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Prevalence and associated risk factors for failed obstetric fistula repair in East African countries: A systematic review and meta-analysis

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Abstract

Objective: Obstetric fistula repair failure is a combination of unsuccessful fistula closure and/or incontinence following a successful closure. There is an inconsistent finding on the failure of obstetric fistula repair in East Africa. Therefore, this systematic review and meta-analysis aimed to determine the pooled prevalence of failed obstetric fistula repair and its associated factors among women who have undergone fistula repair in East Africa.

Methods: This systematic review and meta-analysis were written following the PRISMA guideline protocol. A web-based electronic search of PubMed, Google Scholar, and HINARI was performed to find primary studies. Additional articles were searched by cross-referencing references. A random-effects model was used to estimate the pooled prevalence of failed obstetric fistula repair. The heterogeneity of studies was weighed using I^2 test statistics. Publication bias was assessed by Eggers and funnel plot test.

Results: The 16 studies that met the inclusion criteria for this systematic review and meta-analysis of failed obstetric fistula repair were included. Nonetheless, one study was used for factor analysis but not in pooled prevalence analysis. The pooled prevalence of obstetric fistula repair failure in East Africa was 26.89% (95% confidence interval: 21.71, 32.07). Labor duration $>$ 48 h (Pooled odds ratio = 2.46; 95% confidence interval 1.58, 3.82), fistula size $>$3 cm (Pooled odds ratio = 3.92; 95% confidence interval 2.19, 7.05), previous fistula repair (Pooled odds ratio = 3.20; 95% confidence interval 1.94, 5.29), Goh Type 4 fistulas (Pooled odds ratio = 6.07; 95% confidence interval 2.50, 14.75), completely destructed urethra (Pooled odds ratio = 3.35; 95% confidence interval 1.69, 6.65), and severe vaginal scaring (Pooled odds ratio = 3.89; 95% confidence interval 1.99, 7.62) were significantly associated with obstetric fistula repair failure.

Conclusions: One in four women with obstetric fistula repair experienced repair failure. To fight the problem The Ministry of Health in every part of the country, in collaboration with obstetric care providers, shall intervene on factors affecting obstetric fistula repair failure to reduce or prevent the failure of obstetric fistula repair.

Keywords

Obstetric fistula repair failure, obstetric fistula, obstetric fistula repair, prevalence, East Africa

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Introduction

Obstetric fistula is a debilitating condition that affects an estimated 2 million women worldwide.[1,2] It is an abnormal opening between the vagina and bladder (vesicovaginal fistula (VVF)) and/or the rectum (rectovaginal fistula (RVF)) or both.[3] Obstetric fistula is a maternal morbidity with devastating effects on a woman's life that primarily follows obstructed labor.[4,5] It causes women to experience persistent urinary and/or fecal incontinence through the vagina,[6] which can lead to other complications such as infection, genital ulcers, pain, and secondary infertility.[7] This subsequently leads to community ostracism, depression, and abandonment by husbands and families.[1,8]

The majority of obstetric fistulas are managed primarily by surgical closure. There are three possible outcomes for women who underwent an obstetric fistula repair. These are closed fistula and continent (or closed and dry), failed fistula closure, and incontinence after a successful fistula closure. Successful surgical repair was defined anatomically as closure of the fistula and functionally as the absence of urinary and/or fecal incontinence following surgery.[9] However, the combination of unfavorable repair outcomes of failed fistula closure and incontinence after the successful closure indicates failure of obstetric fistula repair.[10] World Health Organization (WHO) set a goal of more than 85% successful fistula closure after repair and less than 10% for incontinence after successful fistula closure as the ideal range of repair outcomes to determine the level of quality of services given to patients.[3]

Women who have fistula repair failure must undergo another surgery and this presents an additional social and economic burden on the woman and fistula care program.[11,12] Goh et al. has developed a classification system that is useful in predicting successful closure and residual incontinence after closure.[13] Goh type of classification is the classification system, which measures the distance of the distal edge of fistula from the external urethral meatus (for VVF) or the hymen (for RVF).[14] Success rates following repair can reach 90%, but they differ from one repair institution to another.[15,16]

Successful closure of the repaired fistula has been shown to have a positive impact on women's overall well-being or quality of life and represents a rebirth for women with fistula.[17] The success rate after repair of obstetric fistula varies from center to center and depends on several factors, including preoperative evaluation, good visualization, good dissection, good homeostasis, removal of a foreign body, resection of devascularized tissue, excision of surrounding fibrous tissue, tension-free approximation of fistula edges, watertight closure, and adequate postoperative urinary drainage.[17,18]

Factors that contribute to failed repaired fistula include fistula characteristics such as large fistula size Goh Type 3 or Type 4 fistula,[13,19] history of the previous repair,[5,16] urethral damage,[19,20] circumferential fistula,[21] and moderate-to-severe vaginal scarring.[20,22] In addition, preoperative factors such as surgeons' experience, abdominal repair, duration of bladder catheterization, and postoperative infection were considered as contributing factors to repair failure.[3,23]

There are primary studies at different regions of the East Africa with variable findings. This study provides information on the status of obstetric fistula repair failures for obstetric care providers, policy planners, ministries of health, and relevant stakeholders to improve the quality of care in repairing hospitals. Therefore, this study aims to summarize recent evidence on the prevalence of obstetric fistula repair failure and its associated factors in East Africa.

Methods

This study was conducted according to the Preferred Reporting Items of Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) checklist or guidelines.[24]

Eligibility criteria

Inclusion criteria

Study designs: For this review, we included all observational studies reporting the prevalence of obstetric fistula repair failure or associated risk factors in East Africa (Burundi, Djibouti, Ethiopia, Eritrea, Kenya, Rwanda, Somalia, Sudan, Tanzania, and Uganda).

Setting: There was no restriction by type of setting

Publication condition: This review included published and unpublished studies from any period (the study period was not restricted for inclusion).

Language: Only articles reported in English were considered.

Exclusion criteria

Case reports, anonymous reports, editorials, and conferences were excluded. In addition, studies that did not contain appropriate prevalence data, for example, review articles or studies that provide only calculated estimates (without reporting appropriate numerator/denominator) were excluded.

