

SYSTEMATIC REVIEW

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# Functional disability in basic and instrumental activities of daily living among older adults globally: a systematic review and meta-analysis

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## Abstract

**Introduction** Functional disability in older adults refers to difficulties in performing daily activities. It is usually evaluated based on an individual's ability to carry out basic activities of daily living and instrumental activities of daily living. Although existing studies provide valuable insights, comprehensive global data on functional disability in basic and instrumental activities of daily living among older adults remain limited. This study aims to review existing research worldwide to estimate the overall pooled prevalence of functional disability in these areas.

**Methods** Systematic searches were conducted across EMBASE, Scopus, PubMed/MEDLINE, and Google Scholar from May 5 to July 11, 2024. Cross-sectional studies worldwide on functional disability in basic and instrumental activities of daily living among adults aged 60 and older, published in English up to July 11, 2024 were included. Studies were excluded if they did not report the outcomes of interest, were inaccessible, case reports, low quality, review articles, or published in languages other than English. Data extraction and cleaning were performed using Microsoft Excel, and STATA version 17 was used to compute the pooled effect size with 95% confidence intervals (CIs) for functional disability in both basic activities of daily living and instrumental activities of daily living among older adults. To derive these estimates, we used weighted averages, where each study's prevalence was weighted by the inverse of its variance. Study heterogeneity was assessed using the Cochrane  $I^2$  statistic and its associated p-value. Subgroup analysis and meta-regression were conducted to identify sources of heterogeneity. Sensitivity analysis was used to evaluate the impact of individual studies on the overall results. Publication bias was assessed with Egger's test and funnel plots, and was addressed through trim-and-fill analysis.

**Results** This review includes 35 studies with a total of 133,827 participants. The pooled prevalence of functional disability in basic activities of daily living was estimated at 26.07% (95% CI: 19.04–32.74), while on instrumental activities of daily living, it was estimated at 45.15% (95% CI: 36.02–54.29). After applying the trim-and-fill method, the adjusted overall prevalence of disability in basic activities of daily living was 15.12%, (a 95% CI: 11.25–19.13%).

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Subgroup analysis showed highest prevalence in Africa (BADL: 42.91%, IADL: 69.34%) and lowest in Asia (BADL: 19.15%, IADL: 32.66%). Participants aged 65 and above, those in institutional settings, and studies with smaller sample sizes tended to report higher levels of functional disability.

**Conclusions** Nearly one-fourth of the study participants had functional disability related to basic activities of daily living, while about half experienced disability in instrumental activities of daily living. This emphasizes the need for continued effort in improving the quality of life and support systems for individuals facing functional disability, particularly in instrumental activities.

**Keywords** Basic activities of daily living, Functional disability, Instrumental activities of daily living, Older adults

## Introduction

In 2020, around 1 billion people worldwide were aged 60 and over, highlighting the global increase in life expectancy. By 2030, this number is projected to increase to 1.4 billion, and by 2050, the global population of people aged 60 years and older is expected to double to 2.1 billion [1].

With the shift in disease burden from communicable, maternal, neonatal, and nutritional (CMNNs) to non-communicable diseases (NCDs), and from years of life lost (YLLs) to years lived with disability (YLDs), life expectancy is increasing, but more years are being spent in poor health [2]. Thus, the global rise in life expectancy, coupled with an increasing elderly population, is leading to a higher prevalence of functional disability (FD) worldwide [3].

FD in older adults refers to limitations in carrying out everyday activities due to physical, cognitive, or sensory impairments. This is typically assessed based on an individual's ability to perform basic activities of daily living (ADLs), such as dressing, walking, bathing, and instrumental activities of daily living (IADLs), which include tasks like meal preparation, grocery shopping, and managing medications [4].

Its onset is a dynamic and progressive process which is systematically earlier for older adults with major NCDs and their disability progression is compressed within a shorter timeframe than older adults without major NCDs [5].

In addition to impairing older people's autonomy, impaired FD reduces their quality of life, increases their vulnerability and dependence, and increases their risk of developing geriatric conditions such as dementia, depression, incontinence, vertigo, falls, spontaneous bone fractures, and failure to thrive. It also has wider effects on the family, community, and health system [6]. Additionally, it raises mortality risk and increases hospitalization rates and related costs [7].

Various factors contribute to functional disability in activities of daily living (ADL) and instrumental activities of daily living among older adults. These factors include being aged 80 years and above [6, 8], female gender, illiteracy, living with a small number of family members

[8], lower income status, multi-morbidity, depression, reduced physical activity level [6], possible malnutrition, and chronic disease, falls, alcohol consumption, frailty syndrome, and multigenerational family arrangements and hospitalizations [9].

Various primary studies worldwide have reported a high prevalence of FD among older adults, which has negative consequences such as increased mortality risk, hospitalization, reduced quality of life, and susceptibility to geriatric conditions. For instance, a systematic review and meta-analysis conducted in ASEAN region showed that the pooled prevalence of ADL disability was 21.5% [10]. A systematic review and meta-analysis on functional disability among cancer patients found that 36.7% of patients reported disability related to basic activities of daily living (ADLs), while 54.6% reported disability related to instrumental ADLs [11].

These findings have significant public health implications, informing policies and strategies to improve health monitoring for older adults. Additionally, policymakers can utilize these findings to allocate resources and plan effective care provisions, supporting healthy aging and delaying the onset of functional disabilities.

Although numerous primary studies have investigated functional disability among older adults [12–14], their findings are often constrained by regional disparities, small sample sizes, and inconsistent use of measurement tools, population characteristics, socioeconomic conditions, and cultural practices. Additionally, previous reviews have generally exhibited inconsistent and wide variations. They also lack global representation, making it difficult to draw generalizable conclusions. To address these gaps, this systematic review and meta-analysis aims to estimate the global pooled prevalence of functional disability in basic and instrumental ADLs among older adults.

## Methods and materials

### Protocol and registration

The methods reporting for this systematic review were developed according to recommendations from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements [15]. The protocol has

been registered in the International Prospective Register of Systematic Reviews (PROSPERO) and given ID no. CRD42024569235.

### Research/review question

The review questions for this study are:

What is the global pooled prevalence of functional disability in basic activities of daily living among older adults?

What is the global pooled prevalence of functional disability in instrumental activities of daily living among older adults?

### Coco Pop + study design

*Condition = Assessing the functional disability in basic and instrumental ADL.*

*Context = Global context.*

*Population = Older adults.*

**Study design** All observational studies.

### Eligibility criteria

#### Inclusion criteria

All studies reporting functional disability in basic activities of daily living and/ or instrumental activities of daily living among older adults were included if they met the following criteria:

**Study design** All cross-sectional studies were included.

**Study setting** All literatures reporting the outcome variables (BADL and/or IADL) around the world were included.

**Study participants** Studies involving adult populations aged 60 years and older were included.

**Publication status and language** All published studies, abstracts reporting outcomes, and other essential findings were included. Gray literature in English was also included.

**Date published** All studies published up to the search date of July 11, 2024, were included.

#### Exclusion criteria

Studies that did not report the outcome of interest, were not fully available even after two email requests to the first author, were case reports, studies with less than 7 quality score, were published in languages other than English, or were review articles were excluded.

### Databases and search strategy

A systematic search was conducted by five authors (BTA, MG, AG, TTT, and DGB) to identify all relevant literature reporting functional disabilities in basic activities of daily living (BADL) and instrumental activities of daily living (IADL) among older adults. The search was carried out across multiple electronic databases, including EMBASE, Scopus, PubMed/MEDLINE, and Google Scholar. In addition, both published and unpublished (grey literature) sources were considered to maximize the comprehensiveness of the review. All articles published up to the final search date, July 11, 2024, that met the predefined inclusion criteria were eligible for inclusion. The search period extended from May 5, 2024, to July 11, 2024.

To ensure systematic organization and the removal of duplicates, all retrieved records were imported into End-Note Reference Management Software (Version 8, Thomson Reuters, Stamford, CT, USA).

The search strategy was built using both free-text terms and database-specific indexing (e.g., MeSH terms in PubMed where applicable), and adapted accordingly for each database's syntax. A combination of core concepts and synonymous keywords was used to increase search sensitivity.

Key terms used in the search were “basic activities of daily living,” “instrumental activities of disability,” “functional limitation,” “functional dependence,” “BADL,” “ADL,” and, “IADL” “older adults” “elders” and “world-wide”. Boolean operators “AND” and “OR” were used to combine the searching terms (Table 1).

### Selection of articles

The study selection process was carried out in two phases. In the first phase, titles and abstracts were reviewed, and duplicate articles were identified and excluded. In the second phase, the titles and abstracts of articles deemed eligible were further assessed, followed by a full-text review of the selected studies.

Both phases were carried out by three researchers (BTA, AG, and MG), who were trained on the eligibility criteria and responsible for reviewing and extracting the relevant data. A third assessor (WMK) was designated to address any issues or discrepancies that arose during the study selection process.

### Data extraction

Three authors (BTA, MG, &AG) retrieved data from the included studies using a standardized extraction procedure recorded in a Microsoft Excel sheet. Each author independently evaluated the relevance of each study based on title and abstract using predetermined inclusion criteria. The eligibility of the articles for final analysis was assessed by all authors through a critical review of the full

**Table 1** Searches on different databases for functional disability in basic and instrumental activities daily living among older adults in the world, 2024

Databases	Searching terms	Number of studies	Date completion
MEDLINE/PubMed	"functional disability" or "functional limitation" or "functional dependence" and " basic activities of daily living" or "BADL" and "ADL" and "instrumental activities of daily living" or " IADL" and "older adults" or "elders" and "worldwide"	158	July 11, 2024
Google Scholar	functional disability or functional limitation or functional dependence and basic activities of daily living or BADL and ADL and instrumental activities of daily living or IADL and older adults or elders and worldwide	6,930	July 11, 2024
Scopus and EMBASE	"functional disability" or "functional limitation" or "functional dependence" and " basic activities of daily living" or "BADL" and "ADL" and "instrumental activities of daily living" or " IADL" and "older adults" or "elders" and "worldwide"	14	July 11, 2024
Total retrieved articles		7,102	
Included studies		35	

texts. The extraction sheet recorded the basic characteristics of the included studies, including the first author’s name, publication year, the country and continent where the studies were conducted, sample size, study design, study setting, and prevalence of functional disability in BADL and IADL. Any discrepancies that arose during this process were resolved through discussion among the authors.

