A forest plot was used to estimate the effect of independent factors on the outcome variable, and a measure of association at 95% CI was also reported. The Odds Ratio (OR) was the most frequently reported measure of association in the eligible primary studies. To estimate the pooled OR effect, either a random-effects model or a fixed-effects model is used. Specifically, a fixed-effects model should be used if there is no statistical heterogeneity ($P > 0.10$ or $I^2 < 50\%$). Conversely, a random-effects model should be employed if there is statistical heterogeneity ($P < 0.10$ or $I^2 > 50\%$).

In our review, the included primary studies used different methodologies and were drawn from several independent populations. As a result, this review was conducted using a random-effects model.

RESULTS

Search findings

The database search gave a total of 3802 articles from our comprehensive search of both published and unpublished sources. In fact, all 3802 articles were obtained through database searching from only published articles. Among 2715 articles accessed from database searching, 919 articles were obtained using Google Scholar, 1124 articles were from PubMed, 73 from Hinari, 347 from PsycINFO, 252 from CINAHL, 369 from Embas, 257 from Web of Science, and 461 from Cochrane Library. A total of 3085 duplicate articles were removed. After screening the remaining 717 articles for their title and abstracts, 377 articles were excluded because they were unrelated to the topic.

The remaining 340 articles were then evaluated for the presence of full text, with only 145 of them having full-text content. After a full-text review of the 145 papers, 109 studies were removed because they were not published in English, were studies undertaken outside Africa, had different target population groups, or outcomes were not sufficiently defined. Finally, 36 primary studies [21–54] were included (Fig. 1).

Characteristics of the included studies

In this systematic review, a total of 3802 articles were found in our initial search. The publication year of the included studies ranged from 2005–2023. The smallest and the largest sample sizes of the included studies were 90 [42] and 981 from Egypt and Burkina Faso [48] respectively.

Almost all the included studies (N = 35) were conducted using a cross-sectional study design, and only one study was carried out using a cohort study (N = 1). Regarding geographical region, seven studies were conducted in Eastern Africa [24, 25, 33, 34, 46, 53, 54], six studies in Central Africa [21, 26, 27, 45], eight studies in Northern Africa [37–43, 50], five studies in Southern Africa [29, 32, 35, 44, 68] and ten studies in Western Africa [22, 23, 28, 30, 31, 47–49, 51, 52]. Most of the studies included were community-based (n = 24, 66.67%), with the remaining being institutional-based. The response rates of the individual studies ranged from 56.67–100% and the magnitude of mild cognitive impairment ranged from 6.1 [45]to 69.8% [50](Table 1).

Thematic Findings

In this review, we included 36 primary studies conducted in Africa. We focused on systematically identifying the magnitude of mild cognitive impairment among the older populations, as well as factors associated with mild cognitive impairment. The magnitude of mild cognitive impairment among the older populations in individual studies significantly varies from 6.1–69.8%. The magnitude of mild cognitive impairment in primary studies ranged from 6.1–33.3% in Central Africa [21, 26, 27, 45], 7.7–59.4% in Western Africa [22, 23, 28, 30, 31, 47–49, 51, 52], 11.04–45.6% in Eastern Africa [24, 25, 33, 34, 46, 53], 9–53.3% in Southern Africa[29, 32, 35, 44, 68], and 26–69.8% in Northern Africa [37–43, 50]. The magnitude of mild cognitive impairment ranged from 7.2–43.8% in low-income countries [24, 25, 27, 33, 45], 6.1–69.8% in low- middle- income countries [21–23, 26–28, 30, 31, 34, 37–43, 45–47, 49–53], and 9–53.3% in upper-middle income countries [29, 32, 35, 44, 68].

According to the data from the primary studies, ten of them documented a significant association between advanced age and mild cognitive impairment [21, 24, 28, 31, 33, 38, 39, 48, 53, 68]. In twelve studies, lack of formal education was significantly associated with mild cognitive impairment [21, 22, 24, 26, 27, 33, 38, 39, 49, 50, 54, 68].

Eight individual studies reported the odds of mild cognitive impairment among the older populations, with prevalence rates being higher among female respondents than their male counterparts [21, 24, 27, 33, 38, 39, 50]. In the other three studies, spousal loss was significantly associated with mild cognitive impairment [21, 25, 27]. Likewise, two studies documented that mild cognitive impairment was significantly associated with increased blood pressure [21, 22].

Another two primary studies indicated that the magnitude of mild cognitive impairment increases with rising mean arterial pressure in the third quartile [21, 23]. Besides, two individual studies reported that

Table 1. Shows the characteristics of the included studies.

Author (Year)	Country	Study Setting	Study design	Sample size	Response Rate (%)	prevalence/ Incidence (%)	Predictors	Tools used, reliability & validity
Tianyi FL et al [21]	Cameron	Community-based	Cross Sectional	501	100%	33.3	Advanced age, Female, unable to read and write, no spouse, increased BP, Mean Arterial Pressure in the 3rd quartile, severely dependent, low income, ever use of alcohol, having depression, Poor Social Support, Rural resident, Poor nutritional intake, underweight, low physical activity	MMSE Validity: good interrater concordance (κ statistic = 0.86)
Amaefuna C. Anieto et al [22]	South Nigeria	Institutional based	Cross Sectional	160	100%	59.4	unable to read and write, increased BP,	The 10-word delay recall test scale: Validity: Interrater reliability was 0.87, and a Cronbach α = 0.83. Concordance with DSM-IV criteria
Adebiyi AO et al [23]	Southwest Nigeria	Community-based	Cross Sectional	623	100%	19.7	Mean Arterial Pressure in the 3rd quartile	Identification and Intervention for Dementia (IDEA): Validity: Not reported
Atim LM et al [24]	Uganda	Institutional based	Cross Sectional	507	100%	28.01	Advanced age, Female, unable to read and write, Severely Dependent,	MMSE; Validity: Good internal consistency with Cronbach's α = 0.78.
Fekadu B et al [25]	Ethiopia	Community-based	Cross Sectional	423	100%	42.1	No spouse, alcohol ever use, having depression, poor social support	MMSE; Validity: Good internal consistency with Cronbach's α = 0.70
Ntsama Essomba MJ et al [26]	Cameron	Institutional based	Cross Sectional	104	100%	20.2	unable to read and write,	MMSE; validity not reported but stated the sensitivity (0.83) and a specificity (0.82) in LIMCS
Guerchet M et al [27]	Central African Republic	Community-based	Cross Sectional	509	97.50%	37.9	Female, unable to read and write, no spouse,	Community Screening Interview for Dementia. Validity not reported
Guerchet M et al [27]	Republic of Congo	Community-based	Cross Sectional	546	95.20%	28.5	_	Community Screening Interview for Dementia. Validity: not reported
Guerchet M et al [28]	Benin, west Africa	Community based	Cross Sectional	514	97.70%	10.4	Advanced age, Female, Depression,	Community Screening Interview for Dementia. Valid: Cronbach α = 0.87
ClausenT et al [29]	Botswana	Community-based	Cross Sectional	372	100%	9	_	MMSE Validity: not reported
Toure K et al [30]	Senegal	Community-based	Cross Sectional	507	100%	10.8	_	The Test of Senegal Validity: Valid and reliable in the context
Ogunniyi A et al [31]	Nigeria	Community-based	Cross Sectional	642	95.50%	18.4	Advanced age,	Identification and Intervention for Dementia (IDEA): Validity: Sensitivity (100%) &Specificity (96.3%), and Cronbach's α = 0.741
Ssonko M et al [32]	South Africa:	Community-based	Cross Sectional	165	100%	53.3	_	MMSE Validity: Not reported