Information sources and search strategy

A comprehensive search was performed in the following databases for potential studies: MEDLINE/PubMed, HINARI, and Google Scholar. In addition, articles were also searched through a review of the gray literature available on local universities, institutional repositories, and by reviewing the reference lists of already identified articles. The search terms: like, "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Ethiopia," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Burundi," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND

"repair" AND "Djibouti," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Eritrea," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Kenya," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Rwanda," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Somalia," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Sudan," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Tanzania," "obstetric fistula" OR "vesicovaginal fistula" OR "urinary fistula" AND "repair" AND "Uganda" were used separately for each East African country and in combination. The search terms were combined using Boolean operators such as "AND" and "OR": "within each axis we combined keywords with the 'OR' operator and we then linked the search strategies with the 'AND' operator to search studies conducted specifically for each East Africa countries." The appropriateness of key terms was verified before the actual search. All studies conducted in East African countries reporting the prevalence of obstetric fistula repair failure or at least one adjusted factor associated with obstetric fistula repair failure were included in this review. Electronic database searches were conducted from 31 August 2022 to 8 November 2022.

Study selection

After retrieving all studies from the databases, we exported citations to the Endnote™ X7 citation manager software, to remove duplicate studies. Three reviewers (NE, KS, and CK) independently screened the title and abstract of the included studies against the predefined eligibility criteria. In the event of a disagreement, a consensus was reached to read the full lengths of the articles. If the disputes persist, the author (TM) was consulted for the final decision.

Data collection process

After the inclusion of eligible studies, three reviewers (NE, KS, and CK) independently extracted all essential data using a Microsoft Excel™ spreadsheet. The data extraction format included first author, study country, publication year, sample size, study setting, study design, response rate, prevalence, and associated factors (adjusted odds ratio with a confidence interval of the variables were taken based on available literature). The extracted data were imported into STATA version 14 (StataCorp LP.2015, College Station, TX, USA for data analysis.

Outcome

This study has two outcomes. The primary outcome was to determine the pooled prevalence of failed obstetric fistula repairs among women who have undergone repairs in East Africa. It was calculated by dividing the number of participants by the total sample size multiplied by 100. A second outcome of the study was to identify associated factors of failed obstetric fistula repair among women who have undergone repair in East Africa. This was determined by extracting the odd ratio of factors associated with obstetric fistula repair in the primary studies.

Risk of bias assessment

We used the Joanna Briggs Institute's (JBI) quality appraisal checklist to examine the methodological qualities of the included studies.[25] The checklist contains nine items. Remarkably, two authors (NE and KS) independently evaluated the quality of each study using the template. The discrepancies that occurred between the authors were solved based on discussions and/or by taking the average score of the two authors. The study was given a score of either "1" if it fulfilled the prespecified criteria or "0" if not. Otherwise, it will be said "unclear" if it is so. The study was considered low risk if the study scored points of five and above in all quality assessment items. The study was deemed high risk if it received below five points on all quality evaluation criteria.

Statistical analysis

We analyzed the prevalence report and their confidence interval to pool the overall prevalence of failed obstetric fistula repair. The adjusted odds ratio and its corresponding standard error of the covariates were extracted and transformed to natural logarithm to normalize the distribution and stabilize the variance. Then, the pooled odds ratios (PORs) of the covariates were used to determine the associations between dependent and independent variables. Due to possible heterogeneity between studies, the random-effects model was used to estimate the pooled odds ratio and their 95% confidence interval, and forest plots were used to present results. Heterogeneity tests were assessed using the I^2 statistic tests of the included studies. The I^2 test statistics of 25%, 50%, and 75% were declared as low, moderate, and high heterogeneity, respectively.[26] The publication bias was assessed using Egger's regression test and funnel plot. A funnel plot asymmetry and Egger's regression test with a p-value of <0.05 were suggestive of publication bias. Subgroup analyses were done by publication years, study design, and countries. We then conducted sensitivity analyses, excluding each study separately and recalculating the pooled effect size estimates for the remaining studies to ascertain how each study affected the pooled results. STATA version 14 software (StataCorp LP.2015, College Station, TX, USA) was used for all statistical analyses.

Results

Selection of the studies

The database search and desk review yielded a total of 322 articles. Of these 141 articles were removed due to duplication reasons. Then, 146 articles were excluded after reviewing the titles