**Outcome measurement of the study**

Functional disability in BADL and IADL among older adults was calculated in this systematic review and meta-analysis using prevalence and their 95% confidence intervals (CI).

**Risk of bias and quality assessment**

Risk of bias assessment was performed using the Newcastle Ottawa Scale (NOS), evaluating study quality and potential sources of bias [16]. The quality of the studies was assessed based on the representativeness of the sample, methodological quality, ascertainment of exposure or risks, comparability of the study, assessment of outcomes, and statistical tests. Studies that scored 7 or higher out of 10 were considered to be of high quality. All authors independently evaluated and determined the quality of the studies for inclusion in the analysis. Disagreements in assessment results were resolved by using the mean score from all authors (Supplemental Table 1).

**Data processing and statistical analysis**

The data were extracted and cleaned using Microsoft Excel spreadsheets and then exported to STATA version 17 for analysis. STATA version 17 was used to compute the pooled effect size with 95% confidence intervals (CIs) for functional disability in both basic activities of daily living and instrumental activities of daily living among older adults. To derive these estimates, we used weighted averages, where each study’s prevalence was weighted by the inverse of its variance. A meta-analysis employing a

weighted inverse variance random-effects model was used to pool FD in BADL and IADL among older adults worldwide, with a 95% confidence interval [17]. The heterogeneity of the studies was assessed using the Cochrane  $I^2$  with its corresponding p-value [18]. Therefore, this study identifies significant heterogeneity, with  $I^2$  values of 99.9% for both BADL and IADL, and a p-value of 0.00. To investigate the sources of heterogeneity, subgroup analyses were conducted based on continent, sample size, publication year of the studies, age of the participants, and study setting. A sensitivity analysis was carried out to determine the effect of particular studies on the findings in order to determine the overall estimate’s robustness. In order to recalculate the overall effect size, each study was methodically eliminated one at a time. We were able to ascertain the impact of each study on the total estimate by contrasting the estimates acquired with and without each study. This procedure gave us insight into the stability of the results across various research configurations and enabled us to identify any studies that would significantly affect the overall results.

Additionally, publication bias was evaluated using Egger’s test and visual inspection of a funnel plot symmetry [19]. We used the trim-and-fill method, which assesses and corrects for the existence of potentially missing papers, to further assess the possible influence of publication bias on the pooled estimates. The purpose of these studies was to evaluate the overall findings’ reliability and ascertain whether bias may significantly change the findings.

**Results**

A total of 7,102 articles were gathered from various sources to evaluate functional disability (FD) in BADL and IADL among older adults. Of these, 6,651 articles were excluded due to duplication. Additionally, 295 articles were removed after assessing the titles, and 65 were discarded following the review of abstracts. Of the remaining 91 articles, 34 were eliminated for having



irrelevant content or failing to meet the inclusion criteria and 22 articles were excluded because the full content could not be accessed. Ultimately, the final analysis included 35 articles that met the inclusion criteria (Fig. 1).

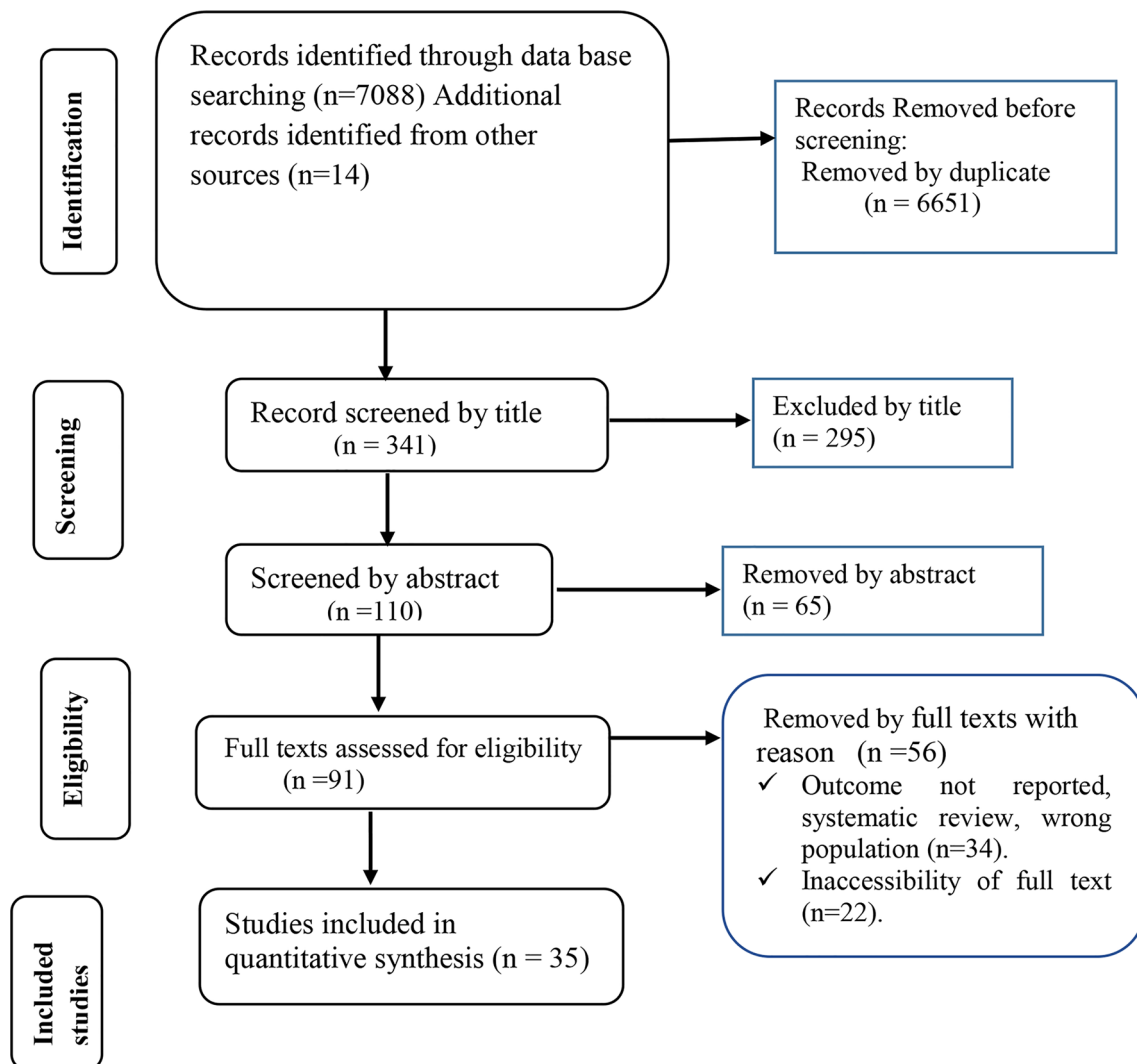
#### Characteristics of the studies and the search results

To assess functional disability in BADL and IADL among older adults, a total of 35 studies, encompassing a total of 133,827 participants, were reviewed; 73,708 were female and 60,119 were male participants. Out of those 35 studies, 34 studies were reporting functional disability in BADL and 26 studies reporting disability in IADL. Among these studies, eighteen were conducted in Asia [13, 20–36], four were carried out in Africa [37–40], five were carried out in Europe [12, 41–44], seven were conducted in South America [7, 9, 45–49] and one in North

America [50]. Seven studies used institutional-based samples, while twenty-eight studies utilized community-based samples. Ten of the studies utilized participants who were at least 65 years old, while the remaining studies used participants who were between 60 and 64. The sample sizes ranged from 110 to 31,477. All included studies employed a cross-sectional design (Supplemental Table 1).

#### Meta-analysis

The reviewed studies were systematically analyzed, and their findings were pooled to estimate the overall effect size. This effect size reflects the prevalence of functional disability in both basic and instrumental activities of daily living.



