

Pathways to Breast Cancer Care and Delays in Diagnosis and Treatment in sub- Saharan Africa: A Systematic Review and Meta-Analysis

Chigbo Chisom Godswill

chizomgodswill@gmail.com

University of Port Harcourt

Omosivie Maduka

University of Port Harcourt

Temitope Olukomogbon

Institute of Human Virology

Emeka Odiaka

Institute of Human Virology

Irowa Omoregie

Federal University of Health Sciences, Otuipo

Ayobami Ademola

Institute of Human Virology

Gregrey Agbonvihele Obo-obo

Tampere University

Sussan Israel-Isah

Institute of Human Virology

Eva Kantelhardt

Martin-Luther-University Halle (Saale)

Maureen Joffe

University of the Witwatersrand

Blandina Mmbaga

Kilimanjaro Clinical Research Institute

Adamu Addissie

Addis Ababa University

Sefonias Getachew

Addis Ababa University

Elima Jedy-Agba

Institute of Human Virology

Systematic Review

Keywords: Breast Cancer Care, sub-Saharan Africa, Barriers to Breast Cancer, Pathways to Breast Cancer

Posted Date: August 6th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10516629/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Breast cancer is a leading cause of cancer morbidity and mortality among women worldwide, with disproportionately poor outcomes in sub-Saharan Africa (SSA), where delayed diagnosis and treatment contribute to advanced-stage presentation and reduced survival. This study systematically reviewed and synthesized evidence on pathways to breast cancer care and delays in diagnosis and treatment across SSA.

Methods

We conducted a systematic review and meta-analysis following PRISMA 2020 guidelines. Five electronic databases (PubMed/MEDLINE, EBSCO, CINAHL, Web of Science, and ScienceDirect) were searched for studies published between 2005 and 2025. Twenty-two eligible studies reported pathways to breast cancer diagnosis, patient and diagnostic delays, treatment initiation delays, stage at diagnosis, or barriers to care in SSA. Two reviewers independently screened studies, extracted data, and assessed methodological quality using the Newcastle–Ottawa Scale. Random-effects meta-analyses were performed to estimate pooled patient delay, diagnostic delay, and late-stage presentation.

Results

Twenty-two studies were included in the systematic review, of which twenty contributed to quantitative synthesis. The pooled mean patient delay from symptom recognition to first healthcare contact was 4.89 months (95% CI: 3.51–6.28), while the pooled diagnostic delay from first healthcare contact to confirmed diagnosis was 3.32 months (95% CI: 2.42–4.21). Approximately 68% (95% CI: 62%–74%) of women presented with late-stage disease (stage III–IV). Care pathways were frequently non-linear, with many women initially consulting traditional healers or informal providers before entering formal health systems. Major barriers included poor breast cancer awareness, cultural beliefs favoring traditional medicine, fear and stigma, financial hardship, geographic inaccessibility, referral bottlenecks, and limited diagnostic infrastructure.

Conclusions

The World Health Organization Global Breast Cancer Initiative (WHO GBCI) recommends that at least 60% of invasive breast cancers should be diagnosed at Stage I or II, diagnostic evaluation should be completed within 60 days of first presentation, and at least 80% of women should receive appropriate multimodal treatment. Women with breast cancer in SSA experience substantial delays in presentation and diagnosis, with most presenting at advanced stages. Strengthening awareness, decentralizing

diagnostic services, improving referral systems, and reducing financial and geographic barriers are critical to improving timely breast cancer care in the region. The protocol is registered in PROSPERO (CRD420251240227).

Introduction

Breast cancer is a major contributor to the international cancer burden¹. In 2022, there were 2.3 million females diagnosed with breast cancer and over 670,000 deaths worldwide². According to the World Health Organisation, breast cancer occurs in every nation of the world among females at ages after puberty, but with rising prevalence in later life³. International estimates show inequities in the breast cancer burden based on human development. In particular, in nations with a high HDI (Human Development Index), 1 in 12 females will be diagnosed with breast cancer in their lifetime and 1 in 71 females die of breast cancer.² On the other hand, in nations with a low HDI; though only 1 in 27 females is diagnosed with breast cancer in their lifetime, 1 in 48 females would die from it.² The IARC (International Agency for Research on Cancer) reported 20 million new cancer cases with approximately 9.7 million deaths globally. Breast cancer was the most common cancer in both sexes worldwide, after lung cancer, accounting for 2.3 million cases (11.6%). It is the most common cancer in females and is equally the most common cause of cancer related deaths⁴. Furthermore, evidence suggests that cancer incidence globally may rise to 35 million cases by 2050. The International Agency for Research on Cancer (IARC) projects 3.2 million new breast cancer cases and over 1 million deaths annually by 2050, with the steepest increases expected in lower Human Development Index (HDI) regions.⁴

In reaction, the WHO's GBCI (Global Breast Cancer Initiative) established system-level targets, which is $\geq 60\%$ of invasive cancers that are diagnosed at stage I–II, completion of key diagnostics in 60 days, plus $\geq 80\%$ of patients getting multimodality therapy with no abandonment, which is aimed at gaining a 2.5% yearly mortality decline (2.5 million lives being saved by 2040).⁵ SSA (Sub-Saharan Africa) faces an intensifying and unique challenge along this sequence. Population-driven registry comparisons reveal that none of the 11 SSA nations with TNM stage data meet the GBCI benchmark of $\geq 60\%$ stage I–II. Instead, the metastatic presentation at diagnosis mostly spans from 6%- 31%, which far exceed rates witnessed in high-income continents or regions.⁶ These patterns of stages translate into survival gaps; a 2024 meta-analysis and systematic review estimated pooled five-year survival at 40% among SSAs (Vs. 70%+ in international syntheses), with relative improvements only in the recent cohorts plus higher-HDI subregions.⁷ Meanwhile, pathways to care in SSA are influenced by interlocking provider, patient, and system challenges. Meta-analytic research from East Africa shows that more than half of patients delay presentation beyond the advised intervals, which is caused by distance, low symptom awareness, conventional care use, plus socioeconomic limitations.⁸ Treatment and diagnostic capacity constraints compound these delays; only 24% of the population in SSA lives within a 2-hour road journey of a pathology service and radiotherapy facility, which remain uneven.⁹ Consequently, learning why and where women are lost in the pathway is crucial in developing interventions that are realistic for limited systems

yet able to shift stage at diagnosis and survival. This meta analysis and systematic review synthesizes primary research and case studies on pathways and challenges to breast cancer care in SSA, resonating with GBCI metrics, to determine leverage points that can provide earlier diagnosis and efficient guideline-based care. In particular, it aims to identify pathways to breast cancer care in sub-Saharan Africa, assess the barriers to accessing breast cancer care in the region, examine how socio-economic, cultural, and health system factors influence access to timely diagnosis, treatment, and follow-up care in breast cancer patients, and assess interventions implemented to improve breast cancer care access.

Materials and Methods

Search Strategy and Terms

A systematic search was conducted to identify relevant studies in PubMed/MEDLINE, EBSCO, CINAHL, Web of Science and Science Direct databases from 2005 to 2025. The search strategy included combinations of MeSH terms, keywords, and free-text terms. These addressed 3 main concepts: breast cancer, Sub-Saharan Africa, and barriers/pathways. Also, boolean operators (AND, OR) and truncation was used to optimize the search: ("breast cancer" OR "breast neoplasms") AND ("pathways" OR "barriers" OR "access to care" OR "healthcare access") AND ("Sub-Saharan Africa" OR "Africa South of the Sahara" OR individual country names in Sub-Saharan Africa).

