



# Variability and awareness of obstetric fistula among women of reproductive age in sub-Saharan African countries: A systematic review and meta-analysis

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## ABSTRACT

**Background:** Obstetric fistula among women of reproductive age is a significant public health issue in developing countries, including Sub-Saharan Africa. However, the pooled awareness of obstetric fistula among women of reproductive age in Sub-Saharan Africa and its variation between countries have not yet been studied. Hence, the review aims to assess variability and awareness of obstetric fistula among women of reproductive age in Sub-Saharan African Countries.

**Method:** Articles were searched using different electronic databases, such as PubMed, Web of science, science direct (Scopus), Google scholar, and HINARI and manual search without regard to publication date. A random-effects model was used to ascertain the pooled prevalence of obstetric fistula awareness among women of reproductive age in Sub-Saharan Africa. Publication bias was checked by using funnel plot and Egger's test at a 5% level of significance.  $I^2$  test statistics was performed to evaluate heterogeneity among included studies. In addition, to identify the possible reason for the potential heterogeneity between the studies, sub-group and meta-regression analyses were conducted. A sensitivity analysis was performed to determine the impact of individual research on the overall results. The data were extracted by using Microsoft excel and analyzed using statistical software STATA/SE version 17.

**Result:** A total of 22 studies with 79,693 women of reproductive age were included in this systematic review and meta-analyses. In Sub-Saharan Africa, the pooled prevalence of awareness towards obstetric fistula among women of reproductive age was 40.85% (95% CI: 33.48, 48.22%). Analysis of the subgroups by specific countries revealed significant variation. The highest awareness of obstetric fistula was found among Tanzanian women of reproductive age (61.10%, 95% CI: 55.87–66.33%), whereas the lowest awareness was found in research from the Gambia (12.80%, 95% CI: 12.20–13.40%). The likelihood of obstetric fistula awareness were lower by a factor of 0.424 among studies with sample sizes greater than 3542 ( $\beta = -0.424$  (95% CI:  $-0.767$  to  $0.081$ ),  $p$ -value  $<0.05$ ).

**Conclusion:** According to the current review, there is a low level of awareness about obstetric fistula among women of reproductive age in sub-Saharan Africa, and the results of the sub-group

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analysis by country showed wide variations. Therefore, we emphasize the need for country-specific public health initiatives to raise awareness about obstetric fistula among women of reproductive age, which could reduce the risk of delayed treatment.

## 1. Introduction

Obstetric fistula, which is an abnormal connection between the genital tract and the urinary or digestive tract, is a serious public health issue for women and their communities, particularly in sub-Saharan Africa (SSA) and Southeast Asia [1,2]. Obstetric fistulas are typically categorized as either vesico-uterine (between the bladder and uterus), rectovaginal (between the rectum or colon and the vagina), ureterovaginal (between the ureter and the vagina), or vesicovaginal (between the anterior vaginal wall and posterior bladder) [3]. It is connected to protracted or obstructed labor and most frequently happens when a baby's head gets stuck in the mother's pelvis, cutting off blood flow to the nearby tissues and it can also occur as a result of tissue necrosis brought on by a protracted blockage [3,4]. As a result, it can cause faecal and/or urine incontinence and has consequences that include stigma and a decreased likelihood that the person would seek treatment because they are less likely to be aware of their treatment alternatives [5,6].

Obstetric fistula is one of the most serious complications and maternal morbidities, and it is considered an avoidable maternal morbidity. Nevertheless, it accounts for 8% of maternal deaths globally, impairs quality of life, and causes lifelong impairments. For every maternal death, about 20–30 women experience severe pregnancy-related complications [7,8]. Obstetric fistula affects an estimated 2–3 million women worldwide, primarily in South Asia and Sub-Saharan Africa [9]. Approximately 30,000 to 130,000 women giving birth annually in Sub-Saharan Africa alone develop obstetric fistula [10]. Obstetric fistula has a variety of severe effects on women, particularly those who live in low-resource countries [11].

Previous studies suggested that there are around 2 million cases of obstetric fistula globally, with 50,000–100,000 new cases being recorded yearly [12,13]. In Asia and sub-Saharan Africa, it is estimated that more than 2 million young women have obstetric fistulas that are untreated [10].

In developing nations, there are a lot of myths about obstetric fistula. A few studies revealed that the majority of women of reproductive age thought that the condition was a result of the Gods punishment, and that it could also be brought on by evil spirits, bad luck, or culturally unacceptable behaviour by women [2,14–16]. Additionally, the majority of women of reproductive age who had obstetric fistulas thought that their disease was brought on by manipulations made by the traditional delivery attendant while attempting to deliver the dead foetus, or by the poison that was released from the dead foetus' skull bone [2,10].

Obstetric fistula can largely be avoided by delaying the age of first pregnancy; the cessation of harmful traditional practices; and timely access to obstetric care [17]. According to numerous studies, there are many major underlying causes of obstetric fistula, including a lack of skilled birth attendants, poor health-seeking behaviour, a lack of referral systems and transportation, media exposure, educational status, sexual violence, poverty, and not spacing out pregnancies [18–21]. In addition, lack of awareness of obstetric fistula prevention and treatment plays a significant role in the prevalence of the condition [22,23].

Due to the low awareness of obstetric fistula, women who have it may experience chronic pain, discomfort, and embarrassment that can make it difficult for them to go about their daily lives and lead normal lives. Additionally, because the condition is frequently linked to shame and blame, they may also experience discrimination and exclusion from their families and communities [24]. Because it may make it difficult for women to care for their children or seek treatment, this condition may also have greater implications for women's families and communities. The prevention and treatment of obstetric fistula depend on raising awareness and improving access to high-quality healthcare [25]. Women of reproductive age may be able to take the necessary preventive steps if they are adequately informed and aware of the fistula risk factors, causes, and available treatments [26]. Moreover, a clinical review study revealed that awareness of these risk factors should be used to reinforce the preventive strategy at the health facility and at the community level [12].

Studies in sub-Saharan Africa have shown that awareness of obstetric fistula among women of reproductive age varies significantly between studies, ranging from 12.8% in the Gambian study to 61.1% in the Tanzanian study [5,20,27–33]. The disparate findings from individual studies in SSA countries make it difficult to draw conclusions about the overall level of obstetric fistula awareness in the region. Further research is needed to understand the variability and awareness of obstetric fistula among women of reproductive age in sub-Saharan Africa, as previous studies have been limited by small sample sizes, inconsistent definitions, and varying study periods, varied quality, and the fact that the majority of the studies were carried out at a single center in a single country, which limits the ability of these studies to generalize beyond a very specific patient population and setting. Moreover, to the best of our knowledge, there is also a limited, comprehensive analysis of the available evidence on obstetric fistula awareness among women of reproductive age in sub-Saharan Africa.

Therefore, the main objective of this systematic review and meta-analysis was to ascertain the overall pooled obstetric fistula awareness and its variability in SSA countries. As a result, the current systematic review and meta-analysis can offer a thorough synthesis of the available information and pinpoint knowledge gaps. Finally, current and trustworthy information on obstetric fistula is necessary for policymakers and healthcare professionals to develop interventions and policies aimed at preventing and treating the condition. This information also helps them in developing, implementing, and evaluating health promotion policies and campaigns aimed at fighting and raising awareness of obstetric fistula.

## 2. Materials and methods

### 2.1. Study design and setting

Systematic review and meta-analysis was conducted to determine the pooled awareness of obstetric fistula among reproductive age women in sub-Saharan Africa in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria [34]. This systematic review and meta-analysis were registered on the PROSPERO International prospective register of systematic reviews with the registration number of **CRD42023388684**.