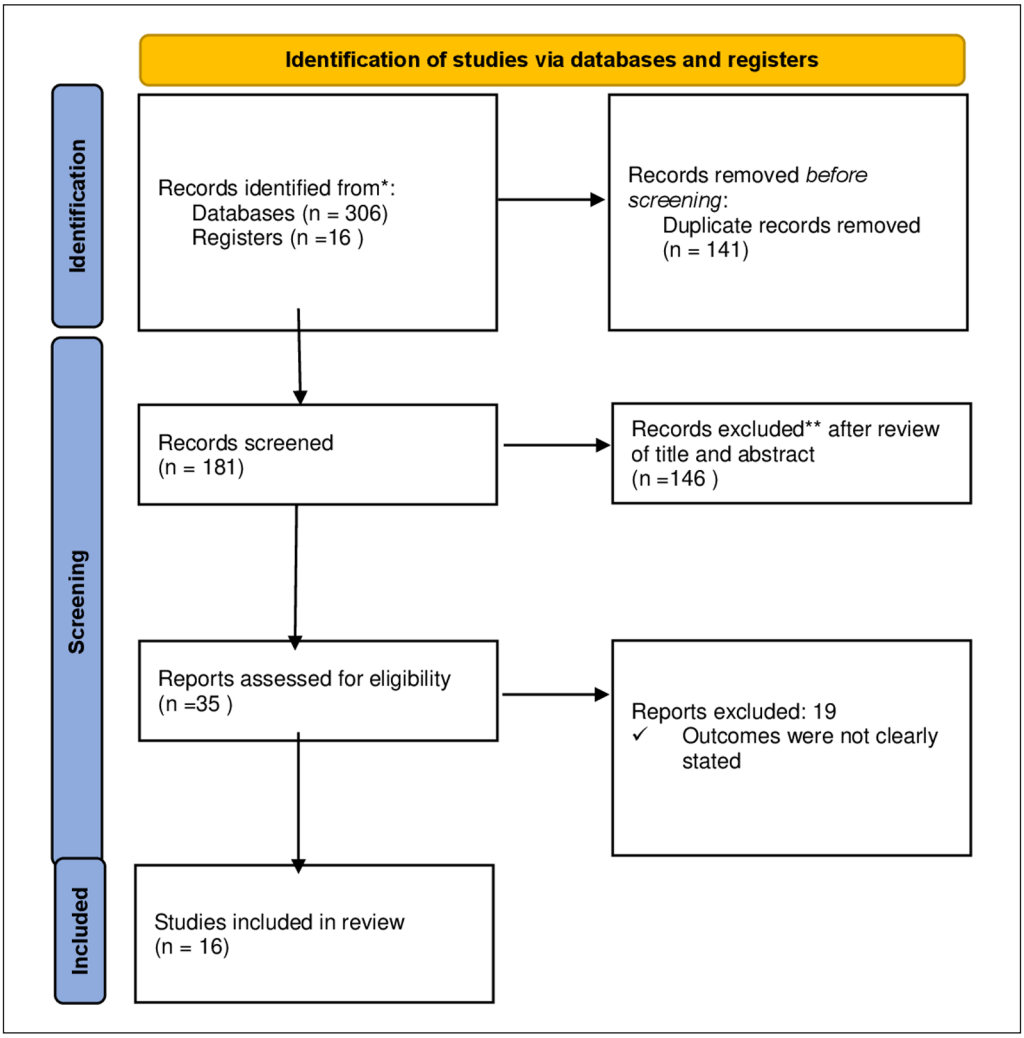

Figure 1. PRISMA flowchart of the article selection process for systematic review and meta-analysis of the obstetric fistula repair failure.

and abstracts of the remained 181 articles. The full text of the remaining 35 articles was downloaded and assessed for eligibility. An additional 19 articles whose outcomes were not clearly defined were excluded. The remaining 16 studies that fulfilled the inclusion criteria were included in the analysis. Finally, the remaining 16 studies that met the inclusion criteria were included in the analysis. Nonetheless, one study was used for factor analysis but not in pooled prevalence analysis[12] (Figure 1).

Characteristics of the included studies

As described in Table 1, a total of 16 studies comprising 6254 participants were included in the final meta-analysis. Of all studies included, six studies were from Ethiopia,[13,22,27–30] one from Eritrea,[31] two from Kenya,[12,32] two from Burundi,[33,34] two from Tanzania,[35,36] one from Rwanda,[19] and two from the Uganda.[21,37] Regarding the year of publications, the earliest article included in this meta-analysis was published in 2003[29] and the most recent was published in 2022.[30] The qualities of articles were also assessed using the JBI checklist, and 1 article had high risk and 14 articles were categorized under low risk (Table 1).

The pooled prevalence of obstetric fistula repair failure (meta-analysis)

The overall pooled prevalence of failed obstetric fistula repair in East Africa was 26.89% (95% confidence interval (CI): 21.71, 32.07) with significant heterogeneity between the included studies ($I^2 = 100\%$, $p < 0.000$). The result was generated from the random effect meta-analysis (Figure 2).

Publication bias

Both funnel plots and the Egger's test were used to assess the presence of publication bias. However, the results show no publication bias at a 95% confidence level (p-value = 0.308) (Figure 3).

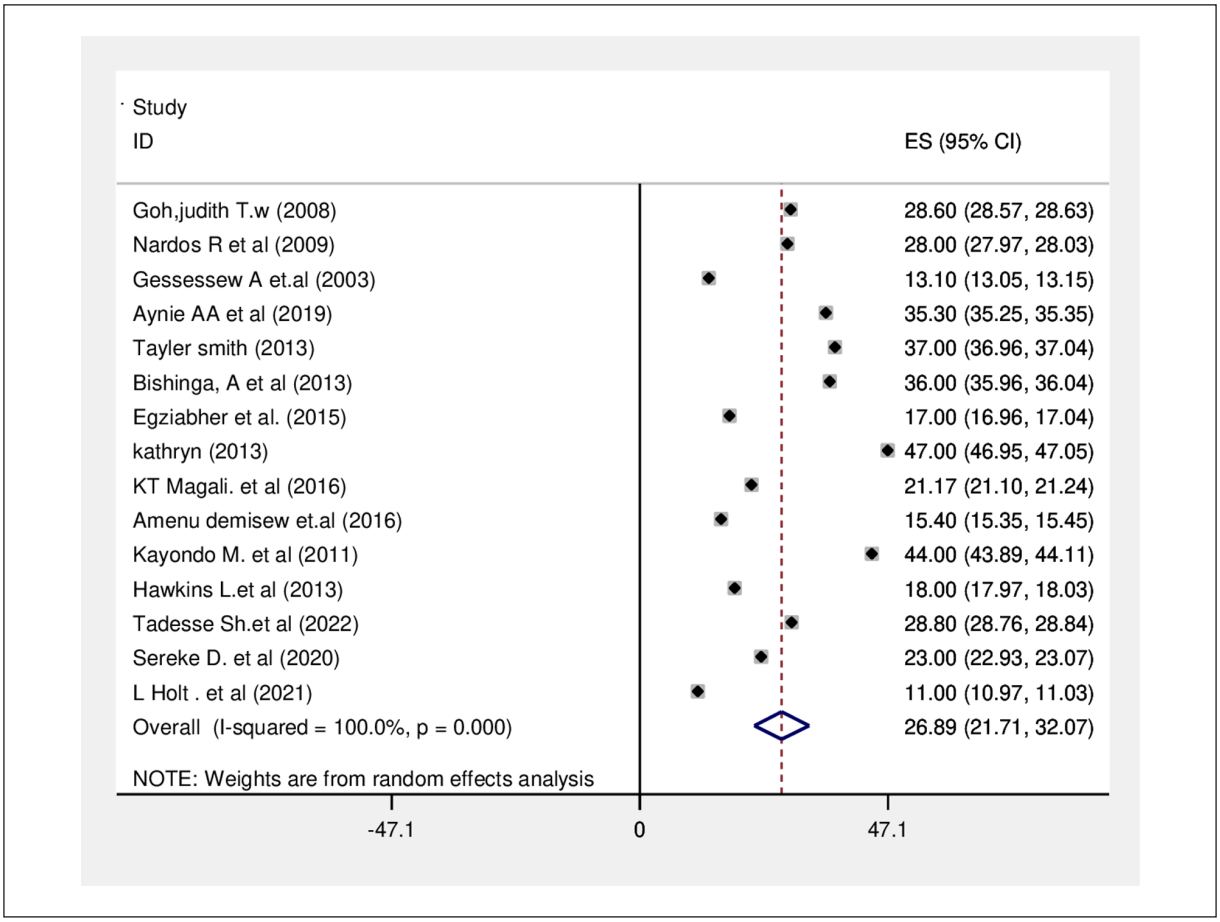

Figure 2. Pooled prevalence of failed obstetric fistula.