Table 1. continued

Author (Year)	Country	Study Setting	Study design	Sample size	Response Rate (%)	prevalence/ Incidence (%)	Predictors	Tools used, reliability & validity
Gela YY et al [33]	Ethiopia	Community-based	Cross Sectional	403	97.50%	43.8	Advanced age, Female, unable to read and write, low income, poor social support, rural resident	MMSE validity: Specificity (77.8%) and sensitivity (78.7%)
Dotchin CL et al [34]	Tanzania	Community-based	Cross Sectional	296	100%	15.5	Alcohol ever use,	DSM-IV Validity: Standard diagnostic tool
S. Ramlall, et al [35]	South Africa	Community-based	Cross Sectional	302	100%	16.9	Advanced age, Lower educational status, Being white	MMSE Cronbach $\alpha = 0.96$ Validity: Good:
Kobayashi LC et al [68]	South Africa	Community-based	Cohort	899	100%	24	Advanced age, unable to read and write, unmarried, alcohol consumption	Brief cognitive function assessment Reliability and validity: not reported
Moustafa SA et al [37]	Egypt	Institutional based	Cross Sectional	299	100%	39.5	_	Three tasks: Validity: not reported
Shawky K et al [38]	Egypt	Institutional based	Cross Sectional	120	100%	38.3	Advanced age, unable to read and write, female, depression, poor nutritional intake,	MMSE Validity: Not reported
Rahman TA et al [39]	Egypt	Institutional based	Cross Sectional	184	100%	56.5	Advanced age, unable to read, and write, female	MoCA Validity: good, Cronbach $\alpha = 0.83$.
Abdelrahman HM et al [40]	Egypt	Institutional based	Cross Sectional	94	100%	43	Advanced age, low education level and longer duration of dialysis history	MMSE reliability and validity: not reported
Amer M, et al [41]	Egypt	Community-based	Cross Sectional	100	100%	32	advanced age, low education, hypertension, and depression,	MMSE, MoCA reliability and validity: not reported
Abdelrahman HM et al [42]	Egypt	Community-based	Cross Sectional	90	100%	51.4	advanced age	Saint-Louis-University-Mental-Status (SLUMS) Validity: good Cronbach $\alpha = 0.72$
Hamza S et al [43]	Egypt	Institutional based	Cross Sectional	100	100%	26	_	MMSE Validity: not reported
Ramlall S et al [44]	South Africa	Community based	Cross Sectional	140	100%	27.1	_	MMSE Validity: not reported
Pilleron S et al [45]	Central African Republic	Community based	Cross Sectional	500	100%	7.2	_	Petersen's criteria, Validity: not reported
Pilleron S et al [45]	Republic of Congo	Community-based	Cross Sectional	500	100%	6.1	Poor nutritional intake	Petersen's criteria: Validity: not reported
Thierry Adoukonou et al [47]	Benin	Community based	Cross Sectional	440	100%	7.7	_	MMSE: Validity: not reported
Onadja Yet al [48]	Burkina Faso	Institutional based	Cross Sectional	981	93.60%	27.6	advanced age, poor social support, Poor nutritional intake, being underweight	Legane 's cognitive test: Validity: Cronbach's $\alpha = 0.82$
Norman D et al [49]	Ghana	Institutional based	Cross Sectional	100	100%	49	Lower educational status,	Ten (10) word list recall: Validity: not reported
Abdeljalil T et al [50]	Morocco	Institutional based	Cross Sectional	237	72.60%	69.8		MMSE: Validity: not reported

Table 1. continued

Author (Year)	Country	Study Setting	Study design	Sample size	Response Rate (%)	prevalence/ Incidence (%)	Predictors	Tools used, reliability & validity
							Female, Lower educational status, Poor nutritional intake, low physical activity	
Ucheagwu V et al [51]	Nigeria	Community based	Cross Sectional	441	100%	12.9	–	MoCA Validity- not reported, but the tool has been used in similar cohorts of Nigerian.
Touré K et al [52]	Senegal	Community based	Cross Sectional	584	100%	20.7	–	Test of Senegal: Valid: with a Sensitivity = 93.1%, Specificity = 89.6%,
Masika GM et al [53]	Tanzania	Community based	Cross Sectional	462	100%	11.04	Advanced age	Identification and Intervention for Dementia (IDEA): Validity: Cronbach α = 0.807
Prynn JE et al [144]	Uganda	Community based	Cross Sectional	811	60.40%	-	Lower educational status, low income	MMSE: Validity-not reported
George G et al [46]	Zambia	Institutional based	Cross Sectional	240	56.67%	45.6	–	Identification and Intervention for Dementia (IDEA): Validity: Not validated in the country's context.

those who were severely dependent performed worse on cognitive tests than those who lived independently [21, 24].

Additionally, two studies found that high levels of alcohol intake affect cognitive performance negatively when compared with non-users [25, 34]. The outcomes of three primary studies demonstrated that the magnitude of mild cognitive impairment was higher among participants with depression than those who were not depressed [25, 28, 38]. Moreover, three primary studies showed [25, 33, 48] those patients with poor social support scored lower on cognitive tests as compared with those with strong social support. Likewise, as reported by the two individual studies, lower income was associated with worse cognitive impairment as opposed to those with a better income [33, 54]. Also, it has been reported that mild cognitive impairment is positively affected by poor nutrition [38, 45, 48, 50]. Furthermore, the magnitude of mild cognitive impairment was higher among those participants who were underweight and had poor physical activity [48, 49].

Trends of mild cognitive impairment

In this study, we tried to see the changes in the magnitude of mild cognitive impairment among the African older population from 2005–2023. In this review, the number of studies conducted include 1 in 2005, 1 in 2006, 2 in 2009, 2 in 2010, 1 in 2011, 2 in 2012, 3 in 2013, 2 in 2014, 3 in 2015, 2 in 2016, 3 in 2019, 2 in 2020, 3 in 2021, 3 in 2022, and 5 in 2023. To examine the time series trends of mild cognitive impairment, we calculated the pooled prevalence for each year. The pooled prevalence rates for mild cognitive impairment were 9% in 2005, 26% in 2006, 22.55% in 2009, 33.04% in 2010, 38.3% in 2011, 14.29% in 2012, 25.28% in 2013, 47.11% in 2014, 11.83% in 2015, 19.04% in 2016, 36.57% in 2019, 10.09% in 2020, 27.01% in 2021, 43.53% in 2022, and 26.78% in 2023. (Fig. 2).

Definitions of terms

Mild cognitive impairment [10] is a stage between cognitive changes in normal aging and early dementia, or mild cognitive impairment, is regarded as a transitional disorder between ages associated with memory impairment and dementia, or MCI is considered the 'symptomatic pre-dementia stage' of cognitive deterioration [69–71].

Quality appraisal of the included studies

Two independent reviewers (Author1 and 7) appraised the quality of the included studies and scored for the validity of the results. The quality of each study was evaluated using the Joanna Briggs Institute (JBI) quality appraisal criteria [10]. All the included studies were appraised for cross-sectional studies, using the JBI checklist, except one cohort study [68]. Thus, among the thirty-five studies, twenty-eight studies scored seven of eight questions, 87.5% (low risk), four studies scored six of eight questions, 75% (low risk), and the other three studies scored five of eight questions, 62.5% (low risk) (Supplemental File 2 -Table 2). Studies were considered low risk when they scored 50% or higher on the quality assessment indicators [10]. All 35 studies included in this review scored 5, 6, and 7 out of a total of 8 points. Thus, all studies included in the review were high quality. Moreover, the single cohort study conducted scored eight of ten questions out of 80%, indicating high-quality work.

Risk of bias assessment

The adopted assessment tool [72] was used to assess the risk of bias. It consists of 10 items that assess 4 areas of bias: internal validity and external validity. Items 1–4 evaluate selection bias, non-response bias, and external validity. Items 5–10 assess measurement bias, analysis-related bias, and internal validity. Accordingly, of the total 36 included studies, 16 studies scored 9 of 10 questions, and 20 studies scored 8 of 10 questions. A study was categorised as 'low risk' when 8 or more questions had a 'Yes'

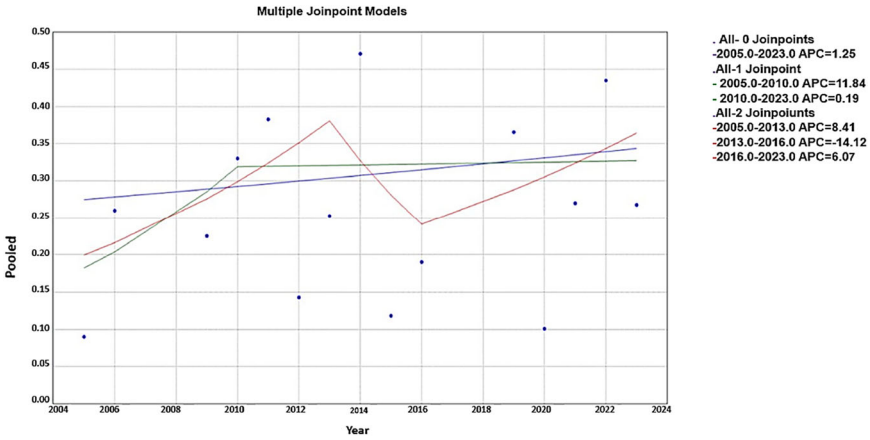


Fig. 2 Shows the trend of the magnitude of mild cognitive impairment among older populations in Africa from 2005–2023. This figure indicates the changes in the magnitude of mild cognitive impairment over the time period.

response, as 'moderate risk' when 6–7 questions had a 'Yes' response, and as 'high risk' when 5 or fewer questions had a 'Yes' response. Therefore, all included studies [73–88] had a low risk of bias (high quality) (Supplemental File 2 –Table 3).

Meta-analysis

Pooled magnitude of mild cognitive impairment. This meta-analysis included a total of 13,896 study participants from 36 studies. The magnitude of mild cognitive impairment among the older populations was obtained from thirty-five primary studies, whereas the data regarding the predictors of cognitive impairment were obtained from twenty of the included studies. The magnitude of cognitive impairment in the primary studies among the older populations in Africa ranged from 6.1 [45] to 69.8% [50] (Table 1) and the pooled magnitude of mild cognitive impairment in Africa was 29.39% (95%CI:24.73, 34.04, $I^2 = 98.05\%$ $P = 0.00$) (Fig. 3).