Eligibility Criteria

Table 1
Eligibility Requirement

Criteria	Inclusion	Exclusion
Population	Women diagnosed with only breast cancer in SSA (regardless of age, race, or stage of cancer).	Women diagnosed with other forms of cancer in SSA.
Intervention/Phenomenon	Pathways to care, barriers, and enablers to care, time to care	Studies that did not investigate breast cancer pathways or barriers and enablers to care
Outcomes	Studies with measurable outcomes such as time to diagnosis, time to treatment, impact of intervention, and survival rates.	Studies without measurable outcomes
Study Design	RCT, Cohort, Cross-sectional, and Case Studies	Reviews and qualitative studies
	Single country	Multiple country
Timeframe	Studies published in the past 20 years (2005 to 2025)	Studies published before 2005
Geographical setting	Studies conducted in SSA	Studies conducted outside SSA
Language	Studies written only in English language	Any other language apart from English

Study Selection and Data Extraction

The study selection process followed the PRISMA 2020 guidelines. All retrieved studies were imported into Covidence to remove duplicates. Also, all the reviewers independently screened titles and abstracts based on the eligibility criteria. The full texts of eligible studies were equally assessed independently by the reviewers. Lastly, a PRISMA flow diagram was used to document the number of studies identified, screened, and included at each stage. Meanwhile, data was extracted using a standardised form, capturing the following: Study characteristics, which include author(s), year, country, study design, and sample size. Barriers like cultural, economic, geographical, and healthcare system-related factors. Pathways such as referral patterns, diagnostic timelines, treatment initiation. and Outcomes, which include delays, adherence, survival rates, and impact of interventions.

Data Synthesis

This study adopted a systematic review plus meta-analysis to synthesize data from the included articles. Meta-analysis methods were utilised to quantify the impact sizes of major barriers and pathways of breast cancer care. Also, the articles were analysed with random-effects techniques to estimate pooled

prevalence plus diagnostic delays. The synthesis outlined common obstacles like geographic barriers, financial constraints, healthcare system deficiencies, and cultural factors. Also, recurring interventions like mobile health services, enhancing healthcare infrastructure, plus educational programmes were revealed as potential solutions.

Quality Assessment and Ethical Considerations

As shown in the Supporting Information section, the methodological quality of the included observational studies was assessed using the Newcastle–Ottawa Scale (NOS) for quantitative studies. Each study was scored based on the relevant tool, and the overall quality was categorised as low, medium, or high. For ethical considerations, the review involved secondary data analysis, therefore, ethical approval was not required. All included studies were appropriately cited, and findings respected the intellectual property rights of original authors.

Results

Study Selection and Scopes

As shown in Fig. 1, systematic search was performed using PRISMA guidelines, 641 studies were identified from 5 databases, including PubMed/MEDLINE, EBSCO, CINAHL, Web of Science and Science Direct. After removing duplicates, 626 articles remained. The next stage of screening the titles plus abstracts resulted into 321 articles to be sought for full text retrieval. 305 records were removed because they could not meet the eligibility requirement, mostly due to wrong setting, population, outcome, language, or study design. From the 321 articles, 248 studies could not be retrieved because the full-texts were not available via the institutional access routes or databases. Although every effort was made to retrieve potentially eligible studies through institutional subscriptions, reference list screening, and publicly accessible sources, the full texts of 248 records could not be obtained and were therefore excluded. This represents a potential source of selection bias and is acknowledged as a limitation of the review. Only 73 articles provided their full text, of which 51 publications were excluded due to no peer review and irrelevant methodology.

Study Characteristics

The final included articles were done across North/East, West, East, and Southern Africa and differed in setting, design, plus the delay metrics. The publications chosen for this review offer insights into several aspects of breast cancer in SSA. Table 2 summarised the characteristics of these articles:

Table 2
Characteristics of Included Evidence

Study	Country	Region	Study Design	Delay Metrics Reported	Pathway to Care Identified	% Stage III–IV at Diagnosis
Deressa 2025	Ethiopia	East Africa	Prospective patient tracking	Patient + Diagnostic delay	Primary healthcare-first pathway	NR
Alfadul 2024	Sudan	North-East Africa	Retrospective registry review	Patient + Diagnostic delay	Mixed pathway	50.1%
Darre 2023	Togo	West Africa	Retrospective clinical review	Patient delay, Late-stage outcome	Traditional-first pathway	Not comparable (selected Stage III–IV sample)
Ojuka 2023	Kenya	East Africa	Prospective cohort	Patient + Diagnostic delay	Primary healthcare-first pathway	NR
Rick 2023	Kenya	East Africa	Retrospective chart abstraction	Patient delay	Hospital-first pathway	NR
Ojuka 2023b	Kenya	East Africa	Cross-sectional	Diagnostic delay	Multiple referral pathway	NR
Achan 2023	Uganda	East Africa	Prospective referral tracking	Diagnostic delay	Multiple referral pathway	76.6%
Makene 2022	Tanzania	East Africa	Prospective facility pathway audit	Patient + Diagnostic delay	Multiple referral pathway	NR
Hassen 2021	Ethiopia	East Africa	Cross-sectional	Patient delay	Traditional-first pathway	65.7%
Agodirin 2021	Nigeria	West Africa	Cross-sectional	Patient delay	Traditional-first pathway	64.0%
Agodirin 2020	Nigeria	West Africa	Cross-sectional hospital-based	Patient + Diagnostic delay	Mixed pathway	NR
Gebremariam 2020	Ethiopia	East Africa	Cross-sectional	Patient + Diagnostic	Traditional-first	64.0%

Study	Country	Region	Study Design	Delay Metrics Reported	Pathway to Care Identified	% Stage III–IV at Diagnosis
				delay	pathway	
Tesfaw 2020	Ethiopia	East Africa	Cross-sectional	Patient delay only	Traditional-first pathway	71.2%
Gebremariam 2020b	Ethiopia	East Africa	Cross-sectional	Patient delay only	Primary healthcare-first pathway	51.5%
Rayne 2019	South Africa	Southern Africa	Prospective care-seeking survey	Patient delay	Hospital-first pathway	56.0%
Grosse Frie 2019	Uganda	East Africa	Prospective cohort	Patient + Diagnostic delay	Multiple referral pathway	NR
Grosse Frie 2018	Uganda	East Africa	Prospective follow-up study	Patient + Diagnostic delay	Multiple referral pathway	NR
Moodley 2018	South Africa	Southern Africa	Mixed-method hospital surveillance	Patient + Diagnostic delay	Hospital-first pathway	NR
Brinton 2016	Kenya	East Africa	Prospective multi-centre cohort	Patient delay	Hospital-first pathway	80.6%
Pace 2015	Uganda	East Africa	Hospital-based cohort study	Patient delay	Traditional-first pathway	76.0%
Toure 2013	Senegal	West Africa	Retrospective	Late-stage at diagnosis	Traditional-first pathway	NR
Ibrahim 2012	Nigeria	West Africa	Retrospective case review	Patient delay	Traditional-first pathway	NR

Barriers to Breast Cancer Care

a. Low Awareness and Poor Knowledge

A major and recurring barrier is low awareness and poor knowledge of breast cancer symptoms and the importance of early presentation. Several studies show that many women do not initially interpret breast changes as serious or warranting urgent evaluation. In Ethiopia, for example, Gebremariam (2020) found

that women frequently misinterpreted breast lumps as benign or self-limiting, while Hassen (2021) similarly reported that symptom misinterpretation and lack of awareness significantly contributed to patient delay. These findings are consistent with previous findings by Agodirin (2020; 2021) in Nigeria, where knowledge gaps and inconsistent or absent breast awareness practices were identified as central drivers of late help-seeking. The limited knowledge observed across these settings is also alluded to by Deressa (2025), who noted that inadequate understanding of breast cancer's early signs often led women to normalise symptoms, self-monitor them for prolonged periods, or first seek advice from informal networks.

b. Fear and Stigmatisation

Closely connected to poor awareness is the influence of fear, denial, and stigma, which surfaced in multiple contexts as powerful deterrents to timely care. In Sudan, Elamin (2025) described how women often feared cancer treatment, particularly mastectomy, and struggled with deep-seated fatalistic beliefs about cancer's outcome. Many women delayed seeking care because they feared a diagnosis that they associated with death or disfigurement. Psychological avoidance was also reflected in qualitative accounts such as those from Mwobobia (2024), where women articulated fears of social judgment and marital instability. Similarly, Brinton (2016) observed that the fear of losing femininity through surgery and the stigma attached to cancer diagnosis contributed significantly to delayed presentation.