### 2.2. Search strategy and sources of information

The following databases were utilised to discover articles that assessed the awareness of obstetric fistula among women of reproductive age in sub-Saharan Africa: PubMed, Web of Science, Science Direct (Scopus), Google Scholar, and HINARI. Additionally, University websites were searched using the references to find unpublished articles such as academic dissertations and other grey literature. There was no restriction of the study period but the searches were carried out between October 2023 and February 2023. Search terms included both MESH terms and free text, such as "women of reproductive age group," "sub-Saharan Africa," "obstetric fistula awareness," and "obstetric fistula knowledge. Using Boolean operators like "OR" and "AND". PubMed/Medline was searched using the following terms: (Prevalence OR Magnitude OR Magnitude [MeSH Terms] AND Awareness OR Awareness [MeSH Terms] OR Knowledge OR Knowledge [MeSH Terms] AND Obstetric fistula OR Vulvovaginal fistula OR Vulvovaginal fistula [MeSH Terms] OR VVF OR Rectovaginal fistula OR Rectovaginal fistula [MeSH Terms] OR (RVF OR Vesico-uterine fistula OR Vesico-uterine fistula [MeSH Terms] OR VUF OR (Ureterovaginal fistula)) OR Ureterovaginal [MeSH Terms] OR UVF AND Women [MeSH Terms] OR Women OR Female [MeSH Terms] OR Female AND Reproductive age group [MeSH Terms] OR Reproductive age group OR (15–49 years old [MeSH Terms] OR (15–49 years old AND Sub-Saharan Africa [MeSH Terms] OR Sub-Saharan Africa OR SSA [MeSH Terms] OR SSA).

### 2.3. Study selection process

Before retrieving the full-text publications, three researchers (HEH, DSW, and TME) independently reviewed the titles and abstracts of the chosen studies. The condition, context, and population (CoCoPop) mnemonics were utilised in this study to formulate a precise and insightful study selection process. During a consensus meeting with the other reviewers (EA, MA, TLL and BGD), any disagreements on selection of studies was resolved through discussion. The collected studies were exported to the Endnote version reference manager software (version X7, for Windows, Thomson Reuters, Philadelphia, PA, USA) in order to remove duplicate studies and speed up the screening procedure.

### 2.4. Eligibility criteria

All cross-sectional, case-control, and cohort studies that met the following criteria were included: studies conducted in sub-Saharan African countries; studies conducted on the awareness of obstetric fistula; all women of reproductive age groups (i.e., literally age b/n 15–49 years); studies published in English; studies conducted in both health facilities and communities; and both published and unpublished studies.

We excluded duplicate studies, case studies, qualitative research, anonymous reports, citations without abstract and/or full-text, conference abstracts, and editorial reports from the analysis. But before eliminating the articles without full-text, we made at least two email attempts to get in touch with the main author (because we were unable to assess the quality of each article in the absence of full texts) and studies that did not report our outcome of interest were also disregarded after reading their complete texts.

### 2.5. Outcome measurement

The primary outcome variable of this study is the awareness of obstetric fistula among women of reproductive age, which is the percentage of women who are aware of obstetric fistula. The prevalence of awareness of obstetric fistula was calculated as the percentage of women who had awareness of obstetric fistula divided by the total number of women participating in the study who were of reproductive age group multiplied by 100.

### 2.6. Data extraction/abstraction

According to PRISMA [34] recommendations, three researchers (HEH, DSW, and TME) independently extracted the data from the studies that made up our study. The data extraction format was carefully designed and piloted, considering the inclusion criteria, to check consistency and make sure that all the relevant information was captured. The data were extracted using a standardised data extraction format that the authors created in a Microsoft Excel spreadsheet. The author's name, sample size, publication year, study design, prevalence rate (in percent) with 95% confidence interval, response rate (in percent), study settings (community vs facility), and country where the study was conducted are all included in the data extraction format. The original study was referred back in order to settle a data dispute that arose during the extraction procedure among data extractors and any differences between the three

investigators over data extraction were resolved by discussion and agreement.

2.7. Quality assessment

For cross-sectional and case-control studies, the Newcastle-Ottawa Quality Assessment Scale (NOS) [35] was used to rate the methodological quality of a study and establish how well it handled the possibility of bias in its planning, execution, and analysis. The following four main classifications were used by NOS tools to evaluate the quality and eligibility of the screened articles: Category I: Selection (5 points): The sample’s representativeness (1 point), the sampling method (1 point), the response rate (1 point), and the determination of exposure (2 points); Category II: Comparability (2 points): Confounding managed (data or results adjusted for significant predictors, risk variables, and confounders (2 points); category III: outcome; 3 points): rating of results (2 points) and statistical tests (1 point). Accordingly, studies with fewer than seven points were rated as low quality, while those with seven or more points were rated as high quality out of a possible ten, and high-quality articles were thought to have a low risk of bias; these articles were then taken into account in the meta-analysis. A study’s quality has been assessed by two independent authors (HEH and MA). There was always discussion to settle any disputes.