Publication bias. Both funnel plots and Egger's regression test were used to investigate publication bias. The results of funnel plots were asymmetrical, indicating the presence of publication bias among the included studies (Fig. 4a), and the p-value of Egger's regression test ($P = 0.00$) also revealed the presence of publication bias. To adjust for publication bias among the papers, Duval and Tweedie's nonparametric trim and fill analyses were performed. Thus, if the analysis included 11 more papers, publication bias would be managed (Fig. 4b).

Investigation of heterogeneity among studies. The percentage of I^2 statistics of the forest plot indicates a marked heterogeneity among the included studies ($I^2 = 98.05\%$, $P = 0.00$) (Fig. 3). Hence, sensitivity and subgroup analysis were performed to minimise the heterogeneity among studies.

Sensitivity analysis. We performed a sensitivity analysis to examine the impact of one specific study on the entire meta-analysis. "By systematically removing each study one at a time, we examined the robustness of the pooled estimates. Figure 5 illustrates that excluding any single study did not significantly alter the combined estimate, indicating the stability of our findings (Fig. 5).

Subgroup analysis. In this meta-analysis, we computed subgroup analysis based on the study Sub-region (geographical location), setting (institutional vs. community-based), publication year (< 2019 and $> = 2019$) and level of economic status.

By sub-region. In this review, the pooled magnitude of mild cognitive impairment among older populations was 22.13(95% CI:10.76, 33.51, $I^2 = 98.59\%$, $P = 0.00$), in Central Africa, 30.89(95% CI:18.42,43.36, $I^2 = 98.11\%$, $P = 0.00$) in Eastern Africa, 44.70(95% CI:33.82,55.58, $I^2 = 93.67\%$, $P = 0.00$) in North Africa, 25.64(95% CI:14.61,36.66, $I^2 = 97.17\%$, $P = 0.00$) in Southern, Africa and 22.71(95%CI:16.54,28.88 $I^2 = 97.25\%$, $P = 0.00$) in Western Africa, (Fig. 6).

By setting. This review revealed that studies conducted in the institutional setting had higher cognitive impairment 41.86% (95% CI, 33.09, 50.63, $I^2 = 96.15\%$, $p = 0.00$) compared with those studies conducted in the community setting 22.97% (95% CI, 18.41, 27.54, $I^2 = 97.60\%$, $p = 0.00$) (Fig. 7).

By publication year. The pooled prevalence of mild cognitive impairment among older populations in studies conducted before the year 2019 was lower 24.95% (95%CI:19.83, 30.07, $I^2 = 97.32\%$, $P = 0.00$), compared with the studies conducted in the year 2019 and later 34.47% (95% CI:26.11, 42.83 $I^2 = 98.39\%$, $P = 0.00$) (Fig. 8).

By level of income. The pooled prevalence of mild cognitive impairment among older populations in studies conducted in low income counties was 31.02(95%CI:18. 48, 43.56, $I^2 = 98.70\%$, $P = 0.00$), 29.43(95%CI:23.65, 35.20, $I^2 = 98.00\%$, $P = 0.00$) in low middle income and 25.64 (95%CI:14.61, 36.66, $I^2 = 97.17\%$, $P = 0.00$), in Upper middle income countries Fig. 9).

The subgroup analysis revealed that the heterogeneity of this study may be attributable to differences in sub-region, study setting, publication year and the level of economy of the primary studies.

Factors Associated with Mild Cognitive Impairment

In this review, ten studies [21, 24, 28, 31, 33, 38, 39, 48, 53, 68] reported a significant association between increased age and cognitive impairment among older populations. The pooled AOR of cognitive impairment and increased age was 1.56 (95% CI:1.36, 1.79; $I^2 = 95.20\%$; $P = 0.00$) (Fig. 10).

Being female was reported as a risk factor (AOR = 2.65, 95% CI:2.06, 3.400; $I^2 = 0.00\%$; $P = 0.92$) for a mild cognitive impairment among older populations in 8 studies [21, 24, 27, 28, 33, 38, 39, 50] (Fig. 11).

Twelve studies [21, 22, 24, 26, 27, 33, 38, 39, 50, 54, 68, 89] reported a significant association between participants who couldn't read and write and mild cognitive impairment among the older populations. The pooled AOR of mild cognitive impairment among the older populations and participants unable to read and write was 4.66 (95% CI:2.83, 7.67; $I^2 = 96.04\%$; $P = 0.00$) (Fig. 12).

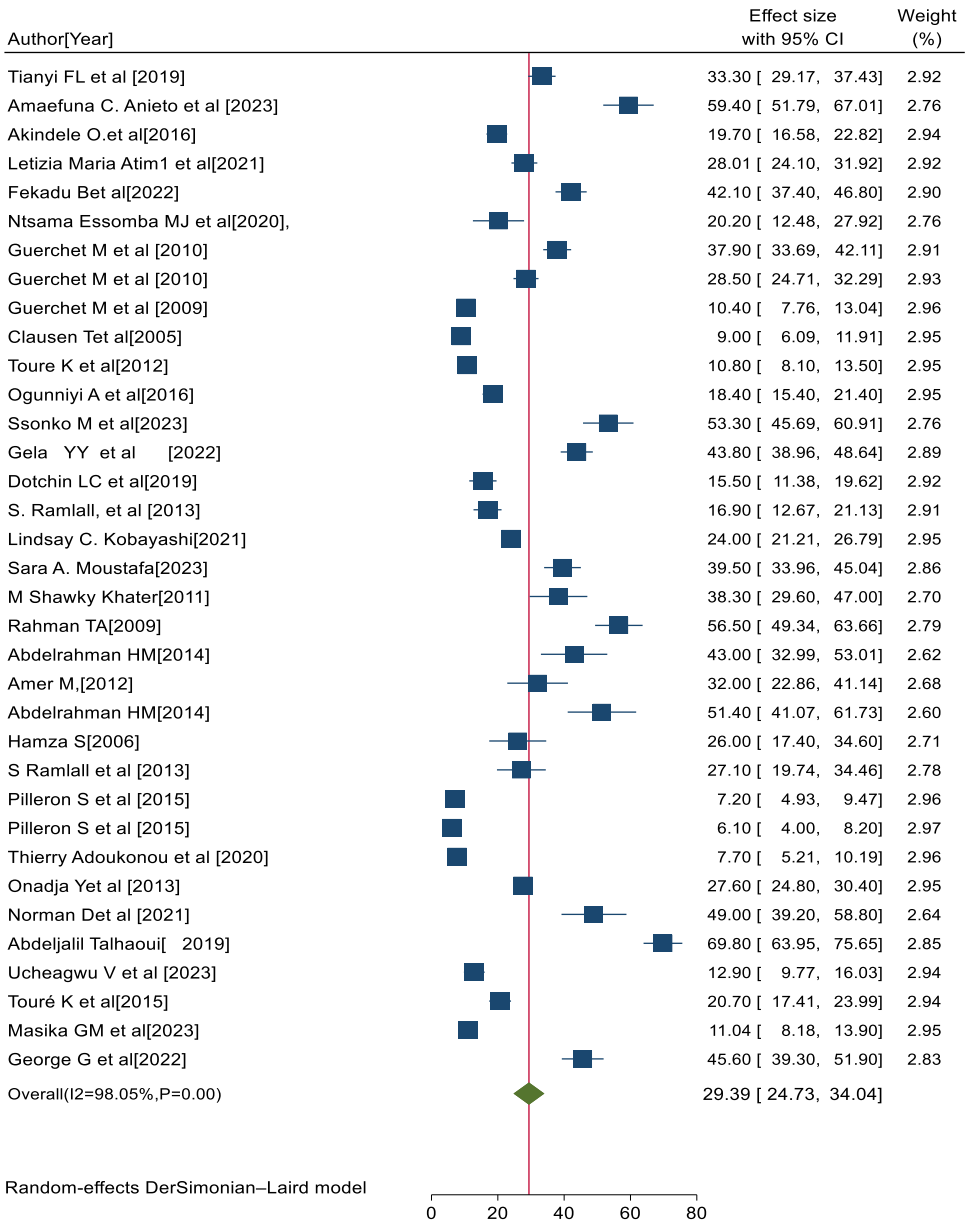


Fig. 3 Forest plot showing the pooled magnitude of mild cognitive impairment among the older populations in Africa in 2024. The plot presents individual study estimates with AOR and 95% confidence intervals and the pooled prevalence.

Three studies [21, 25, 27] showed a significant association between marital status and mild cognitive impairment among the aged population. The pooled AOR of mild cognitive impairment among the aged population and with no spouse was 4.27 (95% CI:1.06, 17.11; $I^2 = 94.00\%$; $P = 0.00$).