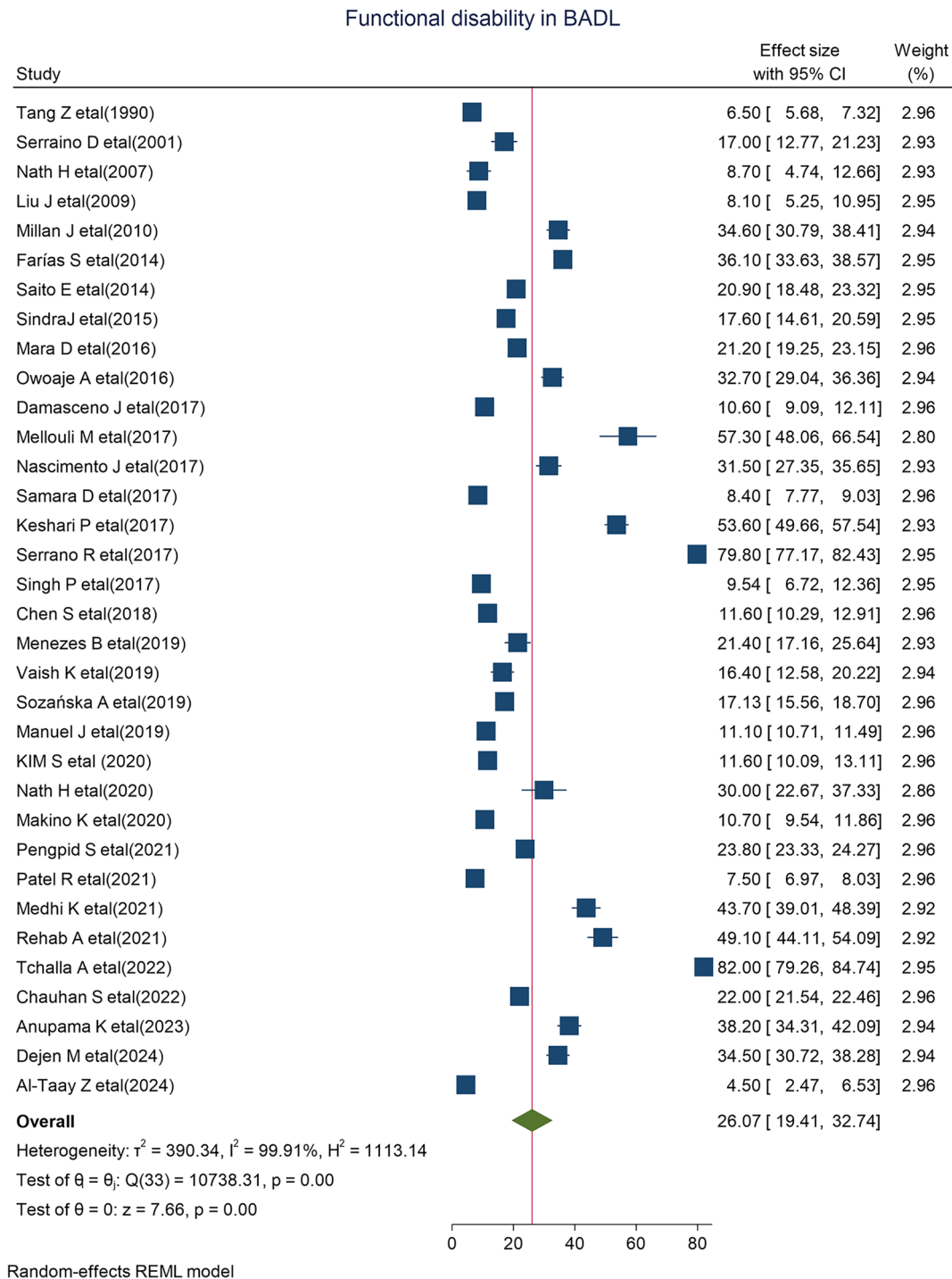
**Fig. 1** Flow chart of selection for systematic review and meta-analysis of functional Disability in Basic and Instrumental Activities Daily Living among older adults in the World, 2024

### Functional disability in basic activities of daily living

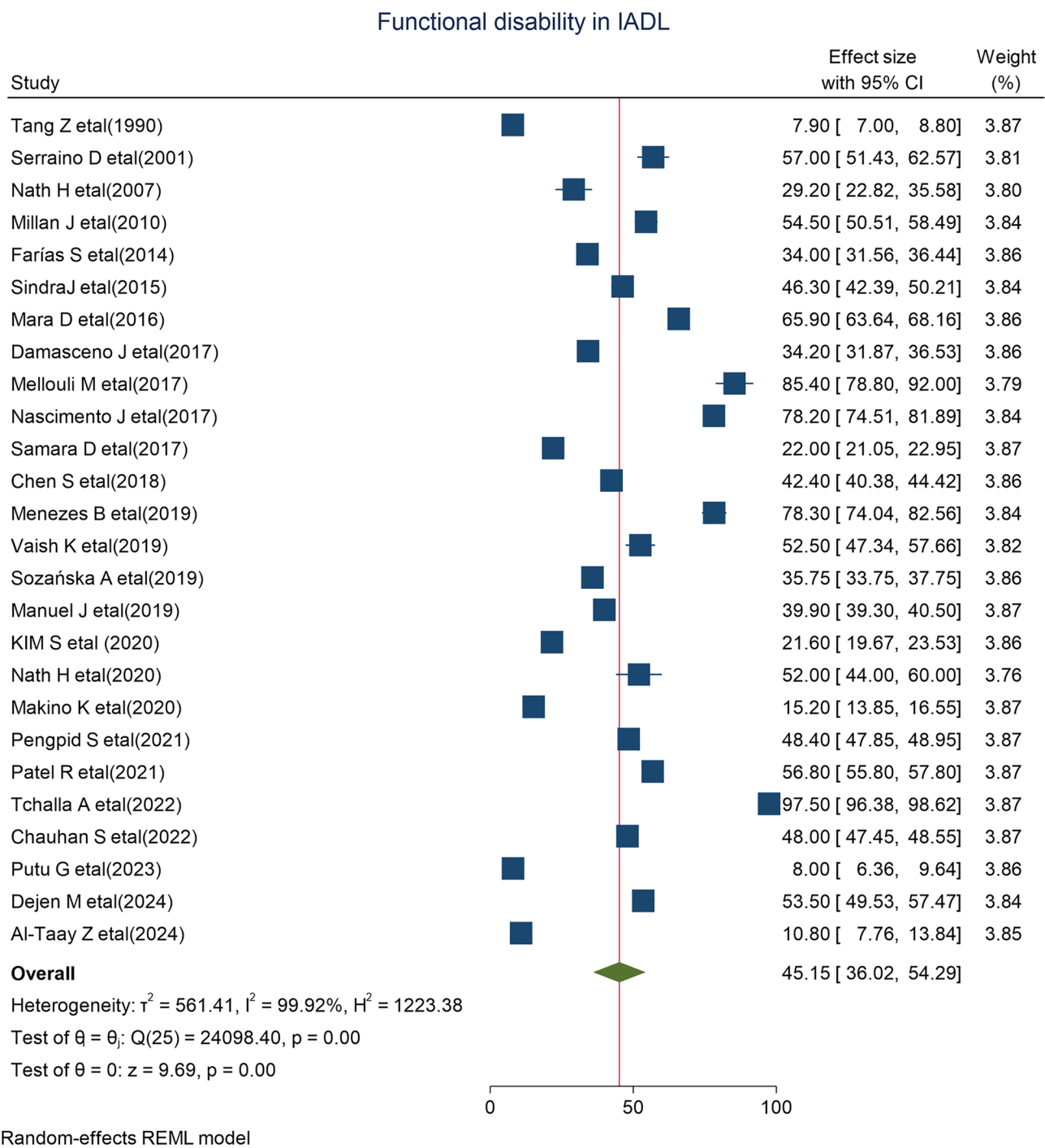
The overall pooled prevalence of functional disability in basic activities of daily living (BADLs) was estimated at 26.07% (95% CI: 19.04–33.74), with substantial heterogeneity observed ( $I^2 = 99.9\%$ ) (Fig. 2).

### Functional disability in instrumental activities of daily living

The pooled prevalence of functional disability in instrumental activities of daily living (IADLs) was 45.15% (95% CI: 36.02–54.29), with substantial heterogeneity indicated by an  $I^2$  value of 99.9% (Fig. 3).



**Fig. 2** Forest plot indicating pooled prevalence of functional disability in basic activities of daily living among older adults in the World, 2024



**Fig. 3** Forest plot indicating pooled prevalence of functional disability in instrumental activities of daily living among older adults in the World, 2024

**Heterogeneity and publication bias**

The heterogeneity of the studies was assessed using  $I^2$  and its corresponding p-value. This study found significant heterogeneity, with  $I^2$  values of 99.9% and a p-value of 0.00 for both BADL and IADL. This suggests the need for subgroup analysis.

To explore the source of this heterogeneity, we conducted subgroup analyses based on several factors: the

continent where the study was conducted, publication year, sample size, age of the participants, and study setting. However, the subgroup analysis did not identify the source of the heterogeneity, as the  $I^2$  value remained high, indicating significant variability. Other potential sources of heterogeneity may include differing definitions of functional disability, cultural variations in the perception and reporting of disability, and variations in

measurement tools or methodologies used across studies. These factors could contribute to the observed differences in prevalence rates.

#### Sub-group analysis by continent of the studies

Studies conducted in Asia had the lowest prevalence of functional disability in both basic activities of daily living and instrumental activities of daily living, with rates of 19.15% (95% CI: 12.23–25.97) and 32.66% (95% CI: 21.76–43.55), respectively (Fig. 4).

Conversely, studies conducted in Africa reported the highest pooled prevalence of functional limitations, with 42.91% (95% CI: 31.61–54.21) for BADL and 69.34% for IADL, as illustrated in Fig. 5.

#### Sub-group analysis by sample size of the studies

No significant difference was found in the prevalence of limitations in basic activities of daily living based on sample size (Fig. 6).

However, studies with smaller sample sizes ( $\leq 500$ ) exhibited a higher pooled prevalence of functional disability in instrumental activities of daily living (55.41%, 95% CI: 37.50–73.32) compared to studies with larger sample sizes ( $> 500$ ), which had a prevalence of 40.65% (95% CI: 30.46–50.83) (Fig. 7).

#### Sub-group analysis by age of the participants

Studies with participants aged  $\geq 65$  years showed a higher pooled prevalence of functional disability in basic activities of daily living (33.96%, 95% CI: 17.79–50.12) compared to the 60–65 age group (22.73%, 95% CI: 16.33–29.14) (Fig. 8). Similarly, for instrumental activities of daily living, the prevalence was higher in the  $\geq 65$  age group (56.78%, 95% CI: 37.14–76.42) than in the 60–65 age group (39.99%, 95% CI: 30.67–49.30) (Fig. 9).