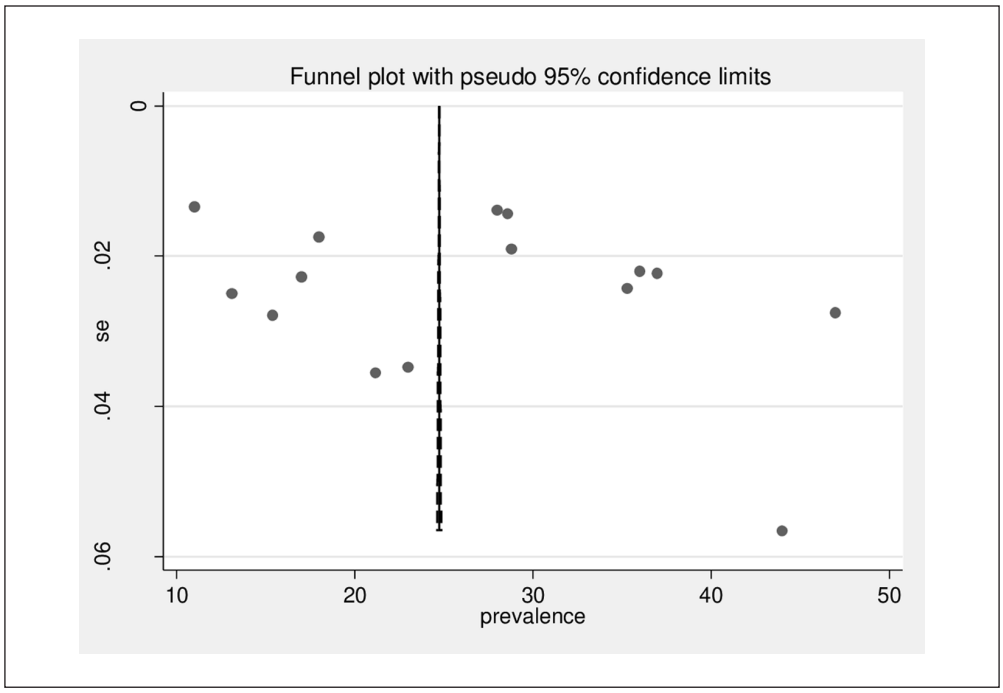

Figure 3. Funnel Plot of pooled prevalence of failed obstetric fistula repair in East Africa.

Table1. Characteristics of the included studies for meta-analysis, East Africa.

Authors	Year of publication	Country	Study setting	Design	Sample size	Response rate	Prevalence	Quality score
Goh et al.[13]	2008	Ethiopia	Health institution	Prospective	987	100	28.6	Low risk
Nardos et al.[22]	2009	Ethiopia	Health institution	Retrospective cross-sectional	1045	100	28	High risk
Gessessew and Mesfin[29]	2003	Ethiopia	Health institution	Retrospective cross-sectional	182	100	13.1	Low risk
Aynie et al.[28]	2019	Ethiopia	Health institution	Cross-sectional	385	100	35.3	Low risk
Tayler-Smith et al.[34]	2013	Burundi	Health institution	Retrospective cross-sectional	470	98	37	Low risk
Bishinga et al.[33]	2013	Burundi	Health institution	Retrospective cross-sectional	475	100	36	Low risk
Egziabher et al.[19]	2015	Rwanda	Health institution	Retrospective cross-sectional	272	100	17	Low risk
Siddle et al.[35]	2013	Tanzania	Health institution	Retrospective cross-sectional	329	100	47	Low risk
Magali et al.[36]	2016	Tanzania	Health institution	Cross-sectional	132	100	21.17	Low risk
Amenu et al.[27]	2016	Ethiopia	Health institution	Retrospective cohort	168	100	15.4	Low risk
Kayondo et al.[21]	2011	Uganda	Health institution	Prospective	77	100	44	Low risk
Hawkins et al.[32]	2013	Kenya	Health institution	retrospective cross-sectional	483	100	18	Low risk
Tadesse et al.[30]	2022	Ethiopia	Health institution	Retrospective cross-sectional	562	100	28.8	Low risk
Sereke et al.[31]	2020	Eritrea	Health institution	Retrospective cross-sectional	146	100	23	Low risk
Holt et al.[37]	2021	Uganda	Health institution	Retrospective cohort	541	100	11	Low risk