Two studies [21, 23] revealed a significant association between increased blood pressure and mild cognitive impairment among older populations. The pooled AOR of mild cognitive impairment and those with hypertension was 2.95(95% CI:1.67, 5.20, I^2=0.00%, $P = 0.85$).

Two studies [74, 75, 84] reported a significant association between participants who were severely dependent and mild cognitive impairment. The pooled AOR magnitude of mild cognitive impairment and severely dependent participants was 7.66(95% CI:3.74, 15.68, $I^2 = 0.00\%$, $p = 0.99$).

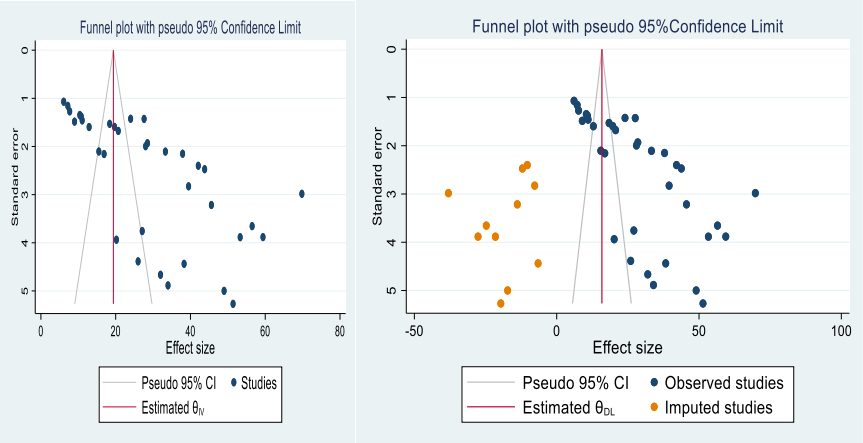
Two studies [73, 75, 80, 84] showed a significant association between participants who had high levels of alcohol use and mild cognitive impairment. The pooled AOR of the magnitude of mild cognitive impairment and alcohol abuse was 2.48 (95% CI:1.49, 4.09, $I^2 = 0.00\%$, $P = 0.67$).

Three studies [76, 77, 80] also showed significant associations between participants with depression and mild cognitive impairment. The pooled AOR of the magnitude of mild cognitive impairment and depression was 3.17(95% CI:2.14, 4.68, $I^2 = 0.00\%$, $P = 0.97$).

Two studies [76, 77] reported a significant association between participants with low income and mild cognitive impairment. The pooled AOR of the magnitude of mild cognitive impairment and respondents with low income was 3.21(95% CI:1.98, 5.19, $I^2 = 0.00\%$, $P = 0.43$).

Three studies [77, 80] reported a significant association between poor social support and mild cognitive impairment. The pooled AOR of the magnitude of mild cognitive impairment and poor social support was 2.41(95% CI:1.65, 3.51, $I^2 = 0.00\%$, $P = 0.43$).

Four studies [77, 80] reported a significant association between poor nutritional intake and mild cognitive impairment. The pooled



(a) (b)

Fig. 4 Funnel plot showing the publication bias before and after adjustment using trim and fill analysis for mild cognitive impairment among older population in Africa, 2024. a Asymmetry of studies around the pooled effect size, suggesting potential publication bias. **b** Adjusted plot after trim-and-fill analysis, where imputed studies are added to correct asymmetry, providing a more balanced estimate of the pooled magnitude.

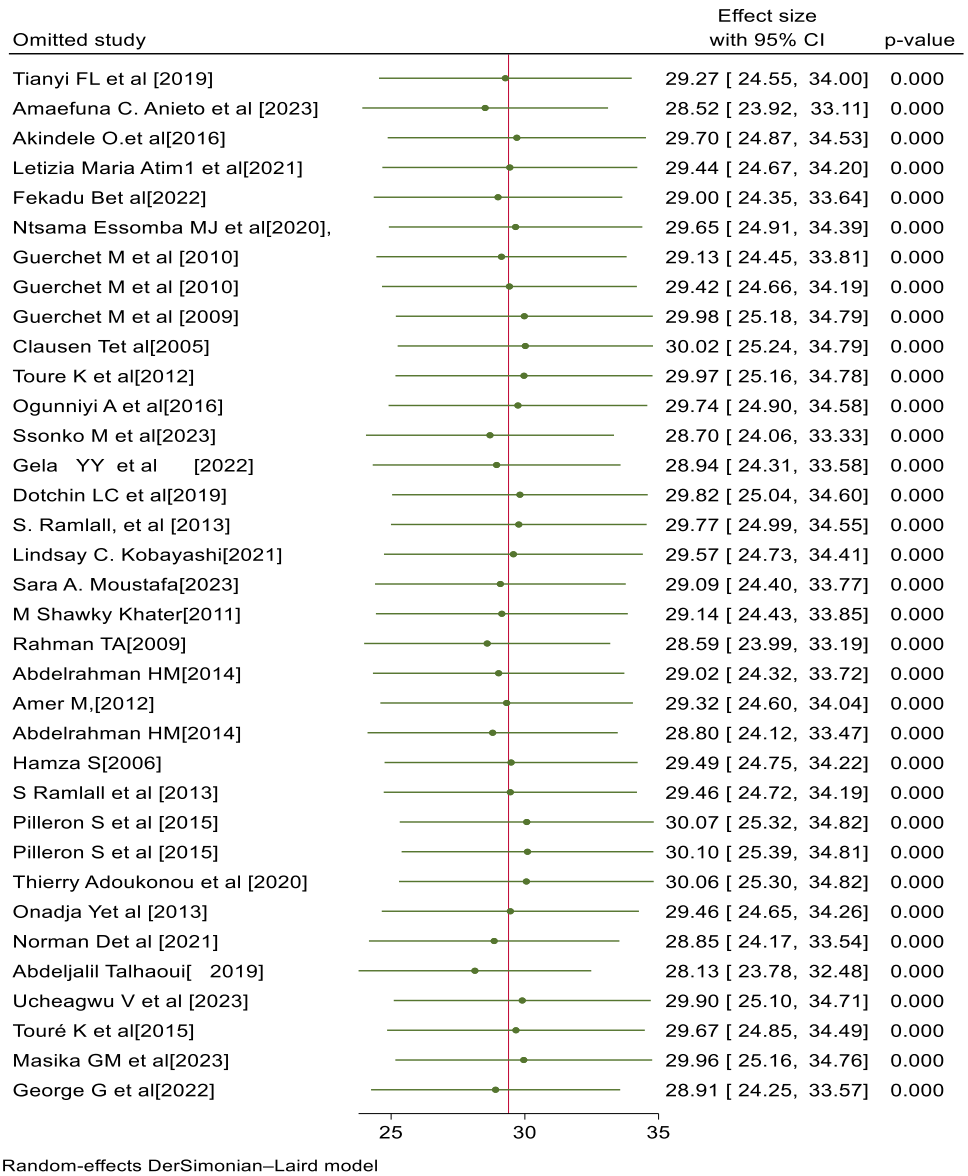


Fig. 5 Sensitivity analysis of mild cognitive impairment among the older population in Africa, 2024. The result indicates the stability of the pooled estimates by sequentially removing individual studies to assess their effect on the overall result.