#### Sub-group analysis by study setting

The pooled prevalence of BADL disability was (33.80%, 95% CI: 12.80–54.92) in institutionalized settings, compared to (24.10%, 95% CI: 17.63–30.56) in community settings (Fig. 10). The same trend was observed for instrumental activities of daily living, with the pooled prevalence of IADL was (57.81%, 95% CI: 24.80–90.82) in institutionalized settings, compared to (42.87%, 95% CI: 33.76–51.99) in community settings (Fig. 11).

#### Sensitivity analysis

To assess the impact of individual studies on the overall estimates, sensitivity analysis was performed for functional disabilities related to BADL and IADL. A leave-one-out sensitivity analysis using the random-effects model showed that all estimates remained within the overall 95% confidence interval of the pooled prevalence,

indicating that no single study had a significant influence on the results (Tables 2 and 3) respectively.

#### Meta-regression

To examine the effects of numerous variables on the prevalence of functional disability in basic activities of daily living and instrumental activities of daily living among older adults worldwide, a meta-regression analysis was carried out.

The meta-regression analysis, which examined the impact of sample size, revealed a significant p-value of 0.00 for both functional disabilities in BADL and IADL. This suggests that the variation in sample sizes among the included studies was a significant source of heterogeneity in the pooled results of this study (Table 4).

#### Publication bias

The presence of publication bias was assessed using Egger's test and a funnel plot. The funnel plot for the prevalence of functional disability in basic activities of daily living was asymmetric, indicating the presence of publication bias (S1 Fig A). Additionally, Egger's test showed a significant intercept ( $B_0$ ) with a p-value of 0.0029, confirming the presence of significant publication bias in the articles.

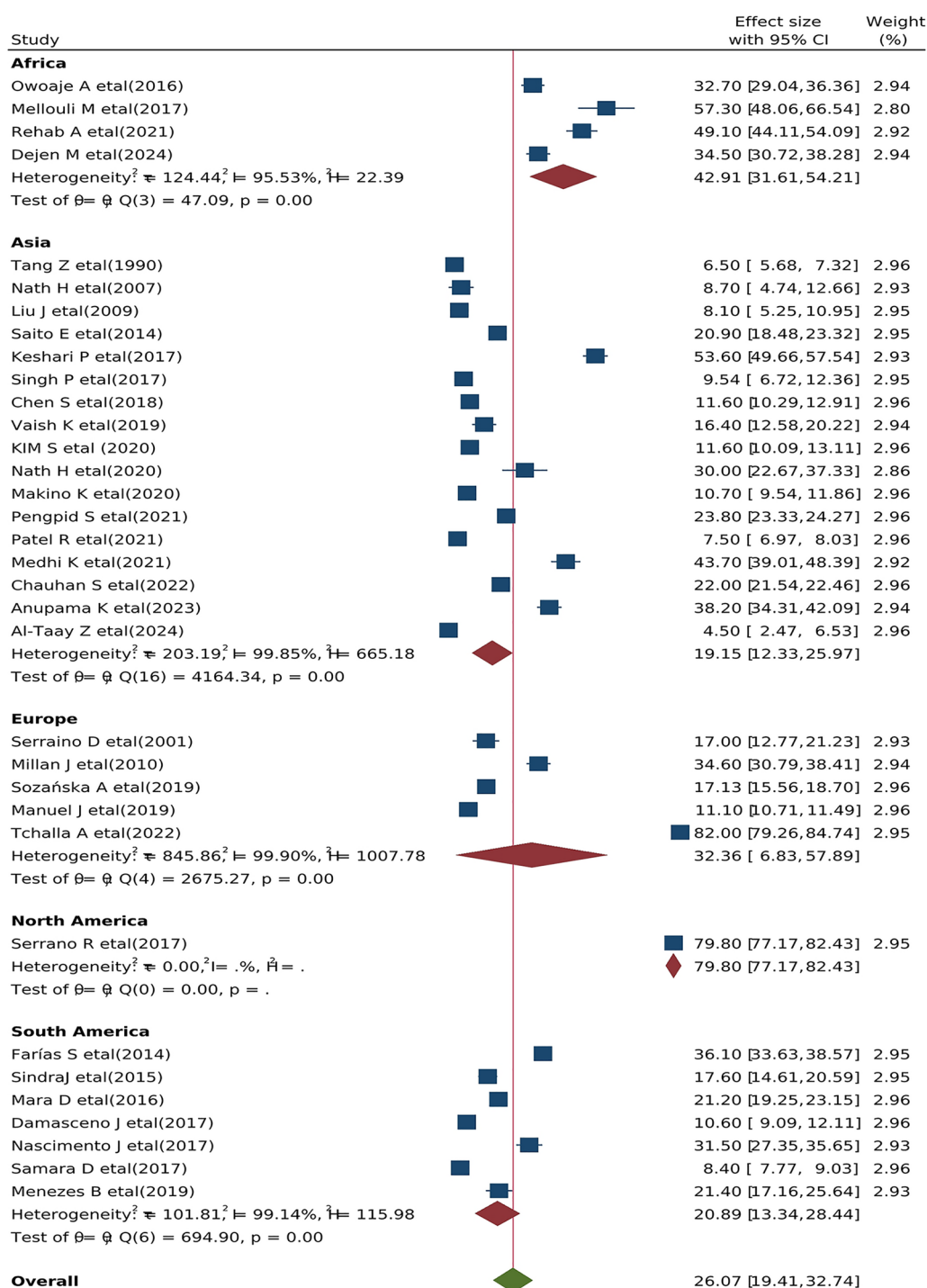
For instance, the funnel plot for the prevalence of functional disability in instrumental activities of daily living was relatively symmetric (S2 Fig), and Egger's test showed an intercept ( $B_0$ ) that was not significant, with a p-value of 0.967. This indicates the absence of publication bias in the studies (Table 5).

#### Trim-and-fill analysis

The trim-and-fill method was applied to manage publication bias for functional disability in basic activities of daily living. The trim-and-fill method is used to estimate the number of missing studies due to publication bias and to provide an adjusted overall effect size. After applying the trim-and-fill method, the adjusted overall prevalence (theta) is 15.12%, (a 95% CI: 11.25–19.13%).

**Bias-adjusted prevalence** The bias-adjusted prevalence was 15.12%, indicating that after accounting for potential publication bias, the overall estimated effect size was lower than the unadjusted value. This suggests that there may have been studies with smaller or non-significant results that were initially excluded.

**Total studies after trim and fill** Following the trim-and-fill adjustment, the total number of studies included in the meta-analysis increased to 43, reflecting the addition of 9 studies to adjust for suspected bias (S1 Fig B).



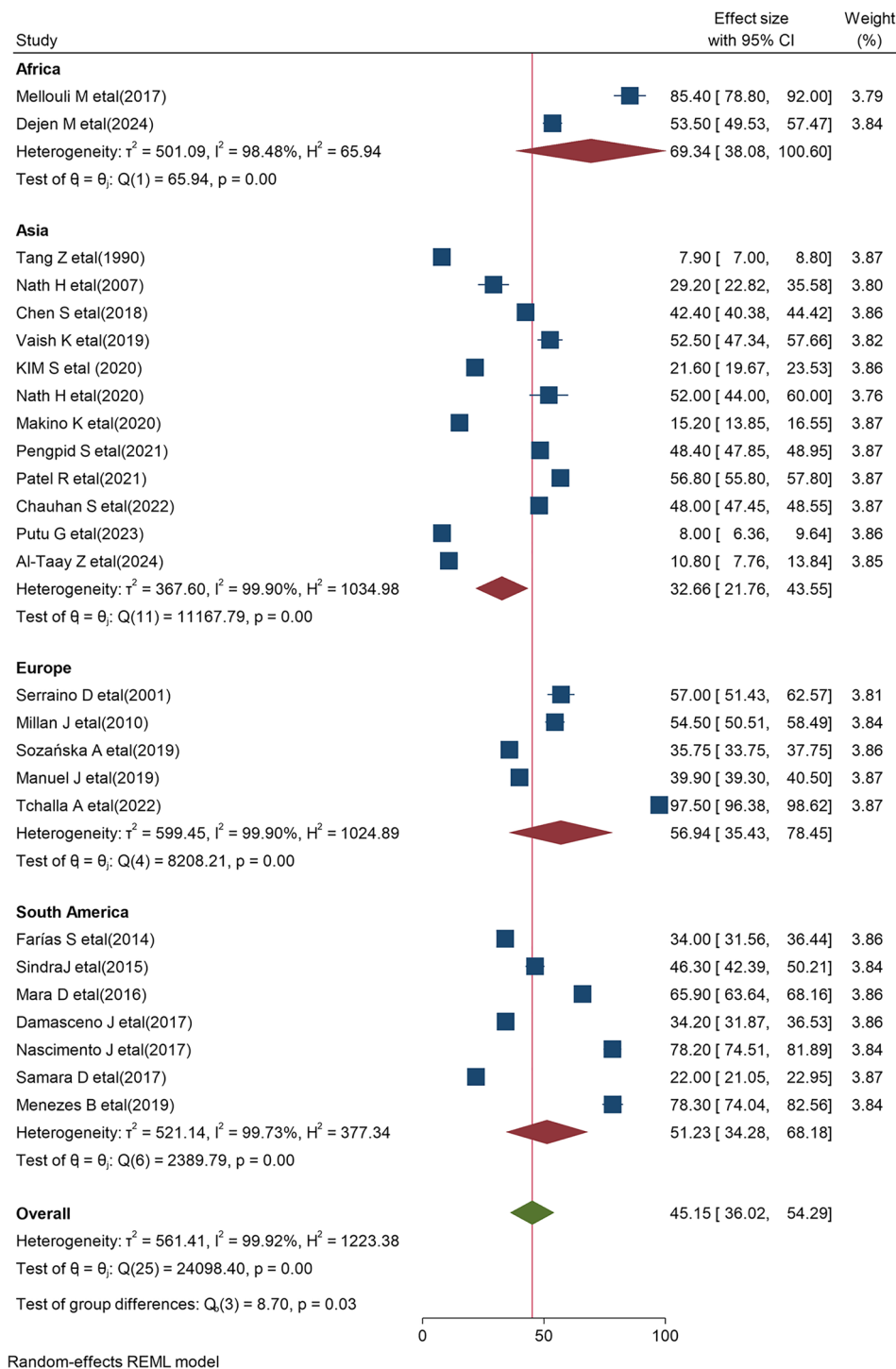
**Fig. 4** Summary of subgroup analysis of functional disability in basic activities of daily living among older adults in the world by continent of the studies (N=133,827)