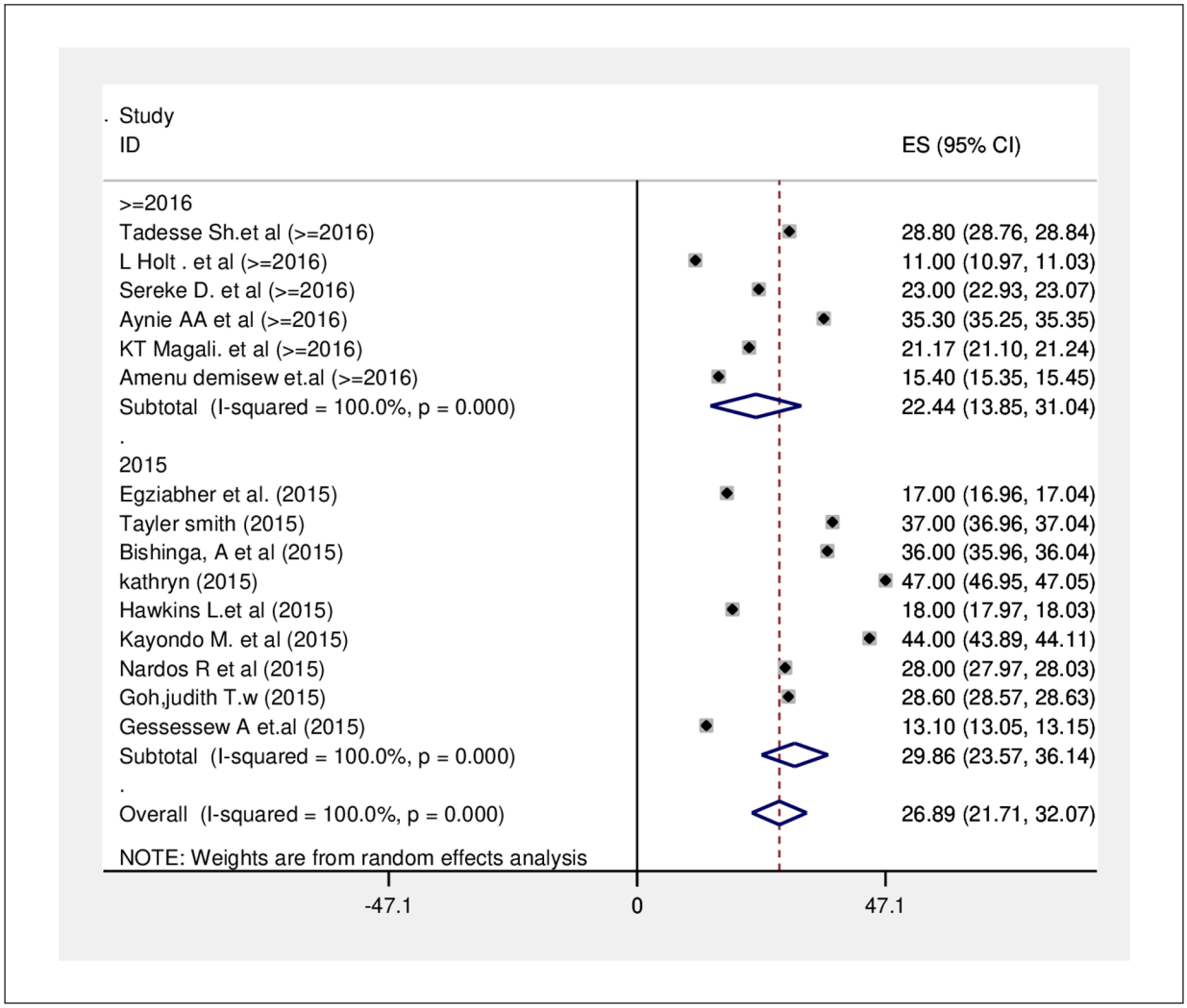

Figure 4. Subgroup analysis by publication year.

Subgroup analysis

To investigate the possible source of heterogeneity, the subgroup analysis was conducted by publication years, study design, and country of publication. However, heterogeneity was not affected by the design of the study, year, and country of publication (Figures 4–6).

We also performed sensitivity analyses to examine the influence of each study on the overall effect size. No single study significantly affected the overall pooled estimate (Figure 7).

Factors associated of obstetric fistula repair failure

Longer duration of labor, large fistula size, fistula repair attempts, Goh Type 4 fistulas, completely destructed urethra, and moderate-to-severe vaginal scaring were found to be associated with an increased risk of failed obstetric fistula repair in this study. The pooled odds ratio of two studies[28,30] indicated that women who were in labor for >2 days were 2.46 times more likely to have obstetric fistula repair failure (POR: 2.46: 95% CI: 1.58, 3.82) as compared to those who were being in labor for ⩽2 days. The four pooled odds ratio of studies[21,28,30,37] indicated that women who had large fistula sizes (>3 cm) were 3.92 times more likely to have obstetric fistula repair failure (POR: 3.92: 95% CI: 2.19, 7.05) compared to women who had fistula sizes of ⩽3 cm. The pooled odds ratio of the three studies[12,21,37] indicated that women who had fistula repair attempts were 3.20 times more likely to have an obstetric fistula repair failure (POR: 3.20: 95% CI: 1.94, 5.29) as compared to women who had no fistula repair attempts.

Moreover, the pooled odds ratio of the two studies[28,30] indicated that women with Goh Type 4 fistulas were 6.07 times more likely to have an obstetric fistula repair failure