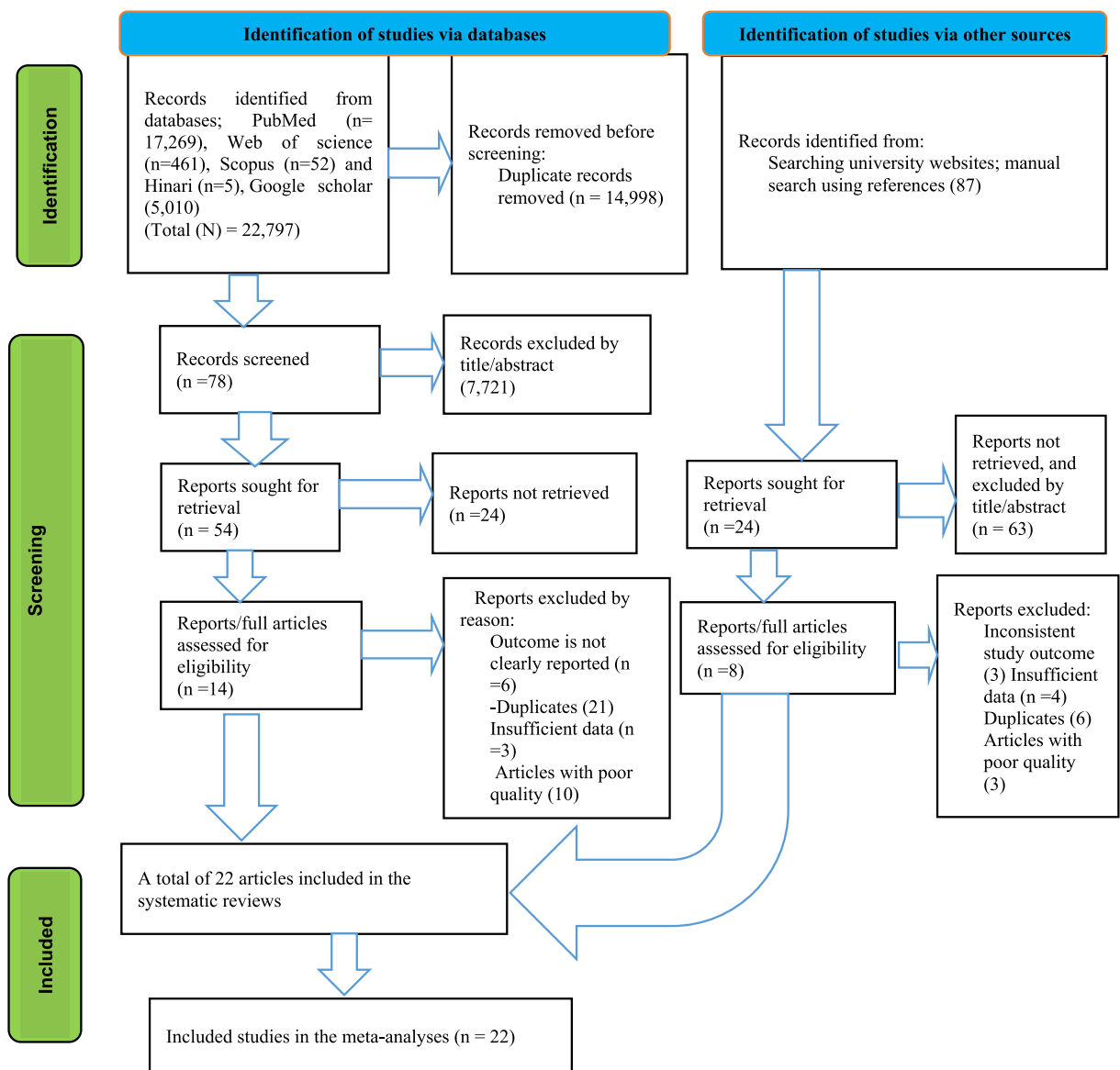


Fig. 1. PRISMA flow diagram describes the selection of studies for a systematic review and meta-analysis of awareness towards obstetric fistula among women’s of reproductive age in sub-Saharan Africa.



## 2.8. Statistical analysis

The Endnote Version 7 program was used to import articles that had been found through various search engines and delete duplicates. All data analyses were carried out in Stata Corporation, College Station, Texas, USA, software version 17, after the data were exported from Microsoft Excel (2010). Using the Q statistic and  $I^2$  statistics, we looked at the effect size heterogeneity [36]. The Q-test determines if the observed effect sizes vary significantly from one another in comparison to what would be predicted by chance. There is significant heterogeneity when the Q test is higher than the degree of freedom. The  $I^2$  statistics measure the percentage of overall variation from all included studies that was a factor in the observed heterogeneity. True homogeneity is shown by an  $I^2$  statistic value of zero, while low, medium, and high heterogeneity are indicated by values of 25, 50, and 75%, respectively [37].

The Cochran's Q test was used to confirm the presence of heterogeneity (a p-value less than 0.10 denotes statistically significant heterogeneity) [38,39]. Due to the highest degree of heterogeneity in the current study ( $I^2$  of 99.8%; p-value <0.001), we used a random effect model [36] to estimate the pooled awareness of obstetric fistula among women of reproductive age in SSA. In order to illustrate the calculated pooled awareness rate of obstetric fistula among women of reproductive age in SSA, the forest plot and 95% confidence interval (CI) were utilised.

Subgroup analysis based on the publication status, research locations (country), was done to further pinpoint the potential cause of heterogeneity across the studies and to control the publication bias. The presence of significant publication bias was measured using the funnel plot and Egger's regression tests (P-value < 0.05 was considered to be suggestive of statistically significant publication bias).

To ascertain the impact of individual studies on the pooled results, a leave-one-out sensitivity analysis was carried out. The trim-and-fill analysis was also done to assess for and adjust any publication bias based on the assumption that the effect sizes of all the studies are normally distributed around the centre of a funnel plot in the absence of publication bias. The trim-and-fill method is used to first trim the studies that cause asymmetry in the funnel's plot so that the overall effect estimate produced by the remaining studies can be considered minimally affected by publication bias, and then to fill imputed missing studies in the funnel plot [40]. Moreover, to look into possible causes of the between-study heterogeneity, meta-regression analysis was employed. Covariates include sample size, which is both continuous and categorical, as well as study location, publication status, and study setting, which is categorical, were subjected to multivariable analysis.

## 3. Result

### 3.1. Study selection and identification

Our searches of multiple electronic databases and other sources yielded a total of 22,884 articles. Using Endnote, We removed 14,998 duplicate articles and excluded 7,784 studies based on a review of their titles and abstracts, and 80 articles after reading the entire texts that had contradictory result reports, irrelevant target populations, and duplicates. Finally, this systematic review and

**Table 1**

Descriptive summary of 22 studies included in the meta-analysis of awareness towards obstetric fistula among women of reproductive age in sub-Saharan Africa, 2022.

Author	Publication year	Country	Study Setting	Sample size	Response rate (%)	Prevalence (%)	Data quality
Adane S et al. [48]	Unpublished	Ethiopia	Community – based	635	96.4	40.5	7
Afaya A et al. [27]	2022	Gambia	Community –based	12481	95	12.8	8
Alamirew W et al. [41]	2021	Ethiopia	Community –based	15683	100	38	8
Asfaha BT et al. [44]	Unpublished	Ethiopia	Community- based	605	100	42.2	6
Assefa Z et al. [32]	2020	Ethiopia	Community –based	422	100	42.8	7
Azanu WK et al. [20]	2020	Ghana	Facility – based	393	100	28.8	8
Balcha WF et al. [43]	2020	Ethiopia	Facility – based	413	100	39.5	7
Banke-Thomas AO et al. [5]	2013	Burkina Faso	Facility – based	126	96	36.4	8
Beyene FY et al. [46]	Unpublished	Ethiopia	Facility – based	413	100	39.5	6
Biadgilign S et al. [45]	2013	Ethiopia	Facility – based	14070	100	23.2	7
Catherine B et al. [29]	Unpublished	Uganda	Facility – based	322	100	33.5	7
Dejen MT et al. [42]	2022	Ethiopia	Community - based	784	98.6	36.4	9
Ezeonu PO et al. [33]	2017	Nigeria	Facility – based	204	100	57.8	7
Feyisa M et al. [49]	2021	Ethiopia	Community – based	395	100	41.3	8
Kazaura MR et al. [28]	2011	Tanzania	Community –based	450	74	61.1	6
Maeri JA [30].	Unpublished	Kenya	Community- based	422	92.18	44	7
Menelek E [50].	Unpublished	Ethiopia	Community -based	978	97.1	36	7
Morhason-Bello IO et al. [53]	2020	Nigeria	Community –based	26,585	99.8	52	9
Omari J et al. [52]	2015	Kenya	Facility – based	253	100	44.2	8
Rundasa et al. [31]	2021	Ethiopia	Facility - based	413	97	53	9
Saeed M F et al. [51]	2014	Ghana	Community- based	3224	82	45.8	6
Semira D [47].	Unpublished	Ethiopia	Community –based	422	95	53	7

meta-analysis comprised a total of 22 studies from eight sub-Saharan African nations that satisfied the inclusion requirements (Fig. 1)