## Discussion

In this systematic review and meta-analysis, we synthesized the findings from 35 observational studies reporting functional disabilities in basic and instrumental activities of daily living. The included studies varied in sample size, study setting, and age of the participants, publication

year, and the continent where they were conducted. Overall, the pooled prevalence of functional disability in basic activities of daily living was approximately 25%, indicating that one in four older adults' faces limitations in basic activity of daily living. In contrast, nearly 50% of participants experienced difficulties with instrumental



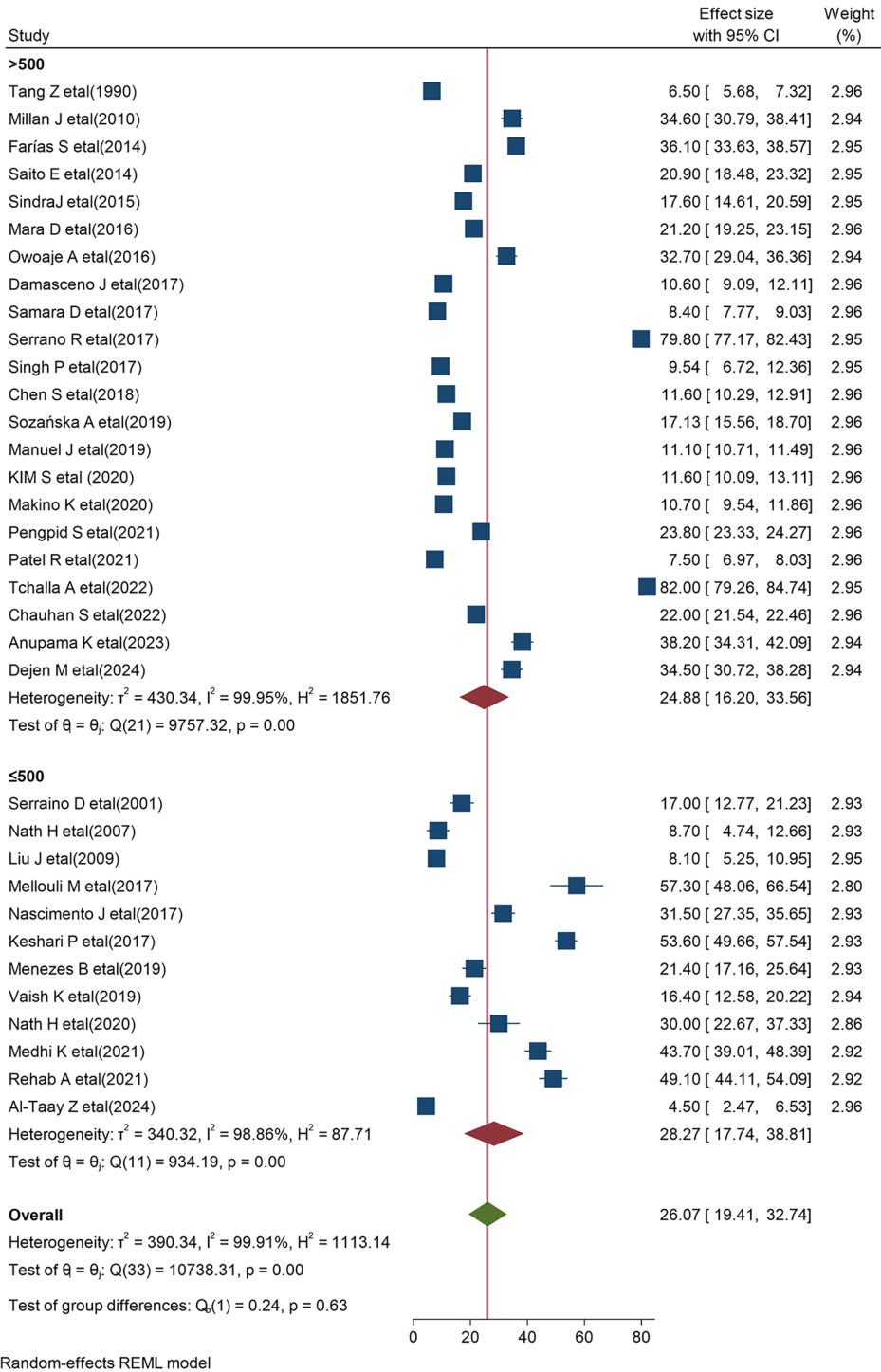


**Fig. 5** Summary of subgroup analysis of functional disability in instrumental activities of daily living among older adults in the world by continent of the studies ( $N = 133,827$ )

activities of daily living. These results emphasize the significant impact of functional disability on both instrumental and basic activities of daily living in older adults around the world, indicating that the aging process universally affects instrumental activities like meal

preparation, grocery shopping, and medication management, as well as basic activities like dressing, walking, and bathing.

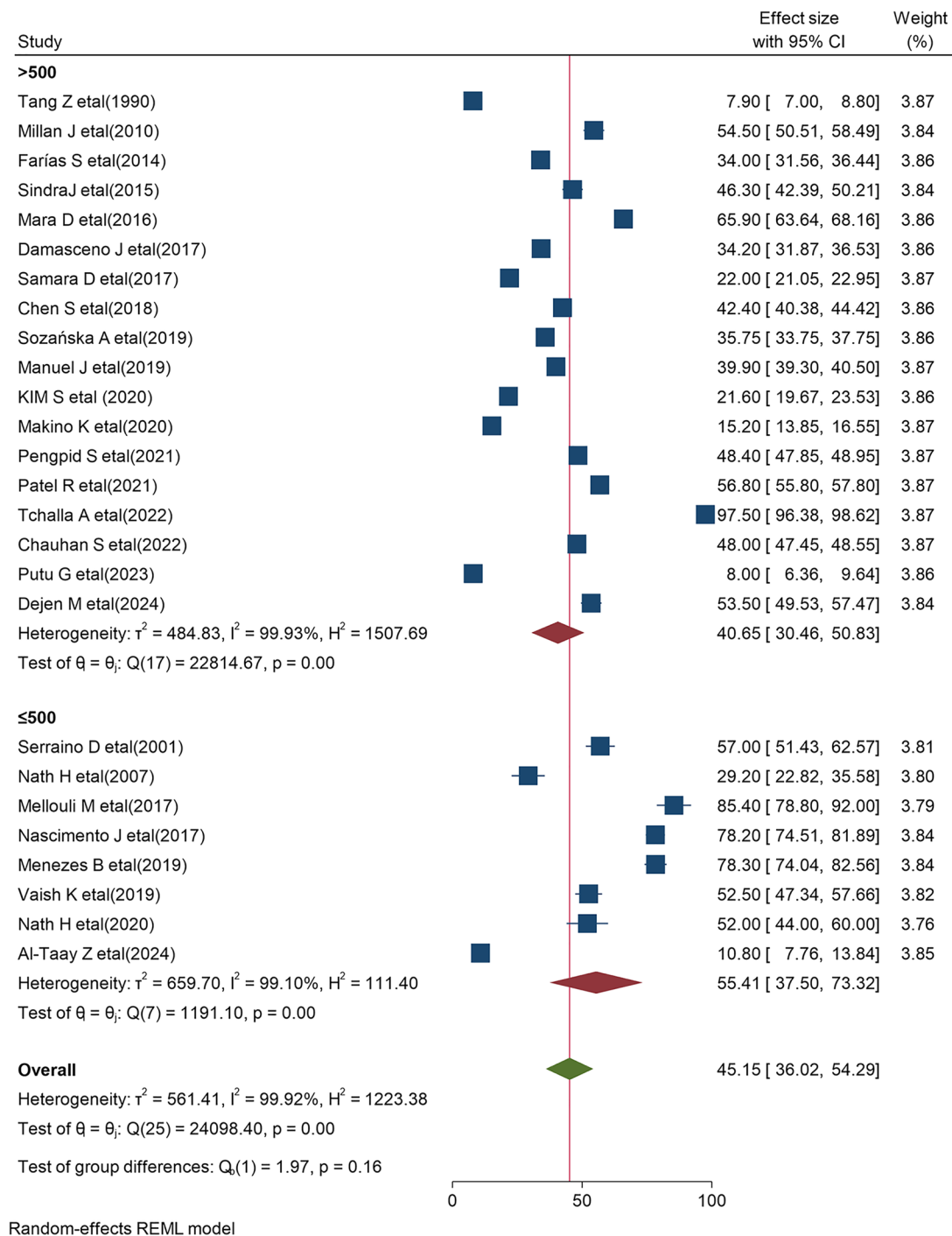
The variability in how BADL and IADL were measured across studies limits comparability and underscores the need for standardized tools. This difference highlights



**Fig. 6** Summary of subgroup analysis of functional disability in basic activities of daily living among older adults in the world by sample size of the studies ( $N = 133,827$ )

the necessity for standardized, trustworthy measurement instruments and makes it challenging to compare results.