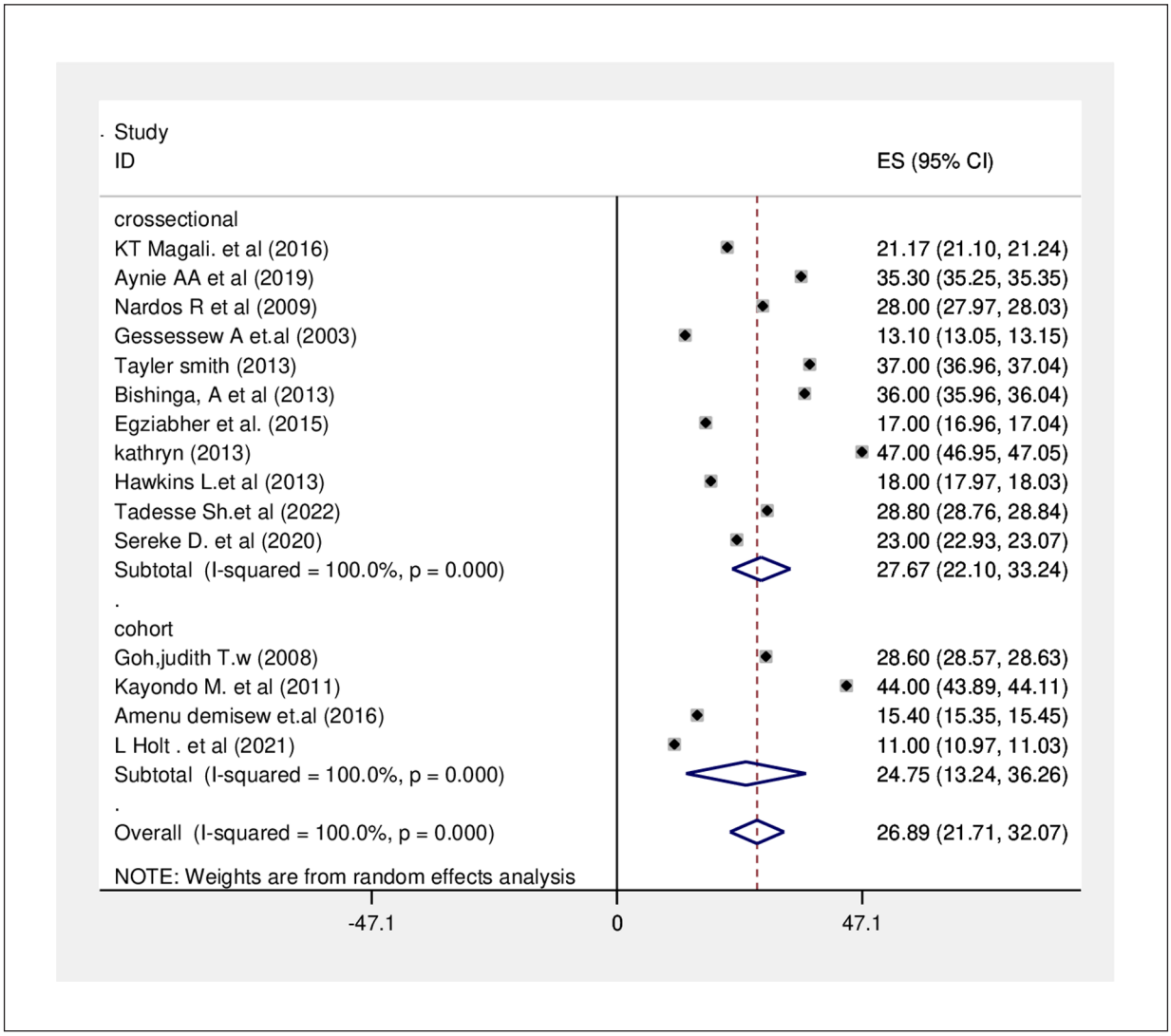

Figure 5. Subgroup analysis by study design.

(POR: 6.07: 95% CI: 2.50, 14.75) as compared to women with Goh Type 1 fistula. The three studies[21,22,30] of the pooled odds ratio of the women with a total damaged urethra were 3.35 times more likely to have an obstetric fistula repair failure (POR: 3.35: 95% CI: 1.69, 6.65) compared to women with an intact urethra. The pooled odds ratio of the three studies[21,22,27] indicates that women with moderate-to-severe vaginal scarring were 3.89 times more likely to have an obstetric fistula repair failure (POR: 3.89: 95% CI: 1.99, 7.62) as compared to women with mild or no scarring (Figure 8).

Discussion

This meta-analysis and systematic review were conducted to estimate the pooled prevalence and the associated factors of obstetric fistula repair failure among women who underwent fistula repair in East Africa. The study found an overall pooled prevalence of obstetric fistula repair failure to be 26.89% (95% CI: 21.71, 32.07). The study also identified factors associated with obstetric fistula repair failure. In this study, factors affecting obstetric fistula repair failure demonstrated that women who had a labor duration of more than 2 days were two times more likely to have an obstetric fistula repair failure than women who had a labor duration of fewer than 2 days. A possible explanation for this may be that the longer duration of labor tissue injury and associated scarring due to ischemic necrosis of the soft tissues surrounding the vagina and bladder and/or the rectum become worse, eventually complicating the fistula, and the patient is prone to failure of fistula repair.[1,30]

In this study, women who had large fistula sizes (>3 cm) were 3.92 times more likely to have an obstetric fistula repair failure compared to their counterparts. Possible