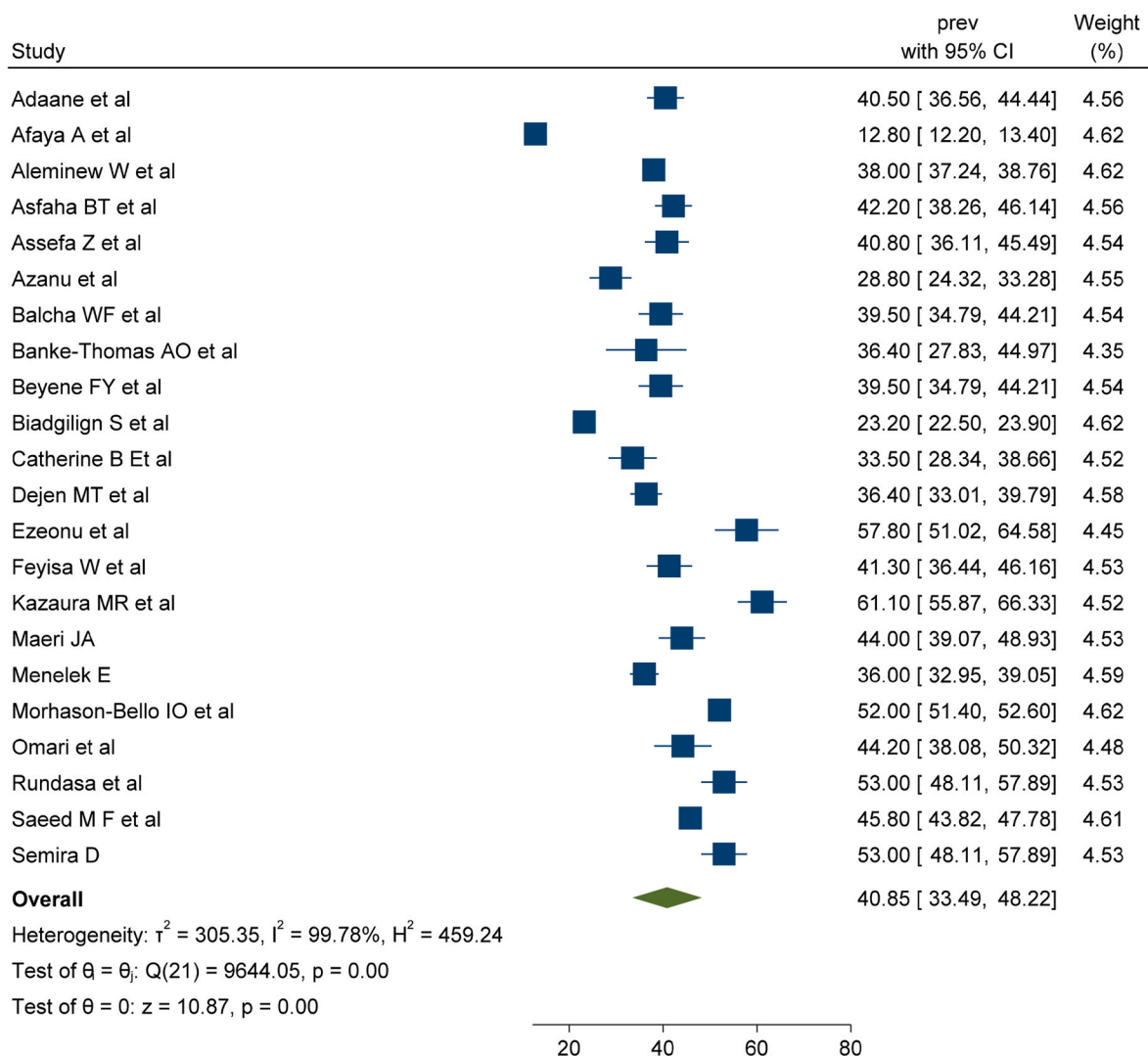
### 3.2. Characteristics of included studies

This meta-analysis included a total of 22 papers that employed a cross-sectional study design and were both published and unpublished (i.e., academic dissertations and other grey literature that were retrieved from the university websites utilizing the reference lists). In order to determine the pooled prevalence of obstetric fistula awareness in SSA, a total of 79693 women of reproductive age participated in these studies, with an estimated sample size range from 126 [5] up to 15683 [41].

Twelve of the articles focused on communities, while the other ten dealt with facilities. Out of the 22 articles, 12 were from Ethiopia [31,32,41–50], 2 were from Ghana [20,51], 2 were from Kenya [30,52], 2 were from Nigeria [33,53], 1 was from Tanzania [28], 1 was from Burkina Faso [5], 1 was from the Gambia [27], and 1 was from Uganda [29]. Seven of the studies that were selected were unpublished, while the remaining 15 studies were articles that had already been published. According to the studies that were reviewed, the percentage of SSA women in reproductive age who are aware of obstetric fistulas ranges from 12.8% [27], to 61.1% [28] (Table 1).

### 3.3. Pooled awareness of obstetric fistula among reproductive age women

The  $I^2$  test statistic results showed high heterogeneity ( $I^2 = 99.8\%$ ,  $p$ -value  $<0.001$ ), indicating that employing a fixed effects



Random-effects DerSimonian–Laird model

Fig. 2. Forest plot of the pooled prevalence of obstetric fistula awareness among women of reproductive age in sub-Saharan Africa.

model would have resulted in an incorrect estimate. In order to assess the pooled prevalence of awareness of obstetric fistula among women of reproductive age in sub-Saharan Africa, we employed a random effects model. High levels of heterogeneity in the primary studies also imply the necessity for subgroup analysis. Therefore, the results of the random effect model indicated that the pooled awareness of obstetric fistula among women of reproductive age in sub-Saharan Africa was 40.85% (95% CI: 33.49–48.22%) (Fig. 2).

### 3.4. Publication bias

A publication bias was not found, as demonstrated by the Begg rank correlation test ( $p = 0.735$ ). The Egger weighted regression, which was used in this systematic review and meta-analysis to test for publication bias, also revealed that there is no significant amount of publication bias (no-small-study effect) for the pooled awareness of women of reproductive age toward obstetric fistula in sub-Saharan Africa ( $P = 0.2520$ , 95% CI:  $-7.29$  to  $18.64$ ). In contrast, a funnel plot test that was performed to visually assess the distribution of awareness of obstetric fistula among women of reproductive age in SSA countries revealed an asymmetric distribution, which is an indicator of publication bias (Fig. 3).

### 3.5. Trim-and-fill analysis for awareness of women of reproductive age towards obstetric fistula

In order to decrease and correct the publication bias in the research, a trim-and-fill analysis was done to identify any probable missing studies. As a result, no studies were imputed, and no detectable changes in the overall results were seen. Furthermore, the estimated pooled awareness of women of reproductive age towards obstetric fistula appeared to be 40.85% (95% CI: 33.49–48.22%) in the trim and fill analysis, which is consistent with the unadjusted pooled awareness in the random-effects model (Table 2).

### 3.6. Subgroup analysis for the pooled awareness of obstetric fistula

To evaluate the potential heterogeneity between studies, subgroup analyses were performed by study setting, publication status and countries of research conducted. The pooled awareness of obstetric fistula in unpublished studies was nearly identical to that in published papers, although they had lower heterogeneity [41.17%, 95% CI: 36.85 to 45.49;  $I^2 = 86.16\%$ ,  $p$ -value  $<0.001$ ] than published articles (Fig. 4). In the sub-group analysis based on study setting, of the 22 articles, studies carried out in the community settings had nearly similar level of awareness of obstetric fistula among women of reproductive age (41.80%, 95%CI: 31.01–52.60%;  $I^2 = 99.86\%$ ,  $p$ -value  $<0.001$ ) (Fig. 5).

Based on the subgroup analysis divided by countries, a study conducted in Tanzania showed the highest level of obstetric fistula awareness among women of reproductive age (61.10%, 95%CI: 55.87–66.33%), followed by Nigerian (53.88%, 95%CI: 48.56%–59.19%), Kenyan (44.08%, 95%: 40.24%–47.92%), and Ethiopian (40.17%, 95%CI: 34.29–46.05%) studies. In addition, the Gambia-based study (12.80%, 95%CI: 12.20–13.40%) found the lowest level of awareness (Fig. 6).