c. Traditional and Alternative Healing Pathways

Another pervasive barrier is the reliance on traditional, spiritual, and alternative healing pathways, which compete with biomedical care and often result in prolonged delays. In Togo, Darré (2023) documented that many women first consulted traditional healers or herbal practitioners, sometimes for extended periods, before entering the formal health system. Likewise, in Senegal, Toure (2013) reported widespread preference for traditional therapy, with a substantial proportion of women initiating care through non-biomedical routes. Studies from Ethiopia (Gebremariam 2020), Kenya (Ojuka 2023; Makene 2022), and Nigeria (Agodirin 2020; 2021) further confirmed that traditional or spiritual healing is commonly perceived as more accessible, less expensive, and culturally aligned, thereby contributing to early pathway diversion and subsequent diagnostic delay.

d. Financial Constraints

Financial constraints and the burden of out-of-pocket payment emerged as some of the strongest structural determinants of delay across nearly all settings. Toure (2013) highlighted that the cost of care prevented many women from seeking timely assessment of breast symptoms. Financial hardship was also a dominant theme in Tanzania's cascade study (Makene 2022), where women frequently postponed or abandoned diagnostic steps because they could not afford imaging, biopsy, or travel. In Ethiopia and Sudan, Alfadul (2024), Tesfaw (2020), and Elamin (2025) all reported that inability to pay for consultations, investigations, and transportation was a major barrier that compounded existing socioeconomic disadvantage. These findings suggest that cost operates not only as a patient-level barrier, but as a system-level inequity built into the design of care pathways.

e. Geographical and Infrastructural Barriers

Geographical and infrastructural barriers, especially distance to facilities and travel challenges, further restrict timely access. Studies from Ethiopia (Tesfaw 2020), Uganda (Achan 2023), Rwanda, and Tanzania (Makene 2022; Cascade Analysis) consistently pointed to the disadvantage faced by rural women who are required to travel long distances or incur repeated transport costs to complete diagnostic investigations. In some contexts, such as Rayne (2019), distance interacted with other structural weaknesses such as poor referral communication and limited availability of specialist services, prolonging the time required to progress through the system.

f. Health System Barriers

On the health-system side, referral bottlenecks, misdiagnosis at first contact, and insufficient diagnostic capacity were among the most critical barriers. Agodirin (2021) described how women often passed through multiple providers, including patent medicine vendors and low-level health workers, before receiving appropriate referral. Frie (2019) also emphasised systemic inefficiencies, showing that even once patients entered the health system, organisational gaps and repeated provider encounters could prolong diagnostic timelines. Makene (2022) and Achan (2023) identified long biopsy and pathology turnaround times as core structural failures, with some women waiting months to complete essential investigations. Across multiple countries: Ethiopia, Rwanda, Uganda and Sudan, limited diagnostic infrastructure (such as scarcity of imaging and pathology services) contributed to multi-step delays that women were often unable to overcome.

Pathways to Breast Cancer Diagnosis and Treatment

i. Traditional-First Pathway

In many settings across sub-Saharan Africa, the first response to breast symptoms is consultation with traditional, spiritual, or herbal healers, forming what can be termed the Traditional-First Pathway. This pathway was strongly evident in studies from Togo (Darré 2023), Senegal (Touré 2013), Ethiopia (Gebremariam 2020), Kenya (Ojuka 2023; Makene 2022), and Nigeria (Agodirin 2020; 2021). Women often choose this route because traditional practitioners are more culturally familiar, geographically accessible, and financially affordable than biomedical clinics. The perception that breast lumps are benign or spiritually rooted further reinforces the choice of traditional or faith-based care.

ii. Primary-Care-First Pathway

Another group of women initiates help-seeking at primary care settings in public clinics, health centres, private general practitioners, or pharmacies. This Primary-Care-First Pathway is documented in studies from Ethiopia (Hassen 2021; Gebremariam 2020), Uganda (Frie 2018; 2019), Kenya (Ojuka 2023), and Nigeria (Agodirin 2021). This route often reflects an intention to seek “formal” care early, but the quality and capacity of primary-level services strongly influence subsequent progression. Primary-care encounters may facilitate early referral when clinicians recognise breast symptoms promptly. However,

many studies found that primary-level providers often misdiagnose symptoms, offered symptomatic treatment, or advised watchful waiting. For example, Frie (2019) and Agodirin (2021) described multiple cycles of primary-care visits before escalating to secondary or tertiary care. Inadequate clinical suspicion, lack of diagnostic tools, inconsistent breast examination practices, and insufficient cancer training for frontline providers contribute to significant delays. As a result, this pathway, though biomedical, may still result in prolonged intervals before biopsy or diagnosis unless stronger referral and triage systems are in place.

iii. Hospital-First Pathway

A smaller proportion of women bypass traditional and primary-care systems and present directly to secondary or tertiary hospitals, forming the Hospital-First Pathway. This pattern appears in studies such as Bhatia (2024), Ibrahim (2012), and segments of the Kenyan and South African cohorts (Moodley 2018; Rayne 2019). Women who take this route often do so because symptoms are severe, rapidly progressive, or visibly alarming, or because they live closer to a referral centre, are referred from targeted outreach screening programmes, or possess greater awareness of cancer warning signs. The Hospital-First Pathway generally offers the shortest route to diagnosis, as tertiary hospitals have access to imaging, biopsy, and oncology services. However, even within this pathway, system-level challenges remain. Some facilities experience diagnostic bottlenecks, long biopsy queues, or pathology delays, as highlighted in Uganda (Achan 2023) and Tanzania (Makene 2022). Nevertheless, compared to other pathways, this route is associated with earlier diagnosis and more timely treatment initiation, underscoring the value of strengthening direct-entry mechanisms.

iv. Complex Multistep or Cascade Pathways

Beyond these linear pathways, several studies reveal that many women navigate complex, multistep pathways, moving between different types of providers, such as, traditional, private, primary-care, and tertiary before obtaining a diagnosis. The most detailed mapping of such a trajectory is seen in the Tanzanian Cascade Analysis by Makene 2022, which demonstrated profound attrition at each phase of the diagnostic process: although many women entered the pathway by seeking care, only about half completed biopsy procedures, and only around 23% achieved treatment initiation. These Cascade Pathways reflect system fragmentation, where women repeatedly cycle through clinics, undergo serial evaluations, face administrative hurdles, or abandon the process due to cost or travel burdens. Similar patterns were documented in Rwanda's diagnostic delay studies, Uganda's referral pathway analyses (Frie 2018; 2019), and Sudanese investigations (Alfadul 2024; Elamin 2025). In these pathways, system delays rather than patient behavior dominate the timeline. Misdiagnosis at first contact, long referral intervals, limited access to imaging or biopsy, and slow pathology reporting combine to create prolonged diagnostic journeys even after women have made early contact with the health system.

v. Treatment-Entry Pathway

Regardless of how women arrive at diagnosis, the final segment of the pathway, transitioning to treatment, presents additional challenges. Treatment-entry pathways differ significantly depending on

the availability and decentralisation of oncology services in various countries. Studies from Ethiopia (Tesfaw 2020), Tanzania (Makene 2022), Sudan (Alfadul 2024), and Nigeria (Ibrahim 2012; Agodirin 2021) show that even after diagnosis, women often face further delays due to cost barriers, distance to tertiary centres, treatment stockouts, and administrative hurdles such as long scheduling queues for surgery or chemotherapy. This phase, therefore, is not a simple endpoint but an extension of the pathway, influenced by the same structural factors that shape diagnosis. For many women, reaching treatment requires multiple returns to the health system, relocations, or abandonment and re-entry at later stages. Where treatment services are concentrated in urban centres, rural women face disproportionately longer and more expensive journeys. This contributes to the persistently high rates of late-stage presentation documented across the studies (Touré 2013; Ojukka 2023b; Alfadul 2024).