This systematic review and meta-analysis assessed the global pooled prevalence of functional disability in both basic activities of daily living (BADLs) and instrumental activities of daily living (IADLs). The estimated prevalence was 26.07% (95% CI: 19.04–32.74) for BADLs and 45.15% (95% CI: 36.02–54.29) for IADLs. These results are comparable to those of a similar review conducted in the ASEAN region, which reported a prevalence of 21.5% (95% CI: 16.2–27.3) for BADLs and 46.8% (95% CI: 35.5–58.3) for IADLs [51].

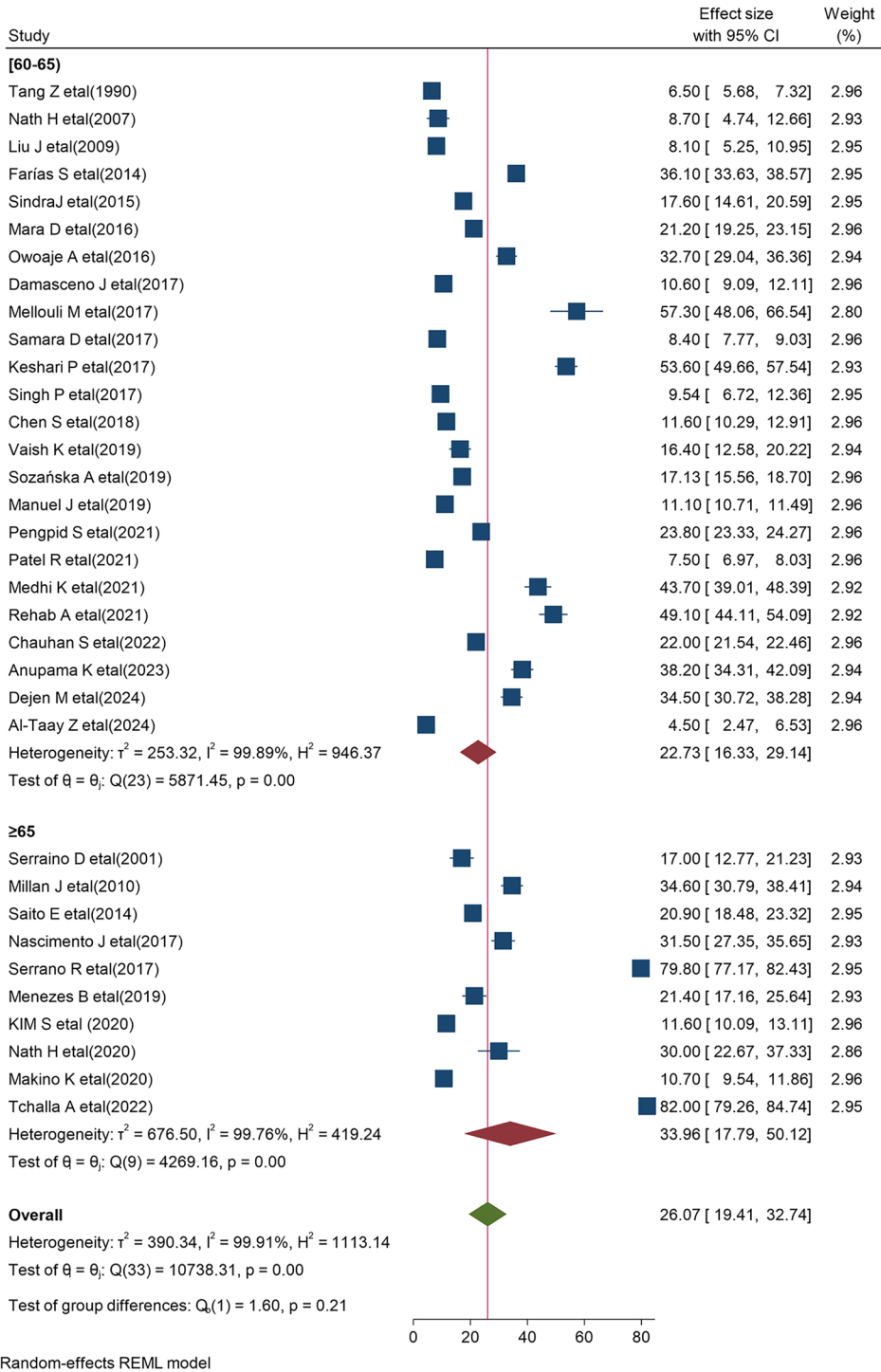


**Fig. 7** Summary of the subgroup analysis of functional disability in instrumental activities of daily living among older adults worldwide, based on the sample size of the studies ( $N = 133,827$ )

On the other hand, this study's findings are lower than those of another systematic review and meta-analysis, which reported a prevalence of functional disability in BADLs of 36.7% (95% CI: 29.8–44.3). This discrepancy may be attributed to differences in study populations. For instance, our study included all studies reporting the outcome regardless of comorbid status, whereas the

previous study focused specifically on functional disability among cancer patients. Moreover, cancer, its treatment, and exposure to chemotherapy can significantly increase interference with activities of daily living [52].

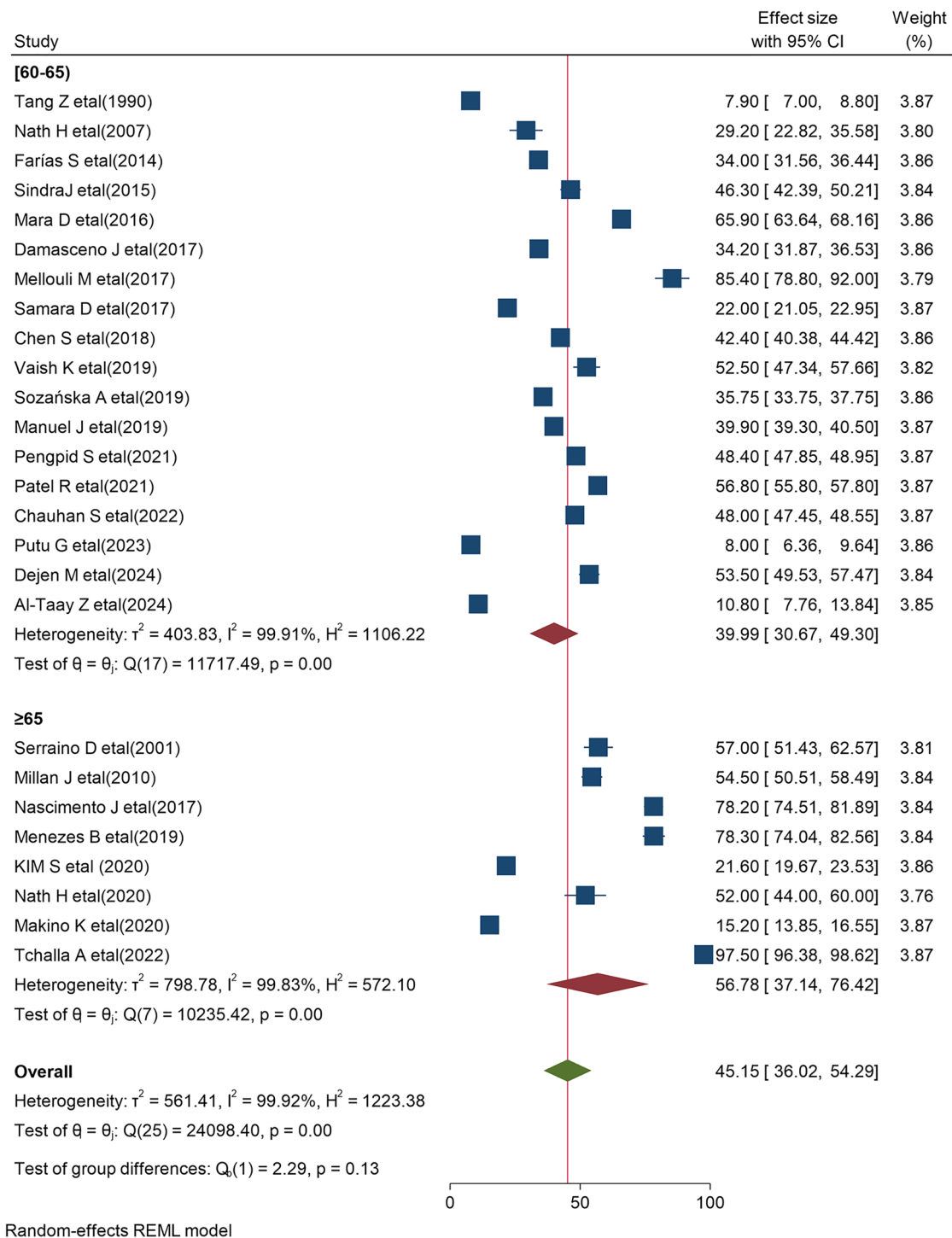
Subgroup analysis revealed significant regional differences in the prevalence of functional disability in both BADLs and IADLs. The highest prevalence was observed



**Fig. 8** Summary of subgroup analysis of functional disability in basic activities of daily living among older adults in the world by age of the participants in the included studies (N= 133,827)

in Africa (42.91% for BADLs and 69.34% for IADLs), while the lowest was reported in Asia (19.15% and 32.66%, respectively). These disparities may reflect differences in socioeconomic conditions, access to healthcare, and the availability of support services for older adults. In more developed regions, older individuals often benefit from better healthcare infrastructure and social support systems, which may help maintain their functional independence and improve quality of life compared to those in less-resourced settings like Africa.