According to a subgroup analysis of the studies' geographical locations, more studies (16) came from eastern than from western Africa (6). For eastern and western Africa, the subtotal pooled obstetric fistula awareness was 41.53% (95% CI: 36.25%–46.80%) and 38.90% (95% CI: 18.01%–59.71%), respectively. The heterogeneity between studies geographical locations was significant ( $p$  - value

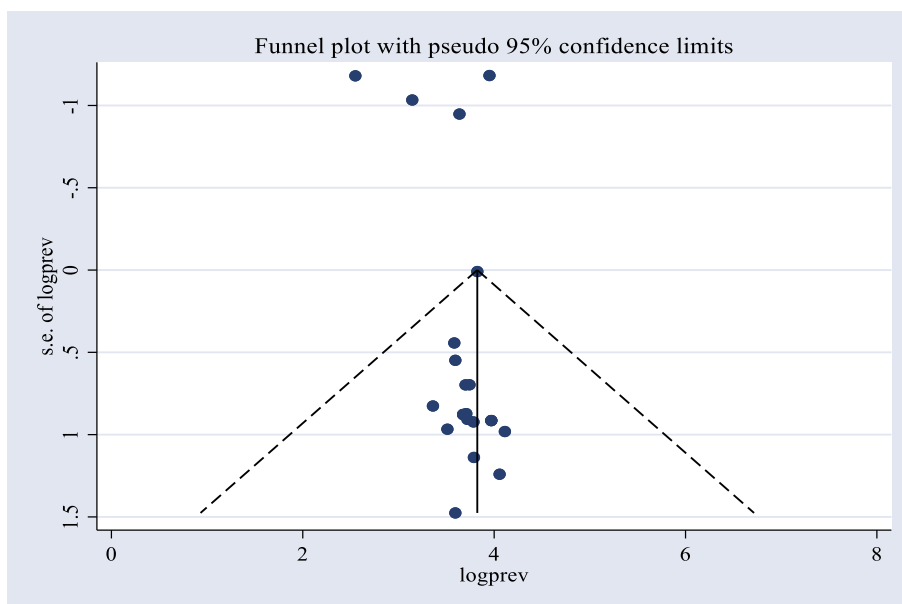


Fig. 3. Funnel plot test for the study of the pooled awareness of reproductive age women towards obstetric fistula in sub-Saharan Africa, 2022.

**Table 2**  
Trim-and-fill analysis for awareness of obstetric fistula among women of reproductive age in Sub-Saharan Africa.

Nonparametric trim-and-fill analysis of publication bias		
Linear estimator, imputing on the left		
Iteration Number of studies = 22		
Model: Random-effects observed = 22		
Method: DerSimonian-Laird imputed = 0		
Pooling		
Model: Random-effects		
Method: DerSimonian-Laird		
Studies	Prev	95% CI
Observed	40.854	33.489 to 48.219
Observed + Imputed	40.854	33.489 to 48.219

< 0.001) (Fig. 7).

### 3.7. Meta-regression analysis

In addition to sub-group analysis and publication bias, we also make an effort to analyse sources heterogeneity using a meta-regression model using the country's geographic location, sample size, publishing status, and study setting as factors. The independent effect size and continuous variables were evaluated to see if there was a linear relationship. The Univariate meta-regression revealed that sample size (continuous), publication status, study setting, and geographical location are not significantly related to the pooled prevalence of obstetric fistula awareness among women of reproductive age. However, the categorical sample size was shown to have contributed to the heterogeneity of studies in the Univariate meta-regression analysis. Studies with mean sample sizes greater than 3542 compared to studies with sample sizes less than or equal to 3542 would have a factor of 0.424 lower likelihood of obstetric fistula awareness among women of reproductive age ( $\beta = -0.424$  (95% CI:  $-0.767$  to  $0.081$ ),  $p$ -value < 0.05) (Table 3).

### 3.8. Sensitivity analysis

A sensitivity analysis was performed using a random effect model to determine whether the results of just one study had an influence on the pooled awareness of women of reproductive age regarding obstetric fistula. Sensitivity analysis showed that no single study had an impact on sub-Saharan women of reproductive age's pooled awareness of obstetric fistula (Fig. 8).

## 4. Discussion

Obstetric fistula is a public health and human rights issue that is often neglected. It is almost entirely found in low resource regions including Sub-Saharan Africa [54]. One of the sustainable development goals is to eliminate obstetric fistulas by 2030 [42,54]. As a result, the study's findings will help reach Sustainable Development Goal (SDG) 3.1, which aimed to reduce the global maternal death ratio to fewer than 70 per 100,000 live births by 2030 [55].

In this study, the pooled awareness obstetric fistula among women of reproductive age across studies conducted in sub-Saharan Africa (SSA) was 40.85% (95% CI: 33.48, 48.22%). This finding was consistent with research utilizing Demographic and Health Surveys (DHS) from 14 sub-Saharan African countries, which estimated that, on average, 37.9% of women of reproductive age were aware of obstetric fistulas [56], with research done in Nepal, where 39.8% of people are at least somewhat aware of obstetric fistula [57], and with studies done in Pakistan, where 38.2% of women were well aware of obstetric fistula [58].

It is lower than a survey that found 72.99% of respondents in the Municipality of Kapilvastu in the Lumbini Province in southern Nepal were aware of obstetric fistula [59]. The discrepancy between our estimated pooled estimate of obstetric fistula awareness and the earlier study may be due to the difference in sample size. A lack of effective and thorough reproductive health education or poor literacy rates in the SSA community may also contribute to the low level of women's awareness of obstetric fistula. This finding suggests that low awareness of obstetric fistula may lead women with the condition to remain at home untreated, as they may not be aware of available treatment options. Therefore, there is a pressing need for national public health intervention to increase awareness about fistula, ultimately enabling women to protect themselves and seek treatment quickly if they develop it.

The sub-group analysis among studies conducted in SSA revealed heterogeneity in the pooled estimates of obstetric fistula awareness across different countries in the region. Compared to a single study conducted in Gambia, which found the lowest level of awareness (12.8%) [27], studies in Tanzania yielded the highest level of pooled obstetric fistula awareness among reproductive women (61.10%) [28], followed by studies in Nigeria (53.88%) [33,53], Kenya (44.08%) [30,52], and Ethiopia (40.17%) [31,32, 41–50].

Additionally, a subgroup analysis result revealed that the prevalence of obstetric fistula awareness was 41.53% and 38.90%, respectively, by classifying research areas as being in eastern or western Africa. The disparity may be due to differences in the frequency of OBF awareness programs in each country. For example, in certain countries, the government often educates people about obstetric fistula through broadcast as well as through local health teams [60]. In general, the sub-group analysis by countries revealed