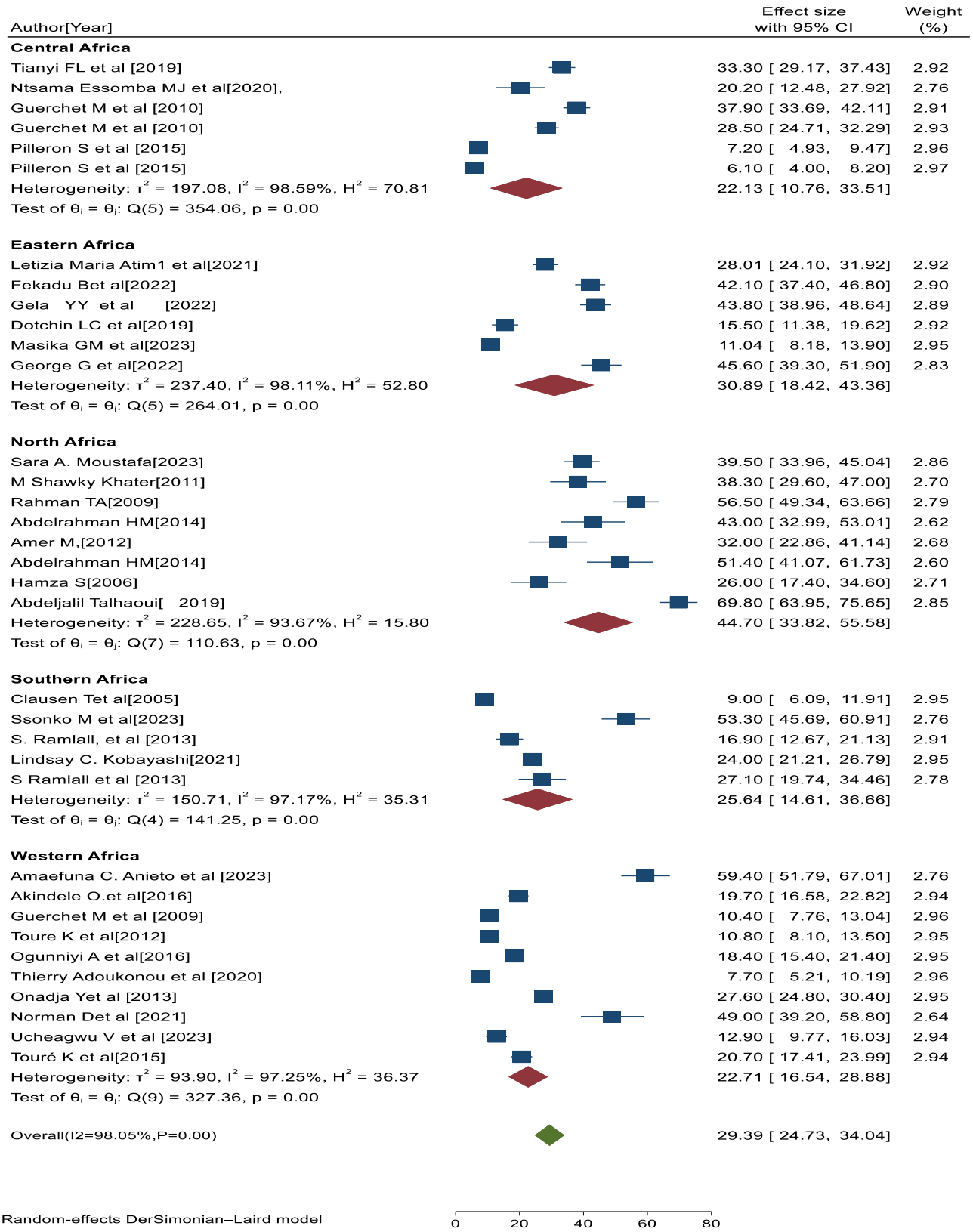


Fig. 6 Forest plot showing subgroup analysis of cognitive impairment by region in Africa, 2024. The plot presents regional subgroup estimates with confidence intervals, highlighting variations in prevalence across regions.

AOR of the magnitude of mild cognitive impairment and poor nutritional intake was 2.77(95% CI:1.83, 4.19, $I^2 = 0.00\%$, $P = 0.75$).

Therefore, with advancing age, the likelihood of mild cognitive impairment was 1.56 times higher compared with their younger age. Female populations were 2.65 times more likely to be cognitively impaired compared with male participants. Participants who could not read and write had 4.66 times mild cognitive impairment compared with those respondents who were

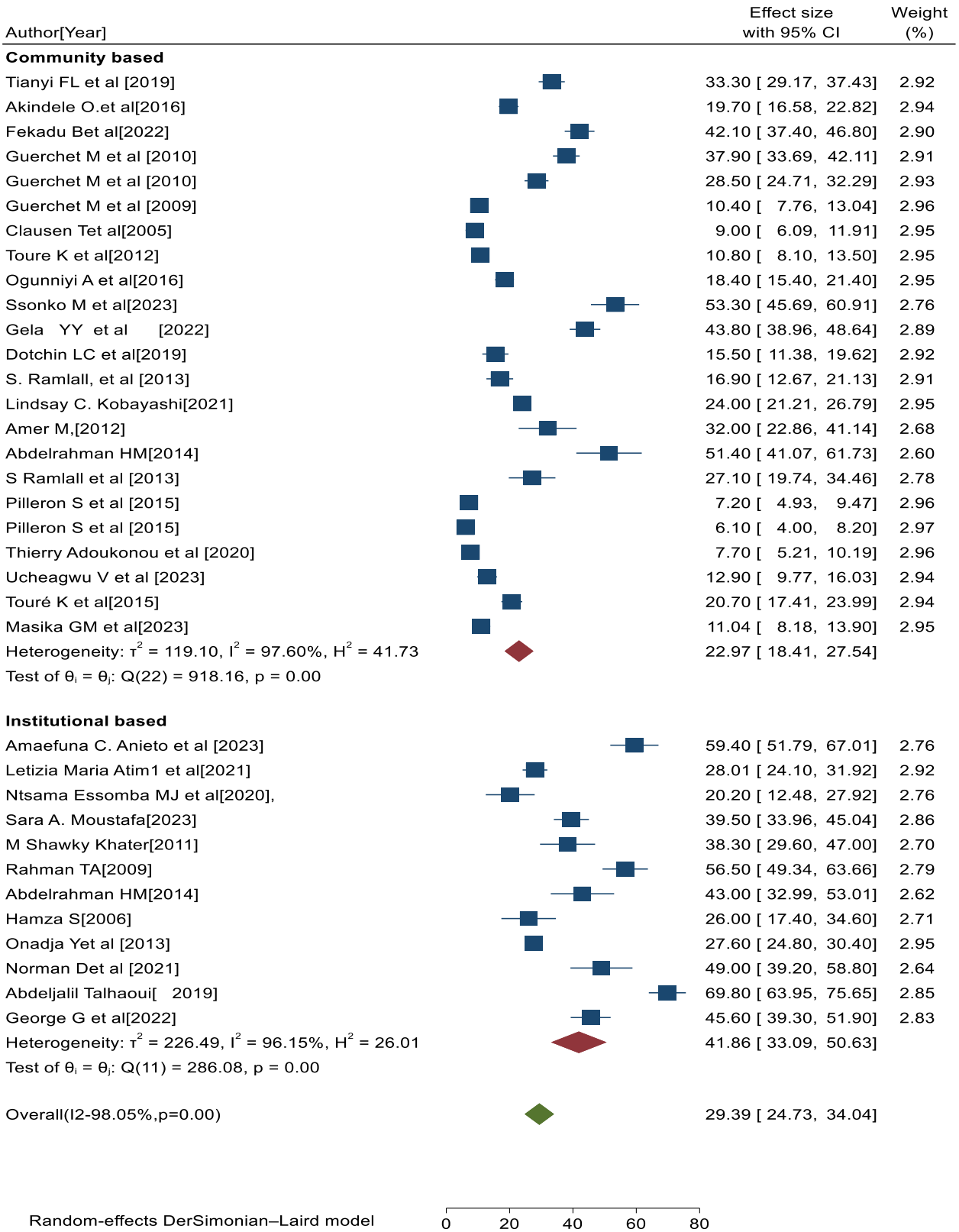


Fig. 7 Forest plot showing the subgroup analysis of cognitive impairment by study setting in Africa, 2024. The plot indicated pooled prevalence estimates with confidence intervals for different study settings, highlighting variations in cognitive impairment across settings.

educated. Likewise, participants with no spouse (never married, widowed, and separated) had 4.27 times poorer cognitive scores as compared with those participants who were married. The risk of having mild cognitive impairment was 2.95 times more likely among hypertensive participants compared with those respondents who were not hypertensive.

Similarly, severely dependent participants were 7.66 times more likely to develop mild cognitive impairment compared with those