Studies with smaller sample sizes ( $\leq 500$  participants) reported a higher pooled prevalence of functional

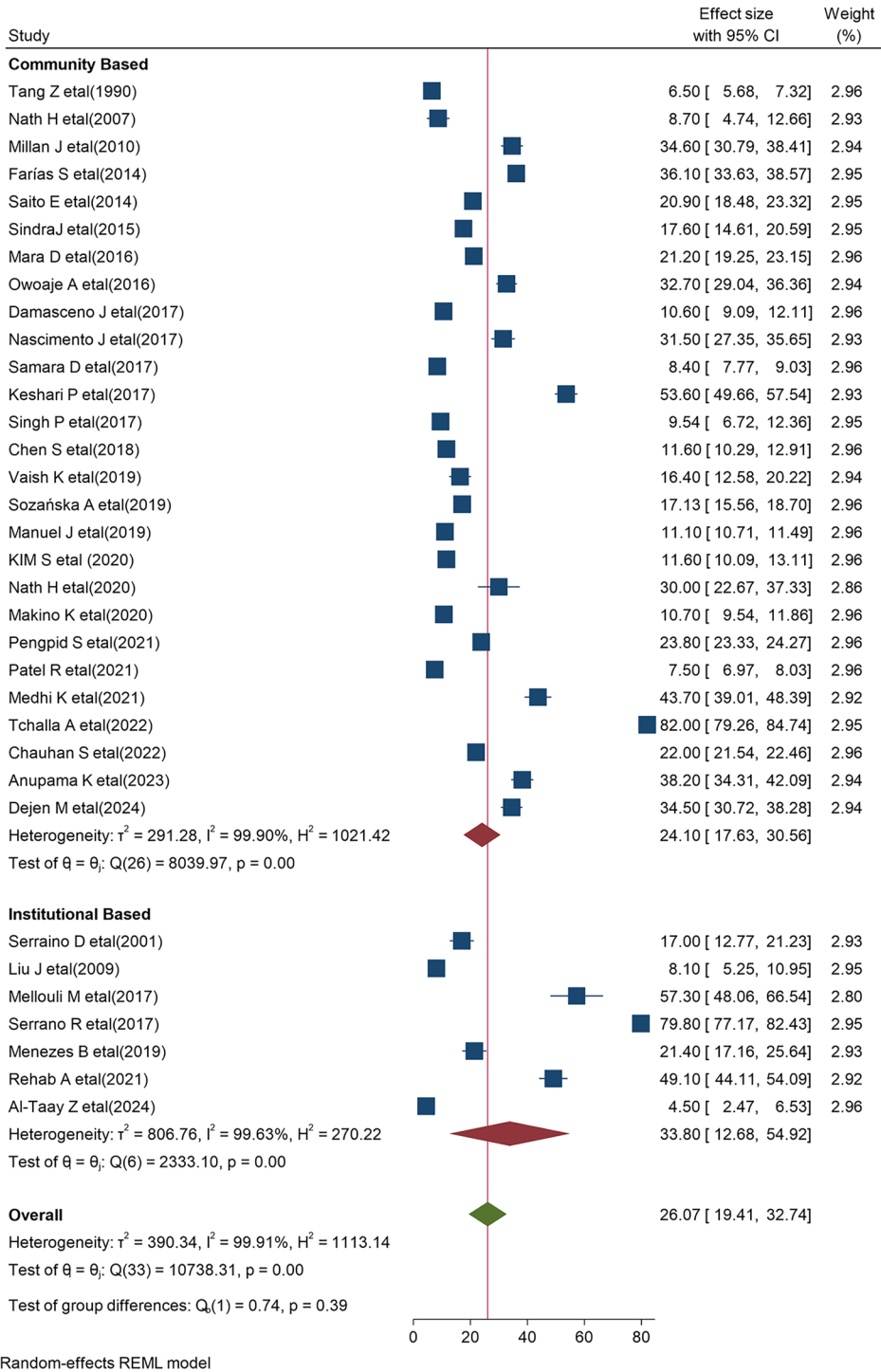


**Fig. 9** Summary of subgroup analysis of functional disability in instrumental activities of daily living among older adults in the world by age of the participants in the included studies ( $N = 133,827$ )

disability in IADLs (55.41%, 95% CI: 37.50–73.32), which was notably higher than the overall pooled prevalence. In contrast, studies with larger sample sizes ( $> 500$  participants) reported a lower prevalence of 40.65% (95% CI: 30.46–50.83). This gap brings up significant methodological issues. The prevalence of functional disabilities

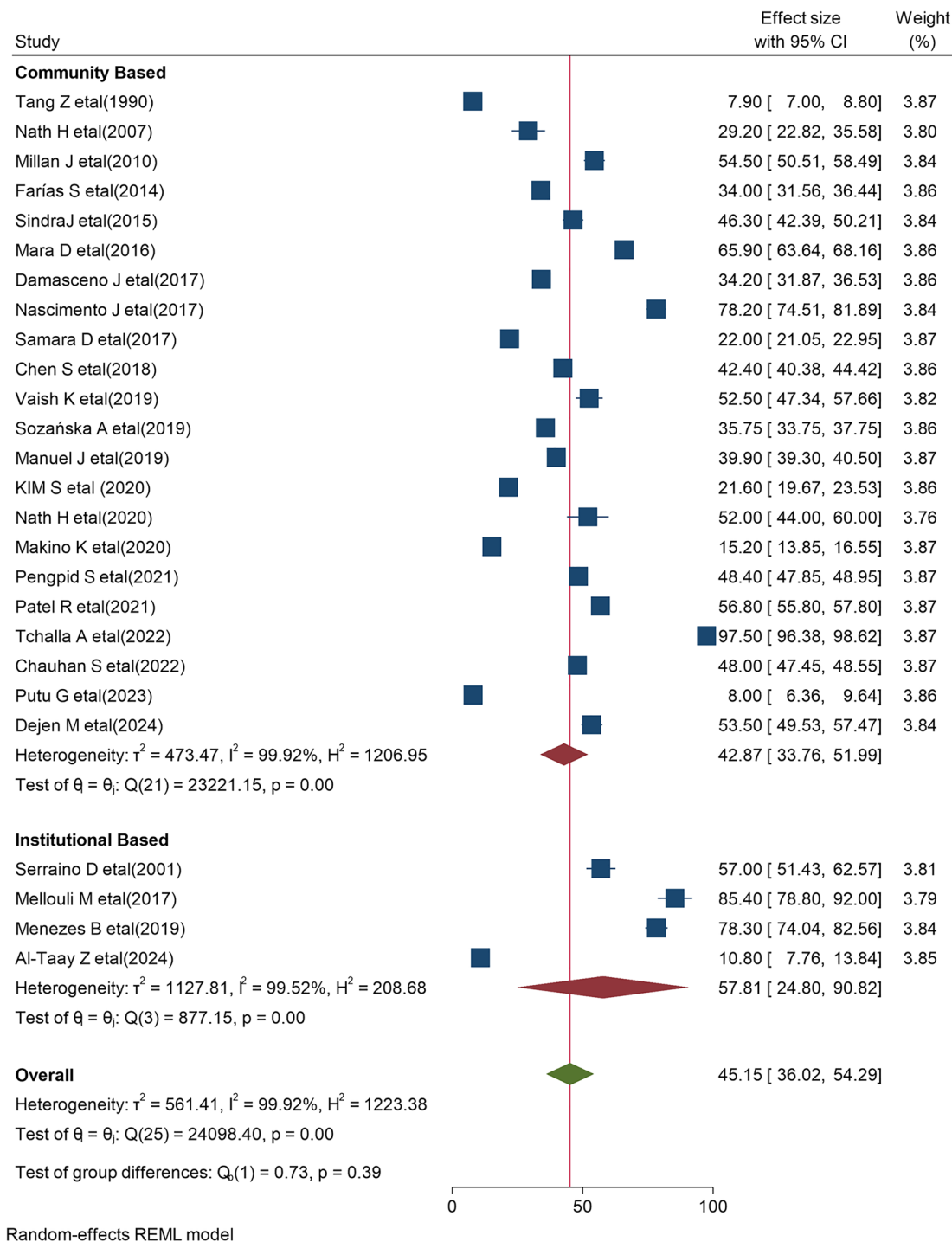
may be overestimated or underestimated due to the more vulnerable nature of smaller sample size. On the other hand, studies with higher sample sizes might offer a more reliable and broadly applicable estimate, which might represent the more comprehensive reality of functional limitations in a variety of groups [53].





**Fig. 10** Summary of subgroup analysis of functional disability in basic activities of daily living among older adults in the world by study setting of the studies (N=133,827)

Studies with participants aged  $\geq 65$  years showed a higher pooled prevalence of functional disability in basic activities of daily living (33.96%, 95% CI: 17.79–50.12) compared to the 60–65 age group (22.73%, 95% CI: 16.33–29.14). Similarly, for instrumental activities of daily living, the prevalence was higher in the  $\geq 65$  age group (56.78%, 95% CI: 37.14–76.42) than in the 60–65 age group (39.99%, 95% CI: 30.67–49.30). These findings strongly suggest that **age** is a prominent factor in the prevalence of functional disability, and the lower prevalence in BADL observed in this study analysis, particularly in developed countries may be attributed to the



**Fig. 11** Summary of subgroup analysis of functional disability in instrumental activities of daily living among older adults in the world by study setting of the studies ( $N = 133,827$ )

inclusion of individuals in the 60–65 age range. The prevalence of functional disability would likely increase with the inclusion of individuals aged 70 and above classification in developed countries. These findings are consistent with existing literature, which consistently reports that older adults experience a higher burden of functional

disabilities, particularly in tasks that require more complex physical and cognitive functions, such as IADLs [54, 55]. As individuals aged, the risk of chronic conditions such as arthritis, cognitive decline, and reduced mobility increases, leading to greater challenges in performing both BADLs and IADLs [56].