Meta-analysis

Study Characteristics

A total of 20 studies met the inclusion criteria for quantitative synthesis, spanning a 14-year publication window and representing diverse regions of sub-Saharan Africa. The included studies were conducted across East Africa, West Africa, Southern Africa and North-East Africa, with Ethiopia and Nigeria contributing the largest number of studies. No eligible studies were identified from Central Africa. Ethiopia and Nigeria contributed the highest number of included studies, reflecting both the burden of disease, population size and increasing research production in these countries. Most studies were hospital-based and cross-sectional in design, although several prospective cohorts and diagnostic-interval audits were also identified, particularly those assessing pathways from first symptom recognition through referral, diagnosis, and treatment initiation.

Study Designs and Settings

Majority of included studies (75%) employed a cross-sectional descriptive or analytical design, primarily using interviewer-administered questionnaires or retrospective medical chart reviews to quantify presentation intervals, stage distribution, and determinants of delay. Prospective studies such as Deressa et al. (2025 Ethiopia) and the Mwanza cascade-analysis in Tanzania provided clearer time-trend relationships between symptom onset, referral progression, and eventual diagnosis. A minority of studies adopted mixed-methods frameworks, integrating quantitative delay measures with qualitative insights into sociocultural perceptions, care-seeking motivations, and the role of traditional medicine. Almost all were conducted in tertiary or referral hospitals, reflecting late entry into the health system and already advanced disease stage at point of contact. Sample sizes ranged widely, from 46 participants (Ntekim et al., 2025) in Nigeria to over 61,000 women in Kenya (Bhatia et al., 2024). The median sample size across studies was approximately 280 participants, demonstrating moderate statistical power for pooled estimates. Most study participants were between 30 and 60 years of age. This reflects the comparatively younger age distribution of women diagnosed with breast cancer in many sub-Saharan African countries and differs from high income settings, where the median age at diagnosis is typically above 60 years.

Pathways To Care and First Provider Contact

Care-seeking pathways demonstrated a consistent pattern across the region most women recognized symptoms independently but delayed formal medical engagement, often consulting traditional healers, prayer centres, patent drug vendors, or low-level primary clinics first. Multiple studies reported two or more healthcare encounters before diagnostic escalation. The Tanzanian cascade study by Makene (2022) revealed striking attrition: despite initial presentation, only 23% of symptomatic women completed biopsy and reached treatment, indicating system bottlenecks at multiple referral points.

Stage At Diagnosis

Across nearly all studies, the proportion of women diagnosed at Stage III or IV exceeded 60%, with pooled estimates expected to range between 68–75% based on extracted proportions. Rwanda, Nigeria, Ethiopia, and Sudan reported the highest advanced-stage burden, frequently > 70%, while South African cohorts showed slightly earlier detection but still predominantly late-stage disease. This late presentation strongly correlated with prolonged patient/diagnostic intervals and socio-economic constraints.

Delays In Breast Cancer Care

Patient delay (symptom discovery to first healthcare contact) was reported in nearly all studies and was substantially prolonged. Median patient delay ranged from 3–13 months, with more than half the sample in several settings presenting 90 days or later after symptom discovery. Ethiopia, Sudan, and Nigeria consistently reported the longest patient delays, often exceeding 6–9 months, and in some cases > 12 months. Diagnostic delay (first contact to a confirmed diagnosis) was similarly prolonged and often additive to the initial patient interval, resulting in total delays frequently exceeding 8–15 months.

Although treatment delay was reported less consistently than patient and diagnostic delays, the available evidence suggests that the median time from diagnosis to treatment initiation ranged from approximately 4 to 12 weeks across the included studies. These delays were largely attributed to shortages of chemotherapy drugs, prolonged pathology turnaround times, limited oncology capacity, and administrative inefficiencies within referral systems. Similar challenges have been reported in other low and middle income countries, where inadequate oncology infrastructure and workforce shortages continue to delay treatment initiation (Raphael et al., 2023; Pearson et al., 2024). In contrast, most high income countries have established multidisciplinary cancer pathways that facilitate treatment initiation within a few weeks of diagnosis, contributing to improved survival outcomes. Although the WHO Global Breast Cancer Initiative (GBCI) does not prescribe a universal maximum interval between diagnosis and treatment initiation, it emphasises timely access to high quality multimodal treatment for at least 80% of women with breast cancer as one of its three core pillars for reducing breast cancer mortality (World Health Organization [WHO], 2023) .

Meta-Analysis Results

Patient Delay

A total of 17 studies reported median delay estimates, providing a broad representation of breast cancer care-seeking behaviour across sub-Saharan Africa. The pooled average patient delay duration was 4.89 months (95% CI: 3.51–6.28), indicating that, on average, women wait nearly five months before presenting to formal medical care after noticing initial symptoms. There was substantial variation between studies, reflecting differences in health-seeking behaviour, system access, sociocultural norms, and availability of early diagnostic services. The shortest delays were observed in Agodirin 2020 (Nigeria) and Moodley 2018 (South Africa), both reporting median delays close to one month, suggesting comparatively faster recognition and decision-making in those populations. Similarly, Rick 2023 (Kenya) and Ibrahim 2012 (Nigeria) reported median delays under three months, offering evidence of relatively early presentation within their respective regions.

Conversely, markedly prolonged patient delays were observed in Makene (2022) (Tanzania) and Pace (2015) (Uganda), with median delays of approximately 10.7 months and 9.0 months, respectively. These prolonged delays were attributed to limited health system capacity, inefficient referral pathways, reliance on traditional or alternative treatment options, and sociocultural perceptions of breast symptoms that discouraged timely presentation to formal healthcare services. Intermediate delays ranging from 3 to 7 months were reported by Ojuka (2023) (Kenya), Grosse Frie (2018, 2019) (Uganda), Hassen (2021) (Ethiopia), Tesfaw (2020) (Ethiopia), and Deressa (2025) (Ethiopia), indicating that delays of several months remain a common and persistent challenge across sub-Saharan Africa. The 95% confidence intervals demonstrated variable precision across studies, with larger studies, such as Brinton (2016) (Kenya), producing narrower confidence intervals, whereas studies with smaller sample sizes yielded wider intervals, reflecting greater statistical uncertainty. Despite the variation in delay estimates, the forest plot shows that most studies clustered around patient delays exceeding three months, demonstrating a consistent pattern of delayed presentation across the region (Fig. 2).

Figure 2: Forest Plot showing patient delay in Breast Cancer in SSA

Diagnostic Delay

The pooled duration of diagnostic delay, was defined as the time from first medical consultation to a confirmed breast cancer diagnosis. This was estimated from 11 studies conducted in sub-Saharan Africa. The pooled effect estimate derived from a random-effects model was 3.32 months (95% CI: 2.42–4.21), indicating that after women seek care for breast symptoms, they experience an additional delay of approximately three to four months before diagnostic confirmation is reached. Diagnostic delay varied across studies, reflecting differences in diagnostic capacity, referral practices, and biopsy turnaround times within health systems. The shortest delays were observed in Frie 2019 (1.27 months; 95% CI: 0.89–1.64) and Frie 2018 (1.80 months; 95% CI: 1.09–2.51), which may suggest a more

streamlined investigative pathway, improved clinical recognition, or more direct access to pathology services. Similarly, studies such as Gebremariam 2020 (2.33 months; 95% CI: 2.13–2.54) and Moodley 2018 (1.81 months; 95% CI: 1.38–2.24) reported relatively shorter diagnostic intervals, possibly reflecting greater awareness among clinicians and better access to diagnostic technologies and specialist evaluation.

In contrast, considerably longer delays were recorded in a study by Makene et al in 2022, (6.38 months; 95% CI: 3.76–9.01) and Achan 2023 (6.07 months; 95% CI: 5.44–6.70). Most studies fell within the 3–4-month range, indicating that what appears to be “average performance” in the region is still substantially prolonged relative to global recommendations, where diagnosis is ideally achieved within weeks. The clustering of delays above two months suggests that inefficient clinical routing, delayed imaging/biopsy access, and insufficient diagnostic bandwidth are common across diverse SSA health systems, as seen in Fig. 3.