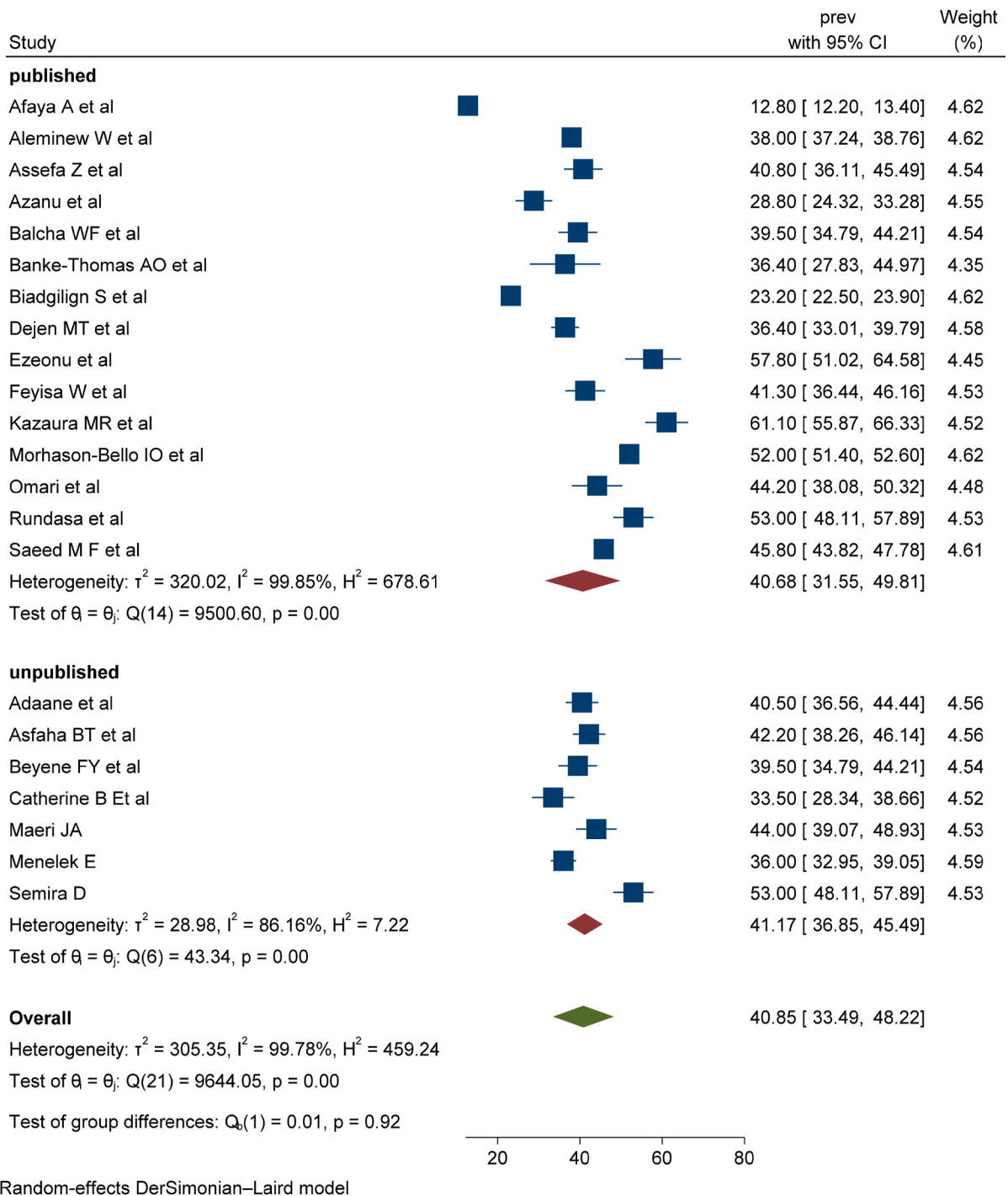


Fig. 4. Sub-group analysis of the pooled awareness of reproductive age women towards obstetric fistula in sub-Saharan Africa by publication status.

that the pooled level of obstetric fistula awareness in SSA is typically below 50%. This shows the importance of implementing initiatives that are suited to each country to enhance women’s awareness about obstetric fistula.

Early detection, reporting, and treatment of obstetric fistula are hampered by a lack of awareness about its indications and symptoms [8], and women who are less informed about the condition are also more likely to have negative effects like mental health issues [61]. The results of this study had clinical implications that highlight the importance of awareness about obstetric fistula among women of reproductive age in SSA so that healthcare providers and support groups can better address the problem through primary prevention efforts by informing women about the causes, symptoms, and prevention of obstetric fistula and encouraging women of

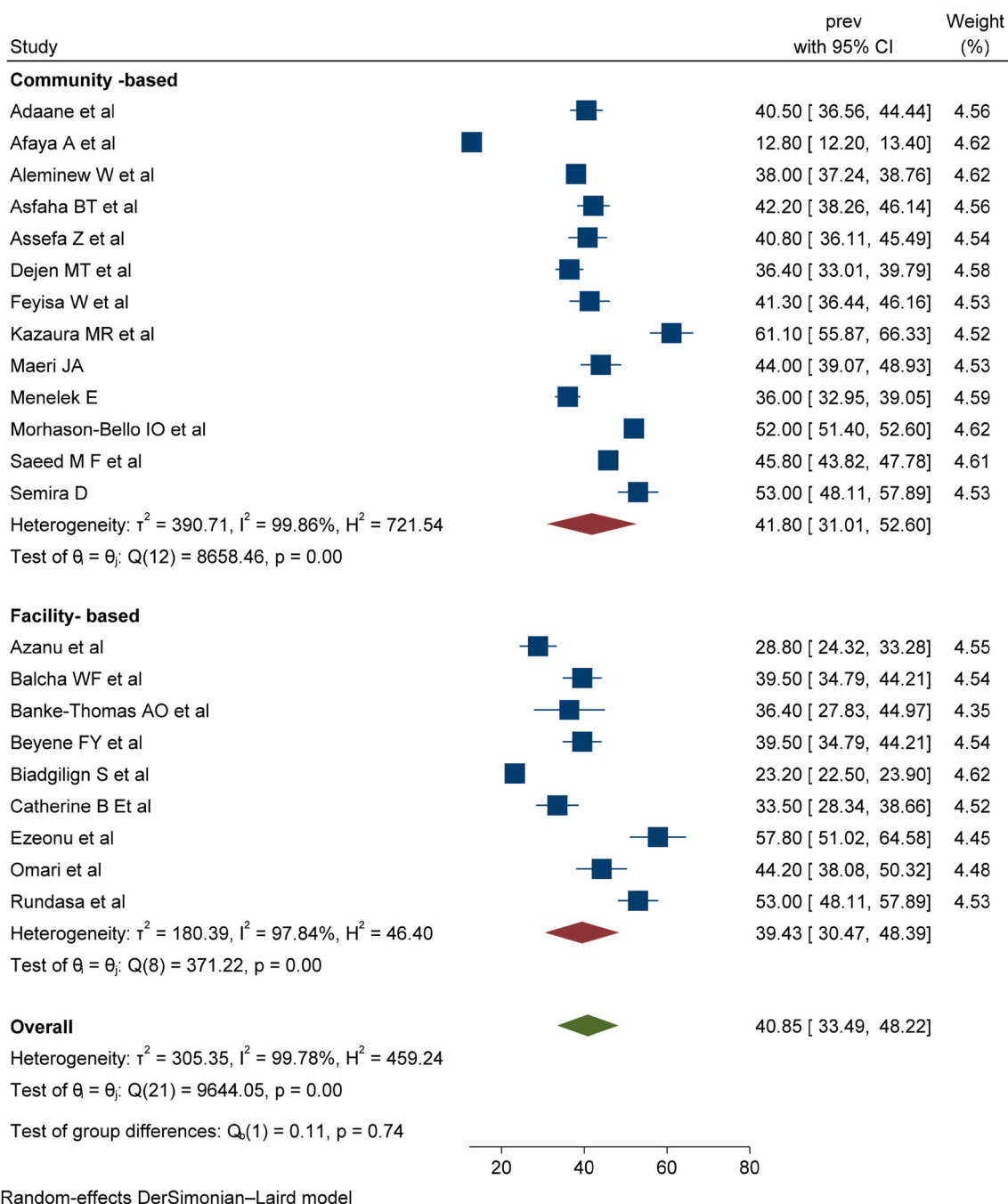
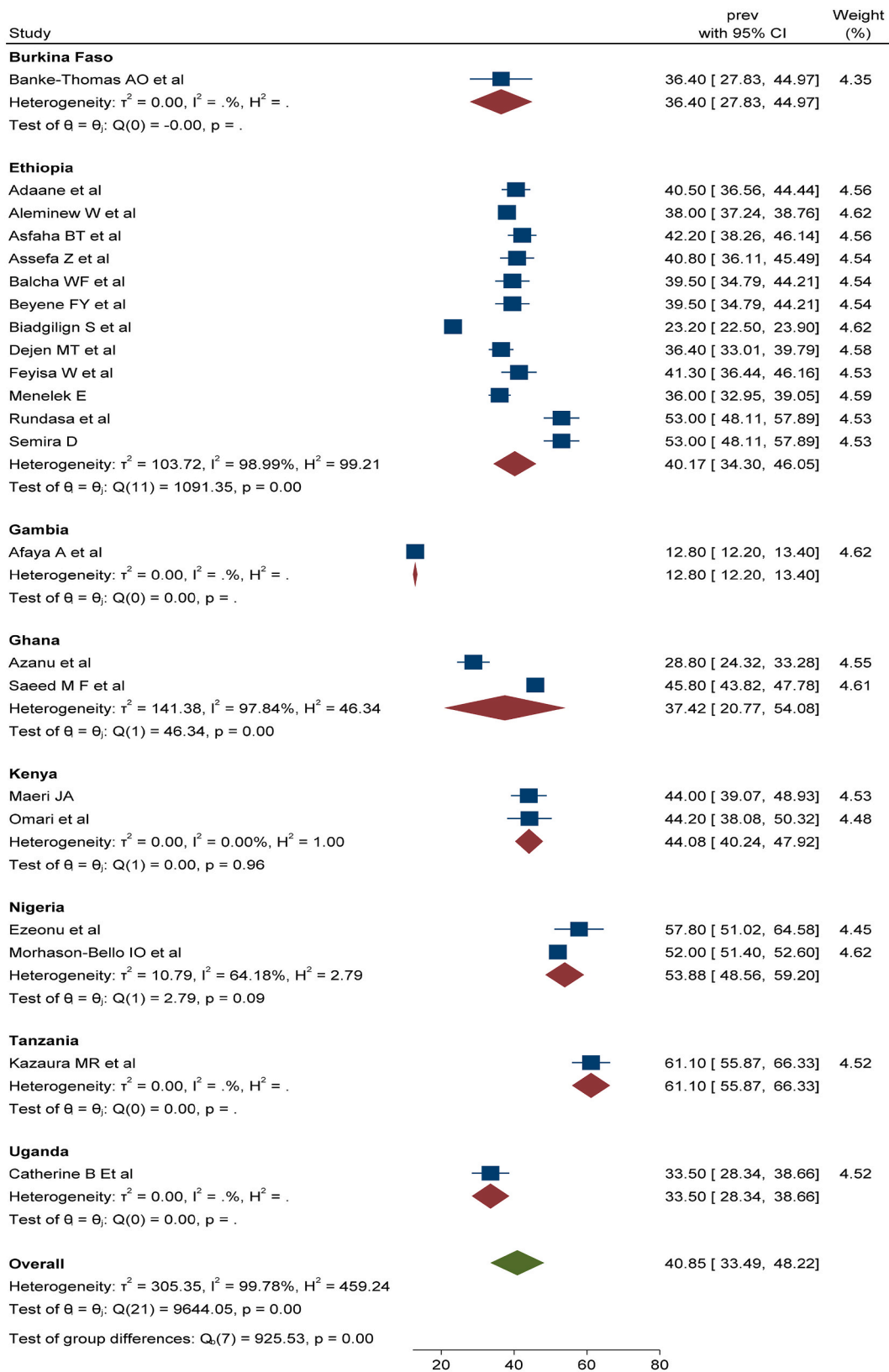