**Table 2** Sensitivity analysis of functional disability in basic activities of daily living among older adults in the world ( $N = 133,827$ )

Study omitted	Estimates	95%CI
Tang Z et al(1990)	26.67	(19.90–33.40)
Serraino D et al(2001)	26.35	(19.50–33.20)
Nath H et al(2007)	26.60	(19.81–33.39)
Liu J et al(2009)	26.62	(19.84–33.41)
Millan J et al(2010)	25.82	(18.97–32.67)
Farias S et al(2014)	25.77	(18.93–32.62)
Saito E et al(2014)	26.23	(19.37–33.10)
SindraJ et al(2015)	26.33	(19.48–33.19)
Mara D et al(2016)	26.23	(19.36–33.09)
Owoaje A et al(2016)	25.88	(19.02–32.74)
Damasceno J et al(2017)	26.55	(19.74–33.36)
Mellouli M et al(2017)	25.17	(18.56–31.79)
Nascimento J et al(2017)	25.91	(19.05–32.78)
Samara D et al(2017)	26.62	(19.83–33.40)
Keshari P et al(2017)	25.24	(18.58–31.90)
Serrano R et al(2017)	24.42	(18.40–33.40)
Singh P et al(2017)	26.58	(19.78–33.38)
Chen S et al(2018)	26.52	(19.70–33.33)
Menezes B et al(2019)	26.22	(19.35–33.08)
Vaish K et al(2019)	26.37	(19.52–33.22)
Sozaska A et al(2019)	26.35	(19.50–33.20)
Manuel J et al(2019)	26.53	(19.72–33.35)
KIM S et al. (2020)	26.52	(19.70–33.33)
Nath H et al(2020)	25.96	19.10–32.82
Makino K et al. (2020)	26.54	(19.74–33.35)
Pengpid S et al(2021)	26.15	(19.27–33.02)
Patel R et al(2021)	26.64	(19.86–33.42)
Medhi K et al(2021)	25.54	(18.76–32.33)
Rehab A et al(2021)	25.38	(18.66–32.11)
Tchalla A et al(2022)	24.35	(18.40–30.29)
Chauhan S et al(2022)	26.20	(19.33–33.07)
Anupama K et al(2023)	25.71	(18.88–32.54)
Dejen M et al(2024)	25.82	(18.97–32.67)
Al-Taay Z et al(2024)	26.73	(19.99–33.48)
<b>Combined</b>	26.07	(19.04–33.74)

The pooled prevalence of BADL disability was (33.80%, 95% CI: 12.80–54.92) in institutionalized settings, compared to (24.10%, 95% CI: 17.63–30.56) in community settings. The same trend was observed for instrumental activities of daily living, with the pooled prevalence of

**Table 3** Sensitivity analysis of functional disability in instrumental activities of daily living among older adults in the world ( $N = 133,827$ )

Study omitted	Estimates	95%CI
Tang Z et al(1990)	46.65	(37.64–55.65)
Serraino D et al(2001)	44.68	(35.23–54.14)
Nath H et al(2007)	45.78	(36.37–55.20)
Millan J et al(2010)	44.78	(35.30–54.26)
Farias S et al(2014)	45.60	(36.14–55.07)
SindraJ et al(2015)	45.11	(35.60–54.61)
Mara D et al(2016)	44.32	(34.96–53.67)
Damasceno J et al(2017)	45.59	(36.13–55.06)
Mellouli M et al(2017)	43.56	(34.63–52.50)
Nascimento J et al(2017)	43.83	(34.71–52.94)
Samara D et al(2017)	46.08	(36.77–55.40)
Chen S et al(2018)	45.26	(35.76–54.77)
Menezes B et al(2019)	43.83	(34.71–52.94)
Vaish K et al(2019)	44.86	(435.38–54.35)
Sozaska A et al(2019)	45.53	(36.05–55.01)
Manuel J et al(2019)	45.37	(35.87–54.86)
KIM S et al. (2020)	46.10	(36.79–55.41)
Nath H et al(2020)	44.89	(35.40–55.37)
Makino K et al. (2020)	46.36	(37.17–55.54)
Pengpid S et al(2021)	45.02	(35.52–54.53)
Patel R et al(2021)	44.69	(35.22–54.15)
Tchalla A et al(2022)	43.03	(34.55–51.51)
Chauhan S et al(2022)	45.04	(35.53–54.55)
Putu G et al(2023)	46.64	(37.63–55.65)
Dejen M et al(2024)	44.82	(35.34–54.30)
Al-Taay Z et al(2024)	46.53	(37.44–55.61)
<b>Combined</b>	<b>45.15</b>	(36.02–54.29)

IADL was (57.81%, 95% CI: 24.80–90.82) in institutionalized settings, compared to (42.87%, 95% CI: 33.76–51.99) in community settings.

This observation indicates the substantial influence that the living context exerts on the functional capabilities of the elderly population. Institutionalized settings frequently accommodate individuals with more pronounced health challenges, higher comorbidity, and increased reliance on caregiving support [57]. In contrast, individuals living in community settings may have more opportunities for independent living, access to

**Table 4** Meta regression test with 95% CI of the prevalence of functional disability in BADL and IADL among older adult in the world, 2024

Domains	Meta es	Coefficient	SE	z	$P >  z $	95% CI
Functional disability in BADL	Sample size	–0.0004293	0.0004117	-1.04	0.297	–0.0012362
	_cons	27.76264	3.764198	7.38	0.000	20.38494
	Test	$P = 0.000$				
Functional disability on IADL	Sample size	–0.0001117	0.0005175	-0.22	0.829	–0.0011261
	_cons	45.70853	5.402176	8.46	0.000	35.12046
	Test	$P = 0.000$				

**Table 5** Egger's test with 95% CI of the prevalence of functional disability in BADL and IADL among older adults in the worldwide, 2024

Domains	Std Eff	Coefficient	SE	T	P> t	95% CI
FD in BADL	Slope	12.13823	2.326708	5.22	0.000	7.398884–16.87758
	Bias	8.734906	4.167283	2.10	0.044	2,464,272 – 17,22338
	Test	P=0.0029				
FD in IADL	Slope	42.36513	6.311769	6.71	0.000	29.33828–55.39198
	Bias	−0.4153316	9.789409	-0.04	0.967	-20.61968-19.78902
	Test	P=0.967				

To address publication bias, a trim-and-fill analysis was performed.

community resources, and informal support from family or peers, which can help delay or mitigate functional decline [58].

To further assess and adjust for this bias, we applied the trim-and-fill method, which suggested the presence of up to nine potentially missing studies. After incorporating these studies, the adjusted pooled prevalence decreased to 15.12% (95% CI: 11.25–19.13%), compared to the original unadjusted estimate. This reduction suggests that the initial pooled estimate may have been slightly inflated due to the underrepresentation of smaller or non-significant studies in the published literature. While the adjusted prevalence remains consistent with the general trend of our findings, the presence of publication bias highlights the importance of cautious interpretation and the need for future studies to include unpublished or gray literature to minimize systemic bias.

The findings of this study have important implications for healthcare policy and practice. They emphasize the need to integrate functional assessments into routine clinical care and public health surveillance. Early identification of functional limitations can enable timely interventions and personalized care planning, helping to prevent further decline and improve long-term functional outcomes [59].

Strengths and limitations of the study

The strengths of this study include an extensive literature search, global coverage, subgroup analyses to identify sources of heterogeneity, and trim-and-fill analysis to address publication bias. However, limitations of the study include the exclusive inclusion of observational studies, presence of substantial heterogeneity, and the exclusion of non-English language studies, which may impact the generalizability of the findings. The fact that most of the included studies were carried out in high-income nations may also be a problem, as it may not fully represent the prevalence of functional disability in low- and middle-income nations. By omitting research with null or negative results, the inclusion of only published studies may have resulted in an overestimation of the actual prevalence of functional disabilities. The choice to include institutionalized and non-institutionalized

persons in the overall analysis is still a limitation, even if we did do subgroup analyses based on their study setting. This study did not assess the potential for publication bias specifically in articles sourced from Google Scholar, which may differ from other databases like PubMed, Scopus, and EMBASE.

Conclusion

The results of this study indicated that the overall pooled prevalence of functional disability in basic activities of daily living was nearly one-fifth, while nearly half of the participants experienced limitations in instrumental activities of daily living. This emphasizes the need for continued effort in improving the quality of life and support systems for individuals facing functional disability, particularly in instrumental activities.

Abbreviations

- BADL Basic activities of daily living
- FD Functional disability
- IADL Instrumental activities of daily living
- NOS Newcastle Ottawa Scale
- PRISMA Preferred Reporting Items for Systematic Review and Meta-analysis

Supplementary Information

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Supplementary Material 1

Supplementary Material 2: S1 Fig. A: Funnel plot of prevalence of functional disability in basic activities of daily living among older adults in the world, 2024 (N=133,827)

Supplementary Material 3: S1 Fig. B: Trim-and-fill analysis of functional disability in basic activities of daily living among older adults in the world, 2024 (N=133,827)

Supplementary Material 4: S2 Figure: Funnel plot of prevalence of functional disability in instrumental activities of daily living among older adults in the world, 2024 (N=133,827)

Supplementary Material 5: S1 Table: Characteristics of included studies on Functional Disability in Basic and Instrumental Activities of Daily Living among older adults in the World, 2024

Supplementary Material 6

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Not applicable.

### Author contributions

BTA, MG, AG, TTT, & DGB designed the study and ran the literature search. Three authors (BTA, MG, & AG) search literatures, screened records, and extracted data. All authors assessed the risk of bias and quality of the studies. BTA did the statistical analysis and wrote the report. DGB and WMK revise and edit the manuscript. All authors provided critical conceptual input, analyzed and interpreted the data, and critically revised the report. All authors read and approved the final manuscript.

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### Data availability

All related data have been presented within the manuscript. The dataset supporting the conclusions of this article is available from the corresponding author upon request.

### Declarations

#### Ethics approval and consent to participate

Not applicable.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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