Figure 3: Forest Plot showing diagnostic delay in Breast Cancer in SSA

Stage at Diagnosis

As shown in Fig. 4, the pooled proportion of late-stage breast cancer (Stage III–IV) in in sub-Saharan Africa, included a total of 4,543 women from across 13 studies. The proportion of late-stage presentation was consistently high across settings, ranging from 54% to 100%, with only minimal overlap of confidence intervals in some studies, indicating substantial between-study variability.

The highest late-stage proportion was reported by Darre 2023 (Togo), where 100% (95% CI: 94%–100%) of women presented at Stage III–IV, suggesting extremely delayed case detection and 0minimal early diagnosis capacity in that setting. Other high-burden studies included Pace 2015 (Uganda) and Ibrahim 2012 (Nigeria), each reporting late-stage diagnosis in 78% of women (95% CIs: 70–84% and 70–85% respectively). Conversely, the lowest late-stage proportions were observed in Toure 2013 (Senegal) with 54% (49–59%), and Rayne 2019 (South Africa) with 55% (48–61%), reflecting relatively better diagnostic access and earlier presentation compared to other locations.

When pooled using a random-effects model, the estimated late-stage burden across all studies was 0.68 (95% CI: 0.62–0.74), meaning that approximately two-thirds of women in sub-Saharan Africa are diagnosed with breast cancer at late stages. The heterogeneity measure was high ($I^2 = 85.6\%$, $\tau^2 = 0.1016$; $p < 0.0001$), indicating substantial variability across countries and health systems. This heterogeneity likely reflects contextual differences including diagnostic infrastructure, outreach screening coverage, time-to-referral intervals, cultural perception of symptoms, and pathway-to-care delays, all of which are recurrent determinants of late diagnosis identified in qualitative and quantitative literature.

Overall, the meta-analysis demonstrates that late-stage breast cancer remains the dominant presentation pattern in sub-Saharan Africa, underlining gaps in awareness, early detection, and system responsiveness.

Figure 4: Forest Plot showing late-stage diagnosis of breast cancer in SSA

Risk of Bias Assessment using the Newcastle-Ottawa Scale

The traffic light plot (Fig. 5) summarises the methodological quality of the 22 observational studies included in this systematic review, irrespective of the specific outcomes they reported. The Newcastle–Ottawa Scale (NOS) was applied to assess the risk of bias across the Selection (S1–S5), Comparability (C1–C2), and Outcome (O1–O3) domains. These studies contributed evidence to one or more review outcomes, including patient delay, diagnostic delay, treatment delay, pathways to breast cancer care, barriers to timely care, and late stage presentation at diagnosis. Each cell indicates whether a study fulfilled the corresponding NOS criterion (green star) or did not fulfil the criterion (red/grey without a star). Across the included studies, the majority of NOS items in the Selection and Outcome domains were consistently met. Most studies adequately described their sampling frame, provided clear eligibility criteria, and reported ascertainment of delays or stage at diagnosis. For example, studies such as Gebremariam 2020, Hassen 2021, Makene 2022, Tesfaw 2020, and Frie 2018/2019 demonstrated near-universal fulfilment of criteria, reflected by mostly green cells in the matrix. This indicates good methodological clarity and appropriate measurement of key variables. In contrast, the Comparability domain (C1 and C2) displayed the greatest concentration of unmet criteria. Several studies did not adjust for major confounding variables such as age, education, socioeconomic status, or rural residence or did not report multivariable analyses. These patterns are visible as consistent red segments in C1 and C2 across multiple studies, including Rayne 2019, Toure 2013, Agodirin 2020, and Deressa 2025. This reveals that, although the studies captured delays and stage patterns well, many did not statistically control for confounders that could influence associations.

A small number of studies, such as Deressa 2025 and Rick 2023, showed gaps across several Selection and Outcome criteria, suggesting more limited reporting or methodological constraints. Nevertheless, the overall grid reflects a dataset where most studies met most critical NOS items, supporting the reliability of pooled analyses while also highlighting areas where methodological variability contributes to heterogeneity.

Figure 5: Risk of Bias assessment of the included studies

The bar chart in Fig. 6 summarises the overall NOS scores for each study, categorised into: High quality (green): ≥ 7 stars; Moderate quality (orange): 5–6 stars; Low quality (red): < 5 stars. The chart shows that most studies scored within the high-quality range, reflected by long green bars extending toward the

right. Studies such as Gebremariam 2020b, Tesfaw 2020, Hassen 2021, Makene 2022, and Frie 2018/2019 consistently achieved high star counts, indicating strong methodological design, good reporting completeness, and reliable outcome assessment. Some studies fall into the moderate quality category: Agodirin 2021, Ojuka 2023, and Rick 2023. Primarily due to insufficient adjustment for confounding and, in some cases, incomplete reporting of selection criteria or measurement tools. Only one study, Deressa 2025, appears in the low-quality category, reflected by a shorter red bar.

Overall, the risk-of-bias assessment showed that the majority of included studies were of moderate-to-high methodological quality. Selection and outcome domains were generally well addressed, with most studies clearly reporting sampling frameworks, delay measurements, and stage classification. The greatest methodological limitation across studies was insufficient adjustment for confounders, reflected by consistently unmet criteria within the Comparability domain. Despite this, the predominance of high-quality assessments supports the robustness of pooled delay and late-stage estimates obtained in this review.

Discussion

This review and meta-analysis provides comprehensive evidence of persistent and clinically substantial delays in breast cancer presentation and diagnosis across sub-Saharan Africa. The findings demonstrate substantial delays at both the patient and health-system levels, underscoring the multifactorial nature of barriers to timely breast cancer care in the region. Pooled estimates indicate an average patient delay of 4.89 months and an average diagnostic delay of 3.32 months, with approximately 68% (CI) of women presenting with advanced-stage disease (stage III–IV). These figures reflect a pattern of late presentation that remains deeply entrenched across diverse settings. The results are consistent with prior regional and global reports and reinforce the urgent need for context-specific strategies aimed at improving early detection, strengthening diagnostic pathways, and reducing time to treatment initiation aligned with WHO/GBCI recommendations (reference).

The prolonged patient delays identified in this review reflect a pattern of delayed symptom recognition and postponed health-seeking behavior. Petrova et al. (2022) also reported comparable delays in low- and middle-income countries (LMICs), observing that African women often face substantial barriers to timely cancer care due to limited awareness, structural vulnerabilities, and strong cultural beliefs about cancer symptoms. The approximately five-month patient delay identified in this study reflects the complex interplay of social norms, financial issues, stigma, and life priorities that collectively hinder health-seeking behaviour. Wendimu et al. (2024) also identified misconceptions about symptoms, emotional stress, reliance on alternative treatments, and weak support systems as key drivers of late presentation, consistent with the patterns identified in this review. These convergent findings show that reducing patient delays requires interventions that extend beyond education; also requiring community engagement, culturally appropriate messaging, and sustained financial support.

The review pooled estimate of a 3.32-month diagnostic delay further highlights significant gaps in timely breast cancer early detection and diagnosis. Brand et al. (2019) observed that diagnostic capabilities in LMICs suffer from poor referral pathways, lack of imaging and pathology facilities, and a disorganized approach to care coordination. Similarly, the qualitative study by Getachew et al. (2020) in Ethiopia demonstrated that diagnostic delays extend beyond health system limitations and are also driven by poor awareness of breast cancer symptoms, fear of a cancer diagnosis, financial constraints, reliance on traditional and religious healing practices, stigma, transportation difficulties, and prolonged referral processes before reaching specialised care. These findings reinforce the complex and interconnected nature of diagnostic delay identified in this review, suggesting that reducing delays will require integrated interventions that address patient, community, and health system factors simultaneously rather than focusing solely on expanding diagnostic infrastructure. These issues contribute to significantly longer diagnostic times. This inefficiency is reflected in the wide heterogeneity in results across studies in this review: with sites reporting diagnoses within one to two months, while others documented delays exceeding six months. Subedi et al. (2024) similarly reported that diagnostic delays often exceed WHO-recommended standards in LMICs, especially when patients first seek care at primary or informal facilities that lack oncology expertise. The current review shows a pattern of patients having multiple healthcare visits prior to a diagnosis, highlighting the consequences of weak referral systems and emphasizing the need to strengthen diagnostic infrastructure and streamline clinical pathways.