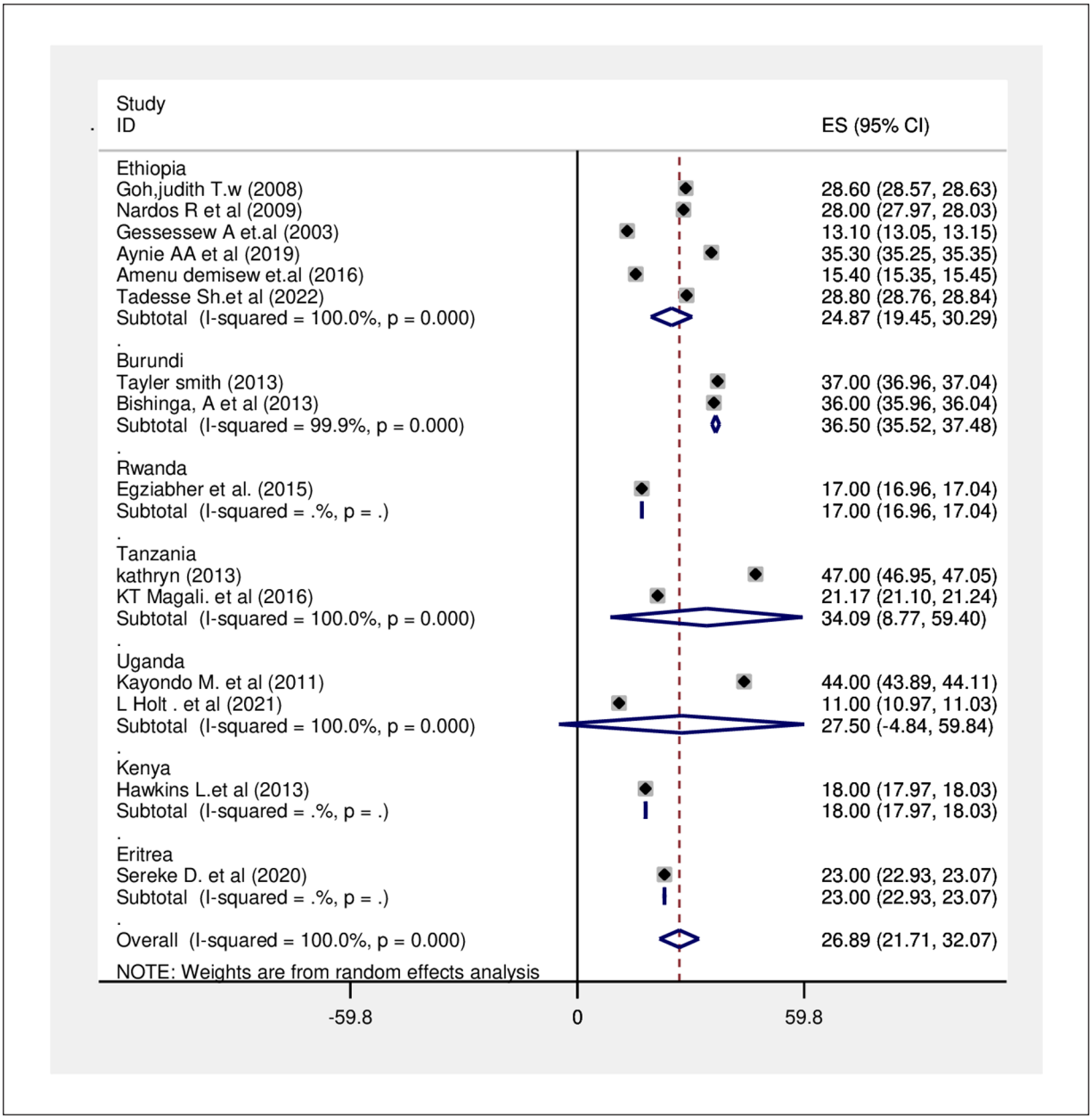

Figure 6. Subgroup analysis by country.

explanations may be due to the difficulty of fully mobilizing a large fistula extensive dissection and suturing required to close a large fistula which can be expected to leave tension and scarring on the urethra, leaving it open and resulting in incontinence.[30,38]

It was also revealed that women with total urethral damage were 3.35 times more likely to have an obstetric fistula repair failure compared to women with an intact urethra. This has previously been reported from different contexts in the literature This finding is supported by different studies conducted in developing countries.[20,39] The possible reason might be due to the fact that the urethra is usually fixed to the pubic bone, making it difficult to move the urethra's length, and the damaged urethra becomes denervated and shortened, which makes it difficult to anastomose a detached urethra. Indeed, urethral fistula repair is a complex procedure that can lead to incontinence in patients even after the surgical repair is complete.[13,20]

In this study, those women who had previous fistula repair attempts were 3.20 times more likely to have poor repair outcomes as compared to women who had no previous fistula repair attempts. This association could be because previous fistula repair attempts may reduce the amount of viable tissue that cannot be easily resolved surgically, additional

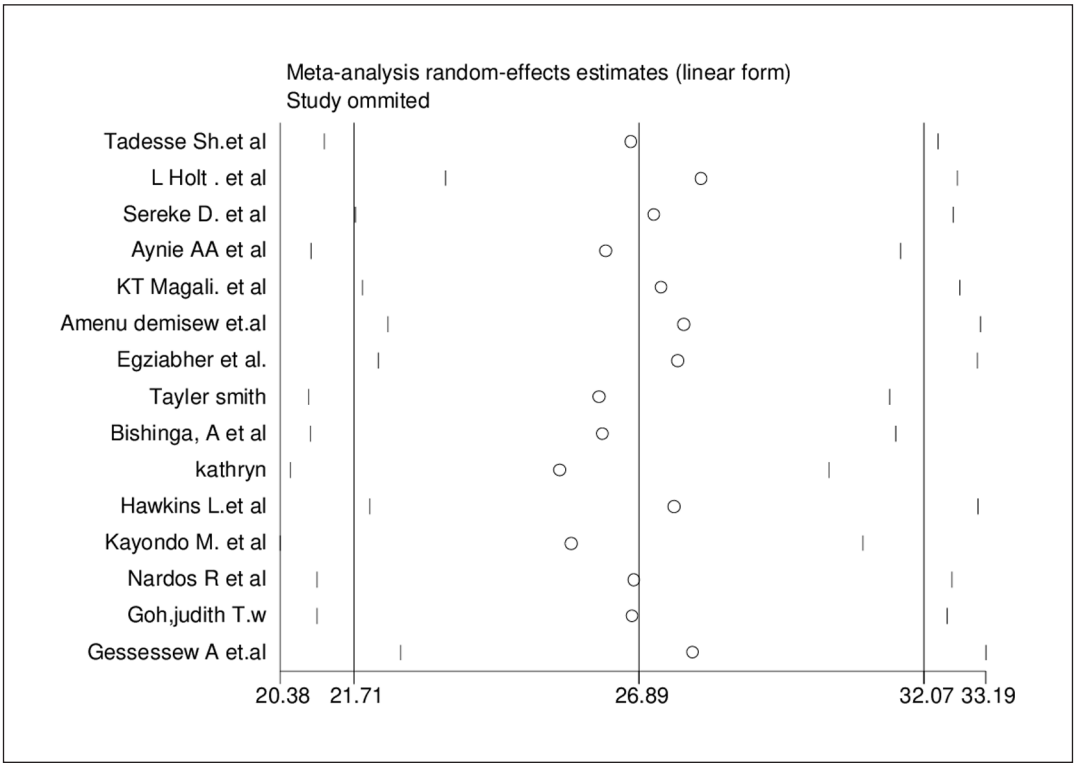

Figure 7. Sensitivity analysis.

fistula repair attempts result in additional tissue damage and scarring, and thus, multiple repair attempts reduce the chance of regaining physiological function.[40]

In this study, women with Goh Type 4 fistulas were 6.07 times more likely to have an obstetric fistula repair failure as compared to women with Goh Type 1 fistulas. A possible explanation may be that due to the proximity of the fistula to the external urethral meatus or the hymen, the function of the urinary system is largely affected, resulting in a high risk of fistula repair failure.[13,30]

In this study, those women with moderate-to-severe vaginal scarring were 3.89 times more likely to have an obstetric fistula repair failure as compared to women with mild or no scarring. This finding is supported by different studies conducted in developing countries.[20,39] This could be due to the fact that scar tissue reduces the amount of viable tissue, lacks a sufficient supply of blood, and is less likely to heal.[20] In addition, scar fistula is difficult to mobilize from surrounding tissues such as the vagina and pubic bone making a tension-free repair nearly impossible.[30]

Limitation

The potential limitation of this study is the methodological difference in measuring failed obstetric fistula repair within the studies. This effects the prevalence of failed obstetric fistula repair. The data should be reported with caution, because of the high heterogeneity. In addition, this study incorporates old and late review that have an effect on outcome variable anyway in the event that if we miss the former one and spotlight on recent study it is not representative, thus, we cannot restrict study period as exclusion criteria. Finally, this systematic review included studies that were published in the English language only.