Fig. 5. Sub-group analysis of the pooled awareness of reproductive age women towards obstetric fistula in sub-Saharan Africa by study setting.

reproductive age to receive comprehensive antenatal care throughout their pregnancies, which is an important step in preventing obstetric fistula.

Our study demonstrated that there is considerable variation in the awareness of obstetric fistula among women of reproductive age in SSA countries, emphasizing the need for targeted interventions to increase awareness and foster prevention efforts. Obstetric fistula is frequently undervalued by policymakers in the field of safe motherhood, both in terms of its severity and the number of cases it results in. Increased awareness may make people more prepared to assume more responsibility for prevention, and governments and politicians should prioritise obstetric fistula prevention and treatment by creating policies that support access to high-quality maternal health care services, such as prevention and treatment services. Community leaders can also play a critical role in prevention initiatives if they are prepared to advocate for delaying marriage and childbirth until later in life, and support programs that provide

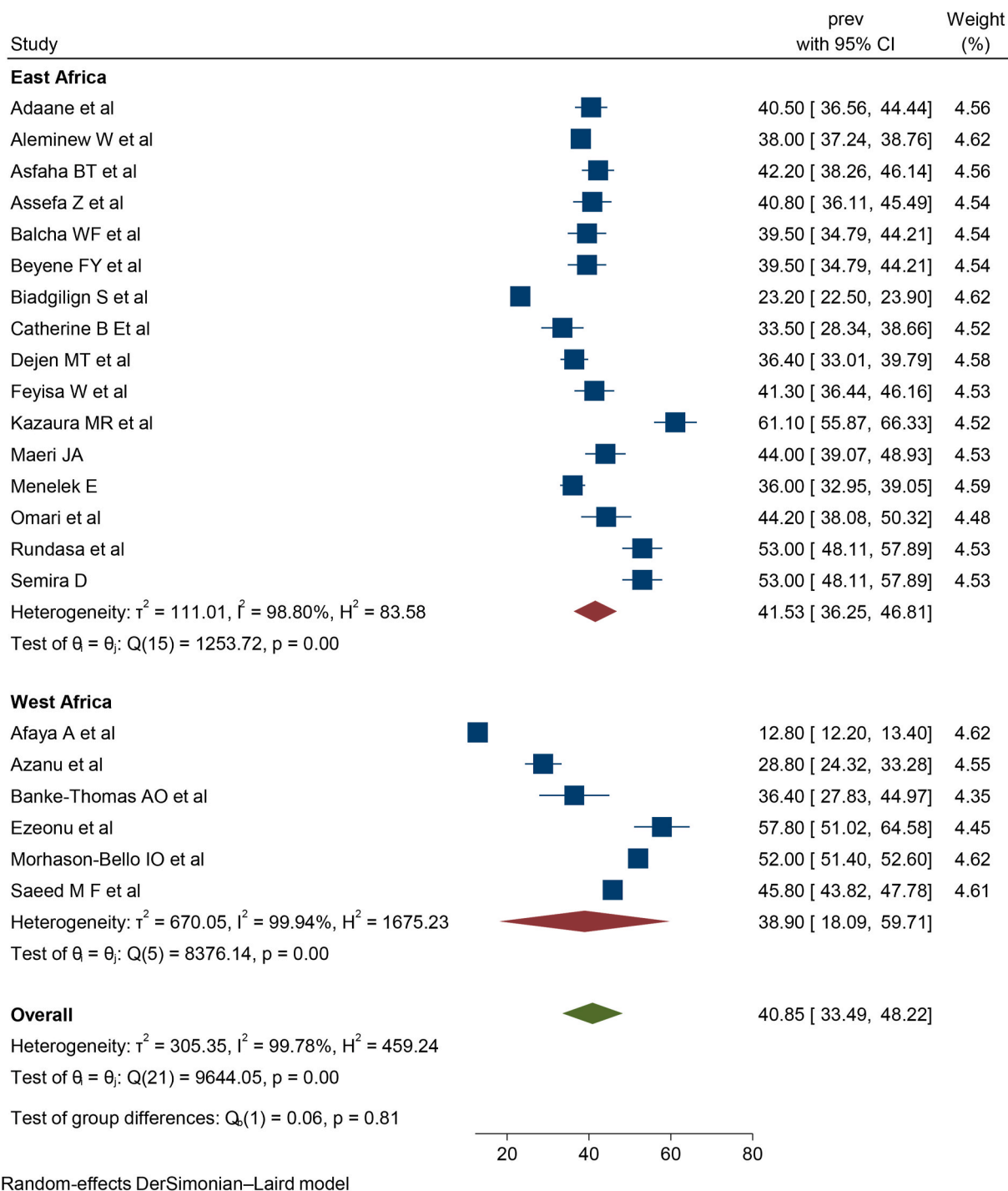




Random-effects DerSimonian–Laird model

(caption on next page)

**Fig. 6.** Sub-group analysis of the pooled awareness of reproductive age women towards obstetric fistula in sub-Saharan Africa by countries of study origin.