The pooled prevalence of late-stage presentation (68%) represents one of the most consequential findings of this review. This estimate closely aligns with the findings of Zewdie et al. (2024), who reported a similarly high late-stage burden of 72% in Ethiopia, reinforcing the persistent pattern of advanced disease at diagnosis across sub-Saharan African settings. They identified similar factors, including patient delays, system delays, reliance on traditional medicine, and rural residence, as key contributors. The evidence from across the African region shows that late-stage diagnosis is not just a random finding but a consistent issue in breast cancer care. This high prevalence directly affects survival, as late-stage detection greatly limits treatment options and raises mortality risk. Raphael et al. (2016) demonstrated that even small delays in treatment after diagnosis significantly increase mortality in breast cancer. This highlights how the cumulative effect of delays in both patient and diagnostic intervals can worsen outcomes.

Interpreting these findings within a broader sociopolitical context highlights the profound influence of structural inequities on breast cancer outcomes. Pearson et al. (2024) demonstrated that even in well-resourced health systems, socioeconomic disparities translate into unequal access to timely cancer diagnosis and treatment. In sub-Saharan Africa, where health systems are comparatively under-resourced, such inequities are further amplified by geographic location, educational attainment, and financial constraints. Similarly, Mohammed et al. (2025) identified cost of care, travel distance, and limited breast cancer awareness as major contributors to delayed diagnosis in Morocco - factors that closely mirror those observed across the studies included in this review. Collectively, these findings suggest that while sociocultural beliefs and individual behaviours influence care-seeking pathways, the

organisation, accessibility, and resourcing of health systems are central determinants of whether women present early or with late-stage disease.

Summary of Findings and Certainty of Evidence

This systematic review and meta-analysis synthesised evidence from 22 studies conducted across sub-Saharan Africa to examine pathways to breast cancer care, delays in diagnosis and treatment, late-stage presentation, and barriers to accessing care. The findings consistently demonstrated prolonged delays throughout the breast cancer care continuum, with a pooled patient delay of 4.89 months (95% CI: 3.51–6.28 months), substantial diagnostic delays, and a high prevalence of late-stage presentation, estimated at 68% (95% CI: 62%–74%). The review also identified complex and often non-linear pathways to care, with many women initially seeking help from traditional healers, informal providers, or lower-level health facilities before reaching specialized cancer services. Financial constraints, low breast cancer awareness, sociocultural beliefs, stigma, geographical barriers, and weaknesses within healthcare systems emerged as recurring barriers across countries.

Under the GRADE approach, observational studies begin at a lower certainty level than randomised controlled trials because they are more susceptible to bias and confounding. Given that breast cancer pathways and delays cannot ethically or practically be studied through randomized experiments, observational studies represent the most appropriate and feasible source of evidence for this research question. Consequently, lower certainty ratings are expected in reviews examining healthcare-seeking behaviour, access to care, and health system performance. The certainty of evidence, assessed using the GRADE framework, ranged from low to very low across outcomes. Patient delay and late-stage presentation were rated as low-certainty evidence, while diagnostic delay, treatment delay, pathways to care, and barriers to care were rated as very low-certainty evidence. Importantly, these ratings should not be interpreted as indicating that the findings are unreliable or that the review was poorly conducted. Rather, they reflect the nature of the available evidence and the methodological characteristics of the primary studies included in the review.

The low certainty ratings observed in this review were driven primarily by substantial heterogeneity across studies, differences in healthcare settings, variations in delay definitions, and differences in measurement approaches rather than by poor study quality. Indeed, the Newcastle–Ottawa Scale assessment showed that most included studies were of moderate to high methodological quality, suggesting that concerns regarding risk of bias were generally limited. Furthermore, despite differences in study design, country context, and healthcare systems, the findings demonstrated remarkable consistency in their overall direction. Studies conducted across Ethiopia, Nigeria, Kenya, Uganda, Tanzania, Ghana, Rwanda, and other countries repeatedly identified similar patterns of delayed presentation, prolonged diagnostic pathways, and high proportions of advanced-stage disease at diagnosis.

This consistency across diverse settings strengthens confidence in the overall conclusions of the review. While the exact magnitude of delays may vary between populations and healthcare systems, there is strong evidence that delays in breast cancer diagnosis and treatment are widespread throughout sub-Saharan Africa and contribute substantially to late-stage presentation. Therefore, the low certainty ratings should be interpreted as indicating uncertainty regarding the precise size of the effect rather than uncertainty about the existence of the problem itself. Future high-quality studies may refine the estimated duration of delays or the relative importance of specific barriers, it is unlikely that they will alter the central conclusion that improving timely access to breast cancer diagnosis and treatment remains a critical priority across the region.

STRENGTH AND LIMITATIONS

The reliability of these findings is supported by the acceptable quality of the studies included, as assessed by the Newcastle–Ottawa Scale (NOS). Many studies were included in the moderate-to-high quality range, particularly in how they selected participants and measured exposure and outcomes. This adds to the confidence in the overall estimates. However, several studies had limitations. A significant number relied on hospital-based sampling, which raises questions about representativeness. Women who never reach tertiary care facilities, likely experiencing even longer delays, are excluded. This selection bias likely leads to an underestimate of true delays in the broader population. Several potentially eligible studies (77%) could not be retrieved despite extensive searching, introducing the possibility of publication or selection bias. Finally, relatively few studies reported treatment delay or intervention outcomes, limiting quantitative synthesis for these outcomes.

Conclusion

This systematic review and meta-analysis synthesized evidence on patient delay, diagnostic delay, and stage at presentation among women with breast cancer in sub-Saharan Africa, revealing a persistent and systemic pattern of late engagement with care. The review reported an average patient delay of 4.89 months and a further diagnostic delay of 3.32 months. It also identified a high prevalence (68%) of late-stage disease. These show a consistent pattern of delayed symptom recognition, prolonged progression through the health system, and, ultimately, presentation with advanced disease.

There was considerable variation across studies, reflecting real differences in healthcare infrastructure, cultural contexts, study designs, and definitions of delay. The lack of standard time thresholds for what counts as “delay” made comparisons difficult. Some studies used over 3 months, others over 6 months, while some reported continuous intervals. This inconsistency affects pooled precision but does not change the main finding that delays are prolonged and widespread across the region.

Despite these methodological issues, the consistency of results across countries and types of studies reinforces the central point: delayed presentation and diagnosis are systemic issues in breast cancer care in sub-Saharan Africa. The connection between this meta-analysis and earlier research shows that

these patterns are stable, longstanding, and deeply rooted in contextual realities. These realities include poor symptom awareness, sociocultural beliefs, insufficient diagnostic capacity, fragmented referral pathways, and financial and geographic obstacles to care.

This review demonstrates that women with breast cancer across sub-Saharan Africa continue to experience prolonged delays from symptom recognition to diagnosis, resulting in a high prevalence of advanced stage disease at presentation. These delays arise from complex interactions between patient level, sociocultural and health system factors. Improving breast cancer outcomes will require coordinated interventions that strengthen public awareness, enhance primary care recognition, expand diagnostic capacity, streamline referral pathways, and reduce financial and geographical barriers to care. Future implementation research should evaluate strategies capable of accelerating diagnosis and treatment within resource constrained health systems

Declarations

Acknowledgment

We thank the authors of the included studies for their contributions to the evidence base.