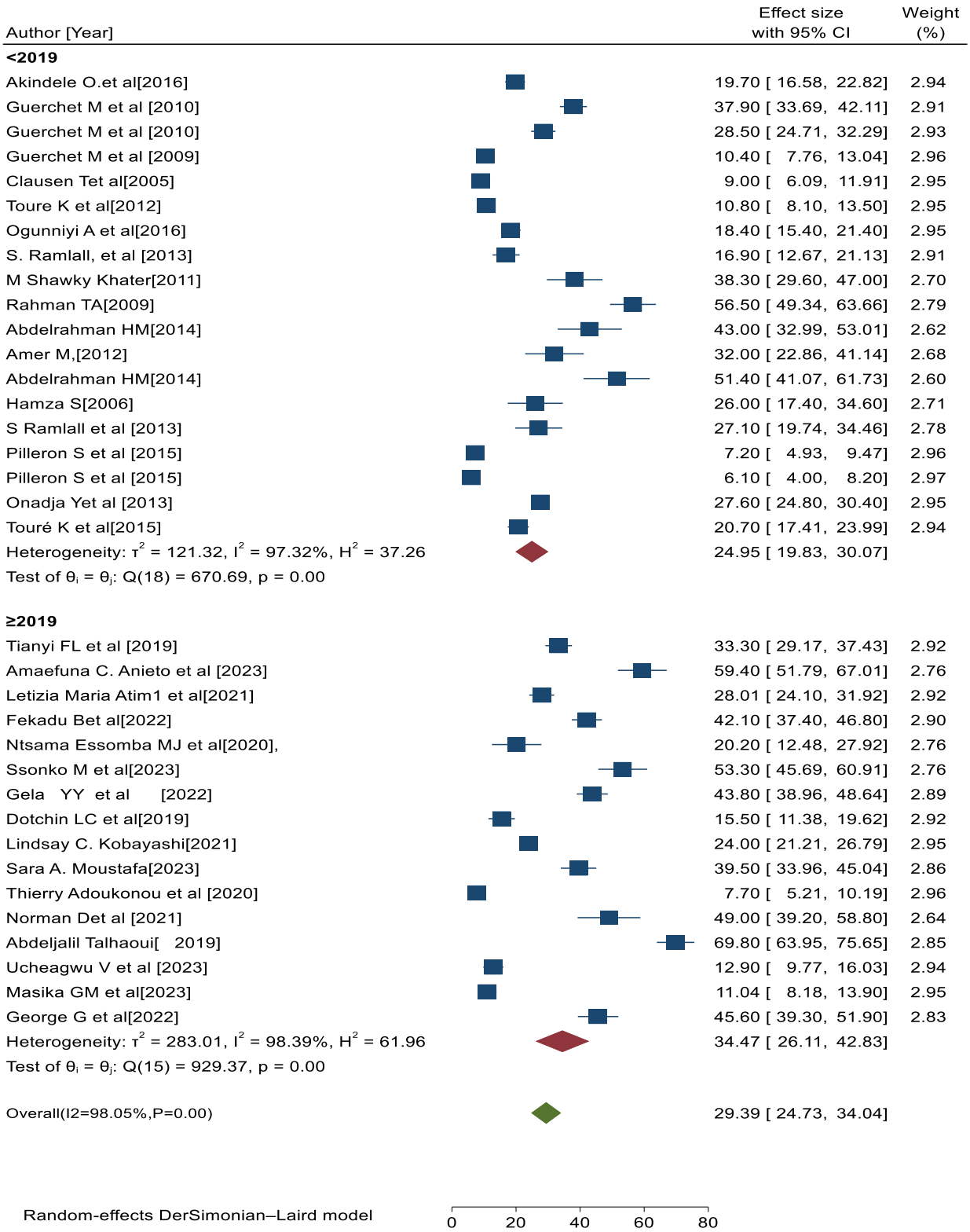


Fig. 8 Forest plot showing subgroup analysis of current evidence of cognitive impairment among the older populations by publication year in Africa, 2024. The plot presents pooled prevalence estimates across different periods, illustrating temporal variations in mild cognitive impairment.

respondents who led independent living. The likelihood of developing cognitive impairment was 2.48 times more likely among respondents who with high levels of alcohol intake compared with those participants who did not have such a problem. Mild cognitive impairment was 3.17 times more likely in participants with depression compared with those participants with no depression.

Participants with low income were affected by mild cognitive impairment 3.21 times compared with those participants with better income. Furthermore, participants with poor social support

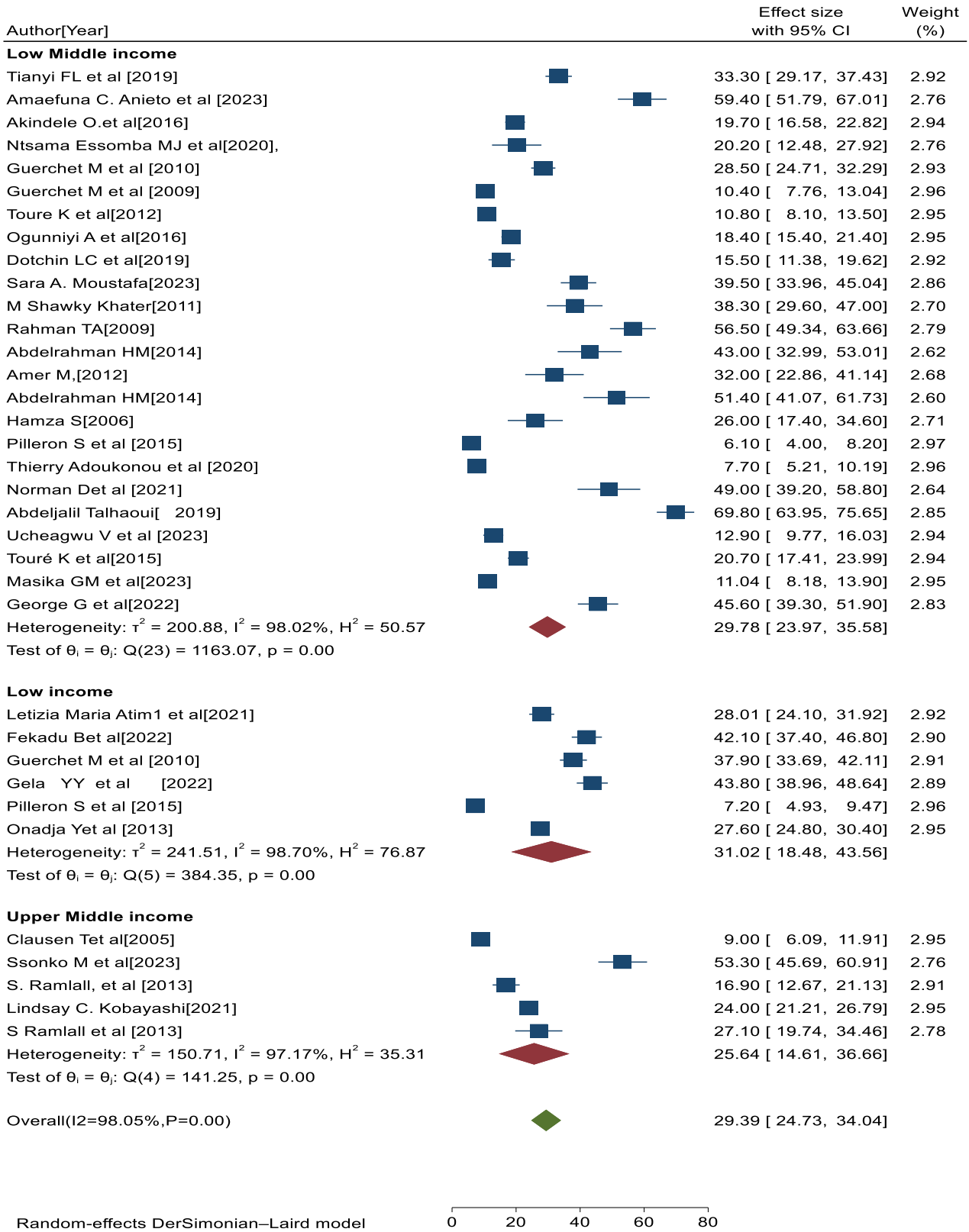


Fig. 9 Forest plot showing subgroup analysis of current evidence of cognitive impairment among the older populations by level of income in Africa, 2024. The plot presents pooled prevalence estimates across different income groups, highlighting variations in cognitive impairment by economic status.

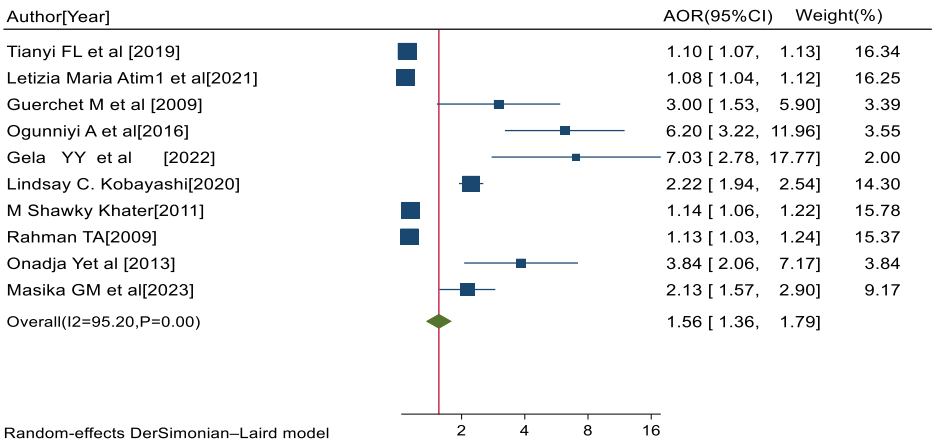


Fig. 10 Forest plot of the adjusted odds ratios with corresponding 95% CI of studies on the association of mild cognitive impairment and increased age. The midpoint and the length of each segment indicated an AOR and a 95% CI, and the diamond shape showed the combined AOR of all studies.