**Fig. 7.** Sub-group analysis by studies geographical location of the pooled awareness of reproductive age women towards obstetric fistula in sub-Saharan Africa.

**Table 3**  
Univariate Meta regression analysis on the prevalence of obstetric fistula awareness among reproductive age women in Sub - Saharan Africa.

Variables	Coefficient	P- value	95% CI
<b>Study setting</b>			
Community based	Reference		
Facility based	-2.313	0.784	-18.864 to 14.238
<b>Sample size (continuous)</b>	-0.000	0.554	-0.001 to 0.000
<b>Sample size (categorical)</b>			
≤3542	Reference		
>3542	-0.424	0.001	-0.767 to 0.081
<b>Publication status</b>			
Unpublished	Reference		
Published	-0.559921	0.945	- 16.434 to 15.314
<b>Geographical location</b>			
East Africa	Reference		
West Africa	-2.726	0.779	-21.774 to 16.321

transportation for women to health facilities [62].

Therefore, increasing women's awareness of obstetric fistula decreases the risk that they would delay receiving care for obstetric fistula [8] and has an impact on lowering maternal and perinatal mortality. Moreover, the results of our study will add to the body of literature around the world and make recommendations for further research. Future studies can look into the causes of the differences in obstetric fistula awareness between sub-Saharan African nations. Research may also be done to find the best means of informing women about obstetric fistula in low-income settings, demonstrating the need for more intense awareness and education campaigns.

#### 4.1. Limitation of the study

These studies have certain limitations, such as the usage of papers written in the English language, the fact that they are all cross-sectional studies, and the absence of the majority of sub-Saharan African nations due to a lack of research. Additionally, the study's inclusion of unpublished studies might be constrained by the fact that some unpublished manuscripts might not ultimately fulfil the standards of a good peer-reviewed journal.

## 5. Conclusion

This research revealed that less than half of women were aware of obstetric fistula in SSA. According to sub-group analysis there is also variation among study locations, publication status, and study settings. Considering this data, policy makers and maternal health providers should put interventional measures in place aimed at raising women's awareness of obstetric fistula in order to lower maternal mortality and morbidity by shortening the time it takes for women to seek obstetric fistula treatment. Furthermore, we stress the need for nation-specific public health programs to increase women's awareness of obstetric fistula because more informed women may be better equipped to contribute more to prevention. Community leaders can also play a significant role in prevention efforts if they are willing to promote delaying marriage and childbirth until later in life and support programs that transport women to health facilities.

### Author contribution statement

Habtamu Endashaw Hareru: conceived and designed the experiments; performed the experiments; analysed and interpreted the data; contributed reagents, materials, analysis tools or data; wrote the paper.

Eden Ashenafi; Temesgen Muche Ewunie: analysed and interpreted the data; wrote the paper.

Daniel Sisay Wtsadik ; Berhanu Gidisa Debela; Temesgen Leka Lerango; Mesfin Abebe: contributed reagents, materials, analysis tools, or data; wrote the paper.

### Data availability statement

Data will be made available on request.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

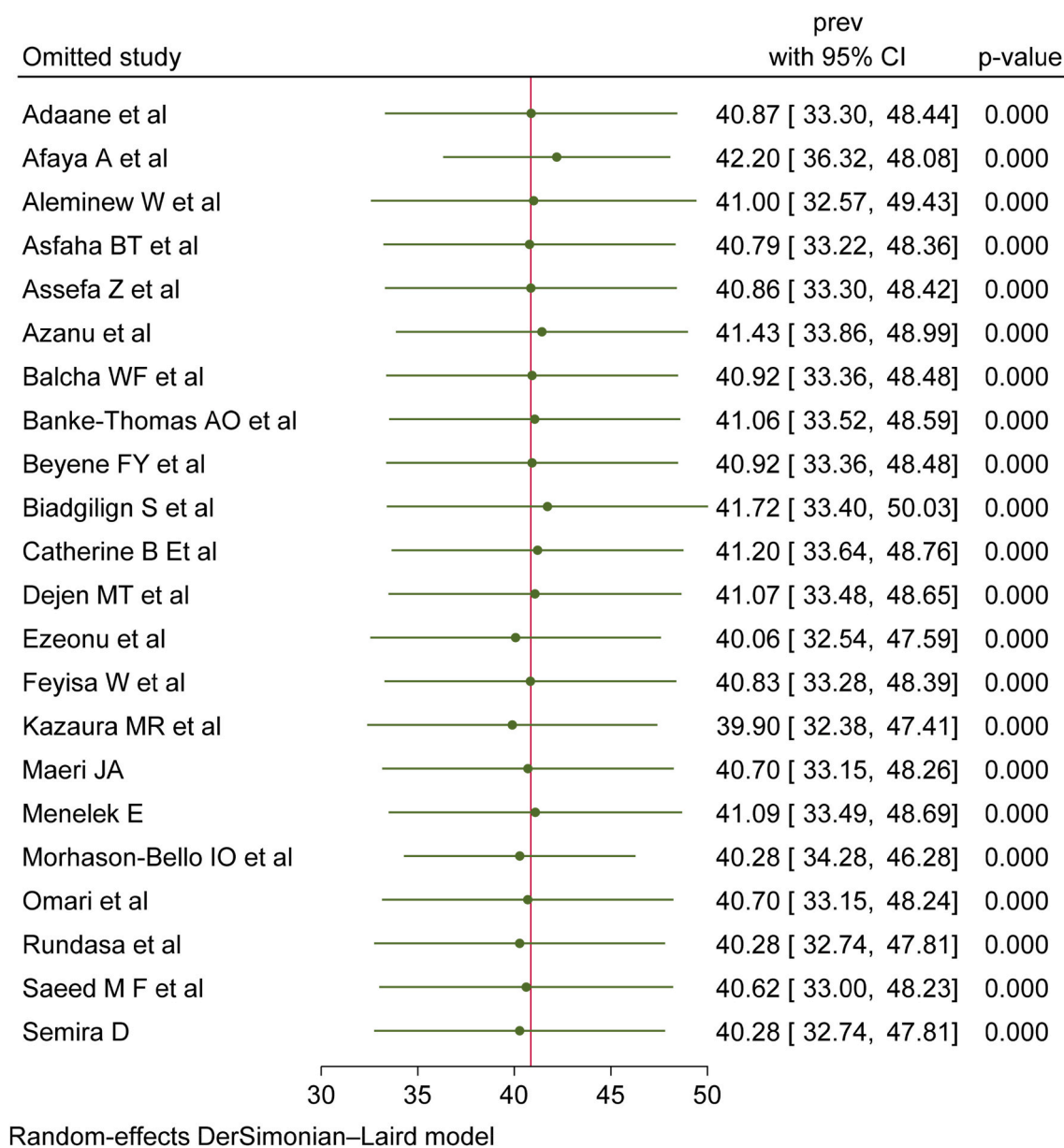


Fig. 8. Sensitivity analysis for the study of the pooled awareness of reproductive age women towards obstetric fistula in sub-Saharan Africa.

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### Abbreviations

CI	Confidence Interval
DHS	Demographic and Health Surveys
NOS	Newcastle-Ottawa Quality Assessment Scale
PRISMA	The Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SSA	Sub Saharan Africa
SDG	Sustainable Development Goal
WHO	World Health Organization

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e18126>.

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