The project on which this publication is based was in part funded by the German Federal Ministry of German Federal Ministry of Research, Technology and Space (BMFTR) 01KA2220B to the RHISSA Programme for the NORA Consortium. This research was funded in part by Science for Africa Foundation to the Programme Del-22-008 with support from Wellcome Trust and the UK Foreign, Commonwealth & Development Office and is part of the EDCPT2 programme supported by the European Union.

Author Contributions

Conceptualization: Chigbo Chisom Godswill, Elima Jedy-Agba.

Methodology: Chigbo Chisom Godswill, Omosivie Maduka, Temitope Olukomogbon, Elima Jedy-Agba.

Data Curation: Chigbo Chisom Godswill, Ayobami Ademola, Sussan Israel-Isah.

Formal Analysis: Chigbo Chisom Godswill.

Investigation: Chigbo Chisom Godswill, Ayobami Ademola, Sussan Israel-Isah.

Validation: Omosivie Maduka, Temitope Olukomogbon, Elima Jedy-Agba.

Visualization: Chigbo Chisom Godswill.

Writing – Original Draft: Chigbo Chisom Godswill.

Writing – Review & Editing: Omosivie Maduka, Temitope Olukomogbon, Emeka Odiaka, Irowa Omoregie, Ayobami Ademola, Gregory Agbonvihele Oko-oboh, Sussan Israel-Isah, Eva Kantelhardt, Maureen Joffe, Blandina Mmbaga, Adamu Addissie, Sefonias Getachew, Elima Jedy-Agba.

Supervision: Omosivie Maduka, Elima Jedy-Agba.

Project Administration: Elima Jedy-Agba, Chigbo Chisom Godswill.

All authors read and approved the final manuscript.

Data Availability Statement

All data generated or analysed during this study are included in this published article and its supplementary information files.

Ethics

Ethics approval and consent to participate were not required because this study synthesized data from previously published studies.

Competing interests

The authors declare that they have no competing interests.

References

1. Zhang Y, Ji Y, Liu S, Li J, et al. Global burden of female breast cancer: new estimates in 2022, temporal trend and future projections up to 2050 based on the latest release from GLOBOCAN. *J Natl Cancer Cent.* 2025; 5(3):287-296. <https://doi.org/10.1016/j.jncc.2025.02.002>
2. WHO. Breast Cancer. 2025. Available from: <https://www.who.int/news-room/fact-sheets/detail/breast-cancer>.
3. Shiraz Z. Breast cancer causes, preventive tips and all about pregnancy after chemotherapy. 2022. *Hindustan Times*. Available from: <https://www.hindustantimes.com/lifestyle/health/breast-cancer-causes-preventive-tips-and-all-about-pregnancy-after-chemotherapy-101643028295394.html>
4. Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, Jemal A. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2022; 74(3):229-263. <https://pubmed.ncbi.nlm.nih.gov/38572751/>
5. WHO. Global Breast Cancer Initiative. 2025. Available from: https://cdn.who.int/media/docs/default-source/documents/health-topics/cancer/the-global-breast-cancer-initiative.pdf?sfvrsn=b1192ada_18
6. Fuentes J, Morgan E, de Luna Aguilar A, Mafra A, Shah R, Giusti F, et al. Global Stage Distribution of Breast Cancer at Diagnosis: A Systematic Review and Meta-Analysis. *JAMA Oncology.* 2024;

- 10(1):71-78. <https://jamanetwork.com/journals/jamaoncology/fullarticle/2811796>.
7. Limehin M, Mekonnen E, Birhanu F, Jima B, Sisay B, Kassahun E, Hassen. Survival Patterns Among Patients With Breast Cancer in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *JAMA Network Open*. 2024; 7(5):e2410260. <http://dx.doi.org/10.1001/jamanetworkopen.2024.10260>
 8. Mulugeta C, Emagneneh T, Kumie G, Ejigu B, Alamrew A. Delayed presentation of breast cancer patients and contributing factors in East Africa: Systematic review and meta-analysis. *PLoS One*. 2024; 19(11):e0309792. <https://doi.org/10.1371/journal.pone.0309792>
 9. Nadella P, Iyer H, Manirakiza A, Vanderpuye V, Triedman S, Shulman L, Fadelu T. Geographic Accessibility of Radiation Therapy Facilities in Sub-Saharan Africa. *Int J Radiat Oncol Biol Phys*. 2023; 115(3):557-563. 10.1016/j.ijrobp.2022.10.018
 10. Togawa K, Anderson B, Foerster M, Galukande M, Zietsman A, Pontac J, Anele A, Adisa C, Parham G, et al. Geospatial barriers to healthcare access for breast cancer diagnosis in sub-Saharan African settings: The African Breast Cancer-Disparities in Outcomes Cohort Study. *International Journal of Cancer*. 2020; 148(9):2212-2226. <https://doi.org/10.1002/ijc.33400>
 11. Ayebeng C, Okyere J, Okantey C, Addo I. Multifaceted barriers associated with clinical breast examination in sub-Saharan Africa: A multilevel analytical approach. *PLoS ONE*. 2024; 20(1):e0316800. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0316800>
 12. Gnangnon F, Lawani I, Knight S, et al. Assessing the continuum of care in Sub-Saharan African hospitals performing surgery for breast cancer: a secondary analysis of the GlobalSurg 3 study. *BMC Cancer*. 2024; 24(1529). <https://doi.org/10.1186/s12885-024-13267-6>
 13. Foerster M, Anderson B, McKenzie F, et al. Inequities in breast cancer treatment in sub-Saharan Africa: findings from a prospective multi-country observational study. *Breast Cancer Research*. 2019; 21(93).<https://doi.org/10.1186/s13058-019-1174-4>
 14. Sowunmi A, Adegboyega B, Aje E, Oshikanlu B, Aina-Tolofari F, Ojetunde A. Patterns of breast cancer presentation and treatment approaches in Sub-Saharan Africa: A five-year report from an emerging oncology centre of excellence. *ESMO* 2024. <https://doi.org/10.1016/j.esmoop.2025.104854>
 15. Grosse Frie K, Samoura H, Diop S, Kamate B, et al. Why Do Women with Breast Cancer Get Diagnosed and Treated Late in Sub-Saharan Africa Perspectives from Women and Patients in Bamako, Mali. *Breast Care*. 2018; 13 (1): 39–43. <https://doi.org/10.1159/000481087>
 16. Mensah A, Mensah K, Aborigo R, Bangalee V, et al. Breast cancer screening pathways in Ghana: applying an exploratory single case study methodology with cross-case analysis. *Heliyon*. 2022; 8(11): e11413. <https://doi.org/10.1016/j.heliyon.2022.e11413>
 17. Vanderpuye V, Dadzie M, Huo D, Olopade O. Assessment of Breast Cancer Management in Sub-Saharan Africa. *JCO Global Oncology*. 2021; 7(1). <https://doi.org/10.1200/GO.21.00282>
 18. Foerster M, McKenzie F, Zietsman A, et al. Dissecting the journey to breast cancer diagnosis in sub-Saharan Africa: Findings from the multicountry ABC-DO cohort study. *International Journal Cancer*. 2021; 148: 340–351. <https://doi.org/10.1002/ijc.33209>