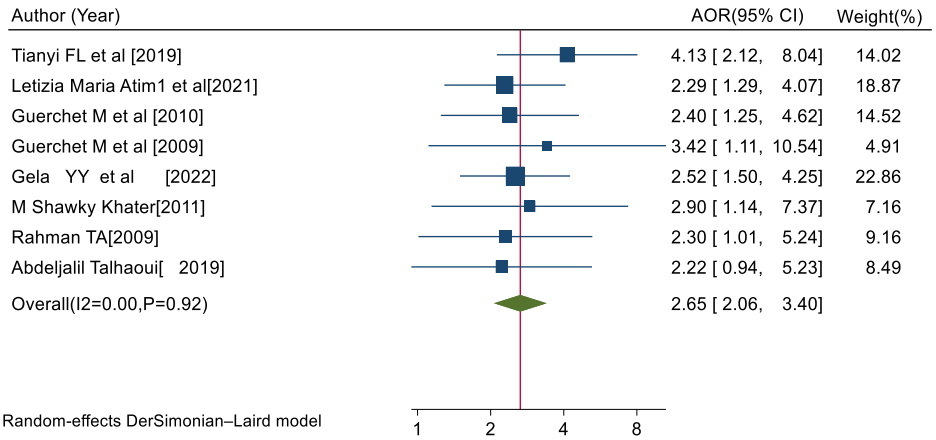


Fig. 11 Forest plot of the adjusted odds ratios with corresponding 95% CIs of studies on the association of mild cognitive impairment and female respondents. The midpoint and the length of each segment indicated an AOR and a 95% CI, and the diamond shape showed the combined AOR of all studies.

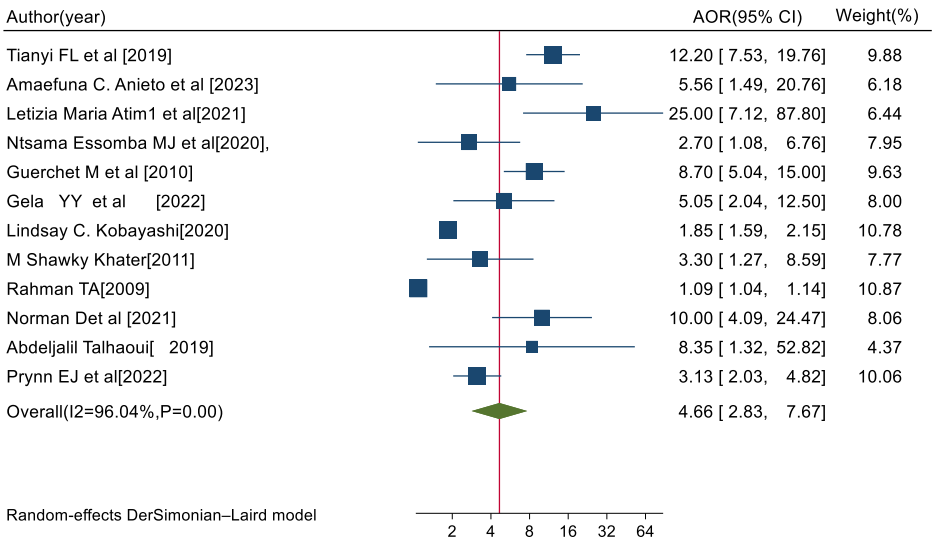


Fig. 12 Forest plot of the AOR with corresponding 95% CIs of studies on the association of mild cognitive impairment and respondents who couldn't read and write. The midpoint and the length of each segment indicated an AOR and a 95% CI, and the diamond shape showed the combined AOR of all studies.

and poor nutritional intake were 2.41 and 2.77 times more likely to develop cognitive impairment compared with their counterparts respectively.

DISCUSSION

We conducted the first systematic review and meta-analysis aimed to show the magnitude of mild cognitive impairment and its predictors among older populations in Africa.

A total of 2.715 papers were found, of which 36 studies had adequate data to be included in the systematic review and meta-analysis. In this review, a total of 13,896 older people were included. The publication year of the included studies ranged from 2005–2023, with the sample sizes ranging from 90 [42] to 981 [48]. All the included studies (N = 35) were conducted using a cross-sectional study design except one study, which was carried out using a cohort study design (N = 1). Regarding geographical region, seven studies [24, 25, 33, 34, 46, 53, 54] were conducted in Eastern Africa, six studies [21, 26, 27, 45] in Central Africa, eight studies [37–43, 50] in Northern Africa, five studies [29, 32, 35, 44, 68] in Southern Africa and ten studies [22, 23, 28, 30, 31, 47–49, 51, 52] in Western Africa. The majority (n = 24, 66.67%) of the included studies were community-based [21, 23, 25, 27–35, 41, 42, 44, 45, 47, 51–54, 68], whereas the remaining was institutional-based [22, 24, 26, 37–40, 43, 46, 48–50]. The pooled magnitude of mild cognitive impairment among the studies conducted before 2019 was 24.95%, whereas it was 34.47% in those conducted in 2019 and later. The magnitude of mild cognitive impairment ranged from 7.2–43.8% in low-income countries [24, 25, 27, 33, 45], 6.1–69.8% in low-middle-income countries [21–23, 26–28, 30, 31, 34, 37–43, 45–47, 49–53] and 9–53.3% in upper-middle income [29, 32, 35, 44, 68]. The pooled prevalence of mild cognitive impairment showed significant fluctuation with time which were 9% in 2005, 26% in 2006, 22.6% in 2009, 33.0% in 2010, 38.3% in 2011, 14.3% in 2012, 25.3% in 2013, 47.1% in 2014, 11.8% in 2015, 19.0% in 2016, 36.6% in 2019, 10.1% in 2020, 27.0% in 2021, 43.5% in 2022, and 26.8% in 2023. The magnitude of MCI showed a significant increase from 9% in 2005–38.3% in 2011, indicating the growing awareness, an increase in the problems, and possibly better diagnosis of MCI. There was also a fluctuation of MCI between 2012 and 2016, showing a notable drop to 14.29% in 2012, followed by a fluctuation over the next few years. The prevalence increased again to 36.57% by 2019, suggesting variability in the magnitude of MCI, reporting or changing screening or diagnostic criteria. The highest magnitude of MCI was recorded in 2014 at 47.11%. After 2014, the prevalence of MCI dropped significantly to 10.09% in 2020, indicating potential methodological issues, such as the tools used. Most recently, between 2021 and 2023, there was a trend of increasing prevalence again, reaching 43.53% in 2022 before dropping to 26.78% in 2023. This variability may reflect changes in health policy, access to healthcare, changes in the aging population or socio-economic factors impacting the screening or diagnosis of MCI.

The magnitude of MCI in Africa was 26% in 2006, which was lower than the study conducted in France, 35% [90], in the same year. By 2010, the prevalence in Africa rose to 33%, surpassing the 12.1% found in a German study [91] yet lower than the 35.17% observed in a study from Western Pennsylvania, USA [92]. In 2011, the MCI prevalence in Africa increased to 38%, although this was lower than the 42% reported in another study in Pennsylvania, USA [93]. In 2012, the prevalence in Africa declined to 14.3%, which was relatively higher than the 12.1% noted in Malaysia [94] during the same year. However, the prevalence of MCI in Africa rose again in 2013–25.3%, exceeding the 15.7% documented in China [95].

The prevalence of MCI in Africa sharply increased to 47.1% in 2014 compared with the previous year, although it fell to 11.8% in 2015, which was lower than the 20.1% reported in China [96], but comparable to the 12.8% found in an Italian study [97]. In 2016, the prevalence in Africa was 19.0%, higher than the 9.6% reported in Spain [98]. This trend continued, with MCI prevalence rising to 36.6% in 2019, exceeding the 14.89% observed in India [99] and the 9.8% from the US study [100] during the same period. However, in 2020, the prevalence in Africa sharply declined to 10.1%, which was lower than the rates reported in studies from India (31.3%) [101], Jordan 87.4% [102], US 67% [103], and China 17.1% [104]. In 2021, the prevalence of MCI in Africa increased to 27.5%, which was lower than the 30% reported in India [105] but similar to the 27.9% reported in Bangladesh [106]. However, it was higher than the 13.7% found in another Indian study [107], and the 25.1% reported in Taiwan [108].

The prevalence of MCI in Africa further increased to 43.5% in 2022, surpassing the findings from studies in Mexico (34%) [109], India (14%)[110], and two other Chinese studies, 22.24% [111], and 23.16% [112]. In 2023, the prevalence in Africa was recorded at 26.8%, which remained higher than the 24.9% from China [113] and the 16% from India [114]. These findings highlight the challenges in comparing trends of mild cognitive impairment over time, likely due to the complex interplay of factors such as age, genetics, education, socioeconomic status, vascular health conditions, lifestyle, and mental health issues. Furthermore, methodological variations, including differences in screening and diagnostic tools used to assess MCI, contribute to regional discrepancies and variability within the same population.

The findings of this meta-analysis found that the overall pooled magnitude of mild cognitive impairment in Africa was 29.39% (95% CI:24.73, 34.04, $I^2 = 98.05\%$ $P = 0.00$), which was in line with research conducted in Shanghai, China 30% [115], Puducherry, India 30% [105] and another Indian study, 31.3% [101].

However, the findings of this study were lower than the studies conducted in France, 35% [90], Jordan 87.4% [102], Mexico 34% [109], Pennsylvania US 42% [93], US western Pennsylvania 35.17% [92] and another US study 67% [103].