Conclusion

The study indicated that one in four women with obstetric fistula repair experienced repair failure. To fight the problem The Ministry of Health in every part of the country in collaboration with obstetric care providers shall intervene on factors affecting obstetric fistula repair failure to reduce or prevent the failure of obstetric fistula repair is recommended. In addition, proper management of labor is highly recommended to tackle the problem. Therefore, East African countries and their policy planners use this information for the evidence-based strategy to reduce or prevent the failure of obstetric fistula repair.

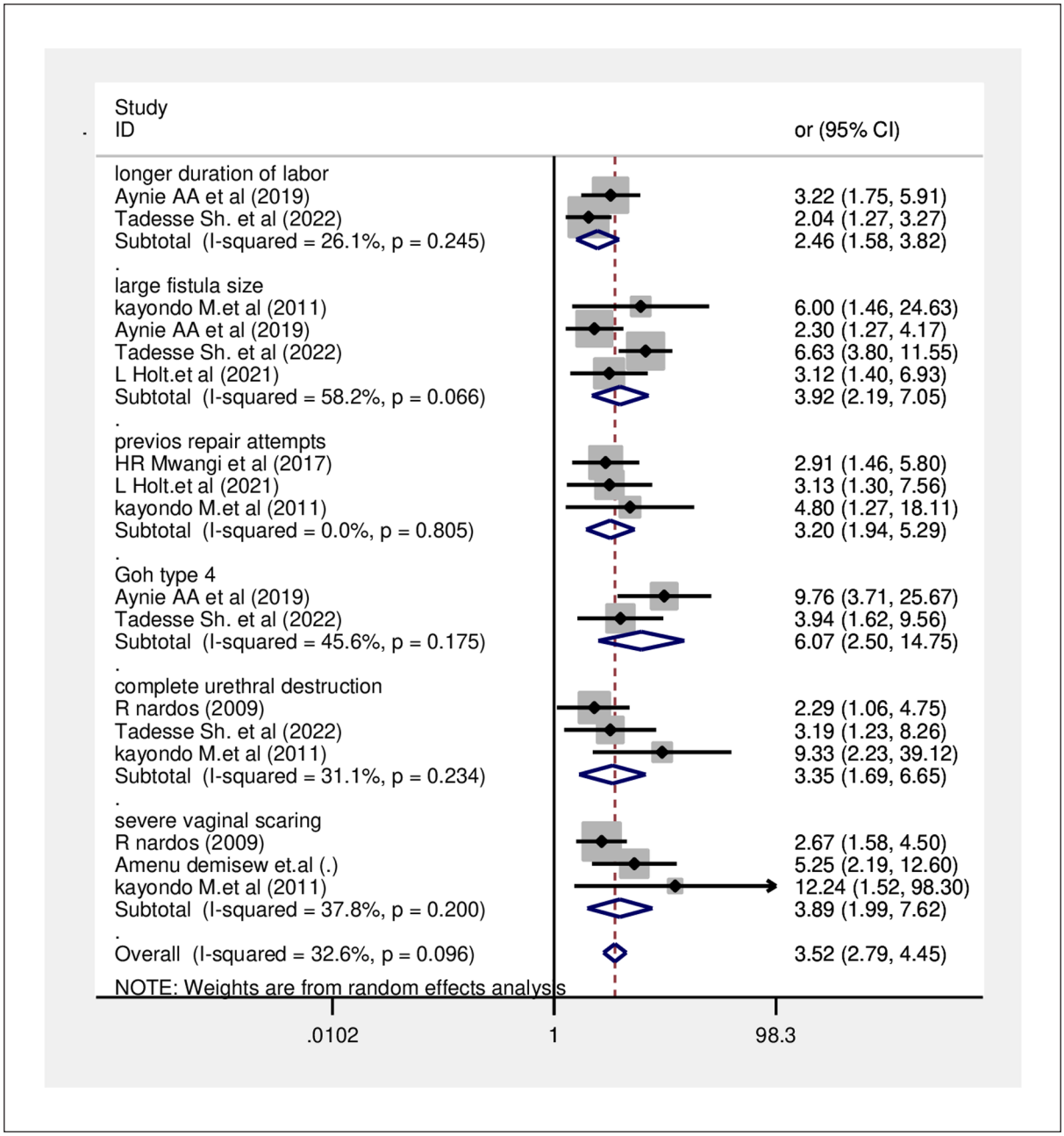

Figure 8. Forest plot showing factors associated with failed obstetric fistula repair in East Africa.

Acknowledgements

The authors acknowledge all the authors of the original studies included in this systematic review and meta-analysis.

Authors' contributions

NE was the principal investigator who contributed to origin, the idea, and design of the study and prepared the article and acted as corresponding author. NE, KS, and CK conducted the literature review, data extraction, and data analysis. DG and GG assisted with quality control. KS, DA, YT, SHT, DE, TM, and SHM assisted in data interpretation and article preparation and editing. KS, DA, NE, YT, CK, DG, GG, SHM, DE, TM, and SHT were involved in revising and editing the final version of the article. All authors have read and approved the final draft.

Availability of data and materials

All relevant data are within the article and its supporting information files.

Declaration of conflicting interests

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Ethics approval

Not applicable

Informed consent

Not applicable

Registration of the protocol

This systematic review has been sent for registration in the international prospective register of systematic reviews (PROSPERO), with ID number 436769, but the protocol is not yet published.

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Supplemental material

Supplemental material for this article is available online.

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