On the other hand, the current finding was higher than the research conducted in Bangladesh, 27.9% [106], the studies conducted in various regions of China 20.1% [96], (18.8%) [116], 17.1%) [104], 22.24% [111], 23.16% [112], 15.7% [95], 24.9% [113], the studies carried out in German 12.1% [91], Greece 15.3% [117], Indian studies 13.7% [107], 14.89% [99], 14% [110], 16% [114],8.4% [118], Malaysia 21.1% [94], South Korea 14.4% [119], Spanish 9.6% [98], Taiwan 25.1% [108], Hispanics/Latinos, US 9.8% [100], and Italian studies 21.6% [120], 12.8% [97]. These discrepancies could be related to socio-demographic disparities among study participants, the tool used to assess cognitive impairment, changes in methodology, sample size, or cultural differences.

More specifically, the findings of this study revealed that advanced age positively affects the development of mild cognitive impairment, which was supported by the studies conducted in Bangladesh [106], China [96, 112, 113, 116, 121], Italy [97], Jordan [102], Mexico [109], Pennsylvania US [93], and India [110, 114, 118]. This may be that synaptic loss is a distinguishing aspect of natural aging. Attention, memory, executive cognitive function, language, and visuospatial ability all suffer demonstrable losses with aging. According to research, the ability to process new information and make quick decisions declines with aging[122].

In this review, female respondents were found to be more affected by mild cognitive impairment compared with their male counterparts. This evidence has been supported by the studies carried out in China [96, 104, 113, 121], and the studies carried out in India [105, 110, 118]. The explanation could be based on social, biological, and genetic factors. Studies investigated sex variations in a harmful protein called tau, which spreads like an infection throughout the brain. In this scenario, tau moves more easily from one brain area to another in women than in males [123]. It has also been generally observed that women have a higher rate of cognitive impairment than men [124], possibly due to their longer life expectancy [125]. Moreover, this could be due to the fall in

estrogen, progesterone, and testosterone hormone levels in women throughout menopause. These hormones protect the brain, and they diminish the level of amyloid beta peptide, which negatively affects the hippocampus [21, 126].

The magnitude of cognitive impairment was higher among participants with no spouse compared with those with a spouse. This was in agreement with the China studies [111, 116, 121], Belagavi Taluka India [110], Puducherry India [105], and Belagavi India [118]. The loss of a spouse is indeed a stressful life event that has a detrimental impact on individual well-being, including mental and physical health, contributing to the development of cognitive impairment [127, 128].

Moreover, participants who couldn't read and write scored lower in cognitive tests which was supported by studies conducted in Mexico [109], Taiwan [108], China [112, 116, 121], and Indian studies [105, 110, 114, 118]. Cognitive impairment is influenced by educational attainment. Individuals with a low education level may have a lack of information about being treated in modern health facilities, as well as challenges in obtaining healthcare resources, which leads to delays in seeking help. There is an unacceptably high rate of false positive diagnoses among educated populations, resulting from cognitive tests with high verbal and intellectual demands that lack adequate sensitivity [129]. Both contribute to low scores in neurocognitive testing.

Participants with poor social support networks were more likely to develop cognitive impairment which was supported by Bangladesh study [106], China Studies [116, 130], Belagavi India [118], and Shanghai China [115]. According to growing data, physical activity may serve as a link between social support and cognitive function. The data indicate that social support has a positive influence on physical activity levels in older people. Social support can have an impact on physical exercise through encouragement, emotional affirmation, or financial assistance, as well as the sharing of useful knowledge [131]. Furthermore, it is theorized that poor social support linked with stress causes corticosterone hyper-secretion, which leads to the permanent death of hippocampus neurons [132].

Individuals who were hypertensive experienced more cognitive impairment than those with normal blood pressure. This finding was also supported by China [95], and Mexico [109] studies. Hypertension induces pathological changes in cerebral microvessels that affect the micro-vascular structure, network architecture, and function, as well as contribute to the development of cerebral micro-hemorrhages, lacunar infarctions, and white matter injury, all of which are related to cognitive decline [133].

Additionally, this review showed that cognitive impairment was higher among depressed individuals compared with non-depressed individuals. This was also supported by the studies carried out in China [111], Indian studies [107, 114], Jordan [102], Mexico [109], Spanish [98], and Taiwan [108]. Cognitive impairment is one of the most noticeable features of serious depressive disorders [134].

In this study, we found that severely dependent respondents develop cognitive impairment compared with those respondents who lead independent lives. This was in agreement with the study conducted in Bangladesh [106]. It has been hypothesised that enhancing physical function has a direct positive impact on quality of life and cognitive performance [135].. Studies have shown positive links between physical and cognitive function in older populations [136]. Aerobic exercise combined with strength training enhanced physical function and balance, resulting in better quality of life and cognitive performance in older people with MCI [137]..

Individuals who consume alcohol score higher in cognitive impairment compared with those who do not use alcohol. This has been supported by the China study [116]. High levels of alcohol intake may cause biological alterations in the frontal brain region responsible for cognition and inhibitory control [138]. The brain is extremely prone to alcohol's neurotoxic effects, and prolonged alcohol consumption can induce brain damage that leads to cognitive impairments [139]. Alcohol's neurotoxic effects that produce cognitive deficiencies may be mediated directly by damage to brain structures or indirectly through malnutrition, metabolite toxicity, electrolyte imbalance, or associated medical disorders such as liver disease and infection [140].

Similarly, populations with lower incomes scored lower on cognitive tests than those with higher incomes. This was consistent with findings from Indian studies [114, 118], and Shanghai, China [115]. This could make it harder for those individuals with poor incomes to afford healthcare services.

Furthermore, participants with poor nutritional intake exhibited worse cognitive impairment than those with adequate nutritional intake. This was in agreement with the previous study [141] Nutrition is a significant lifestyle element that can influence the likelihood of future cognitive impairments. Specific nutrients (e.g., folate, flavonoids, vitamin D, and specific fats) or food groups (e.g., seafood, vegetables, and fruits) have been linked to better cognitive results in older adults. Also, some studies have revealed that antioxidant minerals, including Vitamin A, β-carotene, Vitamin C, and Vitamin E, can help prevent certain types of nerve damage. The cognitive function of older individuals was found to be positively associated with vitamin C, vitamin E, and β-carotene intake [142, 143].

Strengths and limitations of the study

This review has several positive qualities. A thorough search approach was used. Three authors were involved in the quality assessment. This review is also the first of its kind to show the pooled evidence of multiple studies conducted in Africa, which strengthens the body of knowledge regarding the current evidence of the magnitude of mild cognitive impairment among older populations and its predictors.

This study is significantly better than the primary studies since it includes a larger number of study participants (n = 13,896) from thirty-six studies. Moreover, all the studies included in the review had good quality.

Despite its strength, this review has limitations that should be considered before interpreting the results.

Almost all the included studies were cross-sectional. This review included some papers with small sample sizes, which may have an impact on the conclusions. Our search method was limited to articles published in English, resulting in the exclusion of some relevant studies. Since the magnitude of mild cognitive impairment was measured using different tools in each of the primary studies, pooling the outcomes may affect the ability to generalise the findings to the entire older population in Africa.

CONCLUSIONS

This review revealed that nearly one out of every 3 older population in Africa is cognitively impaired. This is associated with advanced age, female respondents, loss of a spouse, lack of formal education, hypertension, severe dependence, high levels of alcohol intake, depression, low income, poor social support, and poor nutritional intake.

Therefore, regular screening of older individuals for their cognitive status is encouraged. Likewise, older populations should be examined for their blood pressure, depression, and nutritional intake to design effective prevention and treatment strategies, which in turn delay the onset of cognitive impairment. Special emphasis should also be given to those populations with advanced age, who are female, who have lost a spouse, and who have poor social support. Moreover, the health sector should implement initiatives to give free health care to older populations

with low income, and a support group is also required for individuals with poor social support. This would inform evidence-based policy to decrease the health and social burdens of cognitive impairment in the aging population. All these things help to prevent the development of cognitive impairment and its progression into dementia.

Research implications

Researchers should focus on studying indicators of future cognitive impairment development among normal older populations.

Policy implications

This research will help policymakers and healthcare planners to develop prevention strategies and increase the older population's health-seeking behavior for early cognitive screening. It is recommended that older adults' health promotion policies be integrated into routine clinical and community health care.

DATA AVAILABILITY

All the data and supplementary materials were included in the manuscript.

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AUTHOR CONTRIBUTIONS

SA and VT have generated the idea for this review. SA, TM, GW, and DG contributed to data collection and statistical analysis. SA wrote the first draft of this manuscript. VT, JN, ASK, SA, TM, GW, and DG revised the manuscript. All authors took responsibility for the accuracy of the analysis and the contents of the review. Finally, all authors read and approved the final version of the manuscript.

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