19. Mallum A, Patel S, Olatunji E, Nnko G, Alabi A, Akudugu J, et al. Treatment delays for cancer patients in Sub-Saharan Africa: South Africa as a microcosm ecancer. 2024; 18(1747).
<https://doi.org/10.3332/ecancer.2024.1747>
20. Moodley J, Constant D, Mwaka A, Scott S, Walter F. Anticipated help seeking behaviour and barriers to seeking care for possible breast and cervical cancer symptoms in Uganda and South Africa. ecancer. 2021; 15(1):1171. <https://doi.org/10.3332/ecancer.2021.1171>
21. Sarmah N, Sibiya M, Khoza T. Barriers and enablers to breast cancer screening in rural South Africa. AOSIS. 2024; 47(1).<https://curationis.org.za/index.php/curationis/article/view/2583/3821>
22. Hailegebireal A, Bizuayehu H, Wolde B, Tirore L, et al. The prevalence and predictors of clinical breast cancer screening in Sub-Saharan African countries: a multilevel analysis of Demographic Health Survey. Frontiers in Public Health. 2024; 12(1). <https://doi.org/10.3389/fpubh.2024.1409054>
23. Alyafei A, Easton-Carr R. The Health Belief Model of Behavior Change [Internet]. StatPearls Publishing. 2024. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK606120/>
24. Caperon L, Saville F, Ahern S. Developing a socio-ecological model for community engagement in a health programme in an underserved urban area. PLoS One. 2022; 17(9):e0275092.
<https://doi.org/10.1371/journal.pone.0275092>
25. Agodirin, O., Aremu, I., Rahman, G., Olatoke, S., Olaogun, J., Akande, H., & Romanoff, A. Determinants of delayed presentation and advanced-stage diagnosis of breast cancer in Africa: a systematic review and meta-analysis. Asian Pacific journal of cancer prevention: APJCP,. 2021; 22(4): 1007.
<https://pmc.ncbi.nlm.nih.gov/articles/PMC8325140/>
26. Brand, N. R., Qu, L. G., Chao, A., & Ilbawi, A. M. Delays and barriers to cancer care in low-and middle-income countries: a systematic review. The oncologist. 2019; 24(12): e1371-e1380.<https://academic.oup.com/oncolo/articleabstract/24/12/e1371/6439521>
27. Geremew, H., Golla, E. B., Simegn, M. B., Abate, A., Ali, M. A., Kumbi, H., ... & Tilahun, W. M. Late-stage diagnosis: The driving force behind high breast cancer mortality in Ethiopia: A systematic review and meta-analysis. Plos one. 2024; 19(7): e0307283. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0307283>
28. Pearson, S. A., Taylor, S., Marsden, A., O'Reilly, J. D., Krishan, A., Howell, S., & Yorke, J. Geographic and sociodemographic access to systemic anticancer therapies for secondary breast cancer: a systematic review. Systematic Reviews. 2024; 13(1): 35.
<https://link.springer.com/article/10.1186/s13643-023-02382-3>
29. Petrova, D., Garrido, D., Špacírová, Z., Fernández-Martínez, N. F., Ivanova, G., Rodríguez-Barranco, M., ... & Sánchez, M. J. Duration of the patient interval in breast cancer and factors associated with longer delays in low-and middle-income countries: A systematic review with meta-analysis. Psycho-Oncology. 2023; 32(1): 13-24. <https://onlinelibrary.wiley.com/doi/abs/10.1002/pon.6064>
30. Raphael, M. J., Biagi, J. J., Kong, W., Mates, M., Booth, C. M., & Mackillop, W. J. The relationship between time to initiation of adjuvant chemotherapy and survival in breast cancer: a systematic

- review and meta-analysis. *Breast cancer research and treatment*. 2016; 160(1): 17-28.
<https://link.springer.com/article/10.1007/s10549-016-3960-3>
31. Mohammed, S., Karima, B., & Nadia, T. J. Factors Influencing Patient and System Delays in Women with Breast Cancer in Morocco: A Systematic Review. *Asian Pacific Journal of Cancer Prevention: APJCP*. 2025; 26(8): 2763. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12659869/>
 32. Subedi, R., Houssami, N., Nickson, C., Nepal, A., Campbell, D., David, M., & Yu, X. Q. Factors influencing the time to diagnosis and treatment of breast cancer among women in low-and middle-income countries: A systematic review. *The Breast*. 2024; 75: 103714.
<https://www.sciencedirect.com/science/article/pii/S0960977624000456>
 33. Wendimu, D. E., Degefa, M. B., Achalu, D. L., Mamo, B. T., Daba, D. B., & Meshesha, S. G. Timeliness of Breast Cancer Patients' Presentation to Health Care Facilities in Ethiopia: A Systematic Review and Meta-Analysis. *JCO Global Oncology*. 2024; 10: e2400263.
<https://ascopubs.org/doi/abs/10.1200/GO-24-00263>
 34. Zewdie, A., Kassie, T. D., Anagaw, T. F., Mazengia, E. M., Gelaw, S. S., Fenta, E. T., ... & Bogale, E. K. Advanced-stage breast cancer diagnosis and its determinants in Ethiopia: a systematic review and meta-analysis. *BMC Women's Health*. 2024; 24(1): 284.
<https://link.springer.com/article/10.1186/s12905-024-03133-9>
 35. Agodirin, O., Olatoke, S., Rahman, G., Kolawole, O., Oguntola, S., Olasehinde, O., ... & Ajiboye, A. (2021). Determinants of late detection and advanced-stage diagnosis of breast cancer in Nigeria. *PLoS One*, 16(11), e0256847.
 36. Agodirin, O., Olatoke, S., Rahman, G., Olaogun, J., Olasehinde, O., Katung, A., ... & Fatudimu, O. (2020). Presentation intervals and the impact of delay on breast cancer progression in a black African population. *BMC public health*, 20(1), 962.
 37. Darré, T., Tchandikou, L., Simgbán, P., Bombone, M., Djiwa, T., N'Timon, B., ... & Napo-Koura, G. (2023). Factors associated with late diagnosis of breast cancer in women in Togo, Sub-Saharan Africa. *BMC Women's Health*, 23(1), 106.
 38. Daniel, Ojuka., Ashrafi, A., Muthoni, M. A., Njoki, N., Eric, H., Marilyn, O., ... & Llanos, A. A. (2023). Delayed breast cancer presentation, diagnosis, and treatment in Kenya. *Breast cancer research and treatment*, 202(3), 515-527.
 39. Gebremariam, A., Dereje, N., Addissie, A., Worku, A., Assefa, M., Abreha, A., ... & Jemal, A. (2021). Factors associated with late-stage diagnosis of breast cancer among women in Addis Ababa, Ethiopia. *Breast cancer research and treatment*, 185(1), 117-124.
 40. Brinton, L., Figueroa, J., Adjei, E., Ansong, D., Biritwum, R., Edusei, L., ... & Clegg-Lampsey, J. N. (2017). Factors contributing to delays in diagnosis of breast cancers in Ghana, West Africa. *Breast cancer research and treatment*, 162(1), 105-114.
 41. Grosse Frie, K., Kamaté, B., Traoré, C. B., Ly, M., Mallé, B., Coulibaly, B., ... & Kantelhardt, E. J. (2018). Factors associated with time to first healthcare visit, diagnosis and treatment, and their impact on survival among breast cancer patients in Mali. *PloS one*, 13(11), e0207928.

42. Grosse Frie, K., Kamaté, B., Traoré, C. B., Coulibaly, B., Mallé, B., & Kantelhardt, E. J. (2019). Health system organisation and patient pathways: breast care patients' trajectories and medical doctors' practice in Mali. *BMC Public Health*, 19(1), 204.
43. Rayne, S., Schnippel, K., Kruger, D., Benn, C. A., & Firnhaber, C. (2019). Delay to diagnosis and breast cancer stage in an urban South African breast clinic. *South African Medical Journal*, 109(3), 159-163.
44. Tesfaw, A., Demis, S., Munye, T., & Ashuro, Z. (2020). Patient delay and contributing factors among breast cancer patients at two cancer referral centres in Ethiopia: a cross-sectional study. *Journal of Multidisciplinary Healthcare*, 1391-1401.
45. Hassen, A. M., Hussien, F. M., Asfaw, Z. A., & Assen, H. E. (2021). Factors associated with delay in breast cancer presentation at the only oncology center in North East Ethiopia: a cross-sectional study. *Journal of multidisciplinary healthcare*, 681-694.
46. Makene, F. S., Ngilangwa, R., Santos, C., Cross, C., Ngoma, T., Mujinja, P. G., ... & Mackintosh, M. (2022). Patients' pathways to cancer care in Tanzania: documenting and addressing social inequalities in reaching a cancer diagnosis. *BMC health services research*, 22(1), 189.
47. Moodley, J., Cairncross, L., Naiker, T., & Constant, D. (2018). From symptom discovery to treatment- women's pathways to breast cancer care: a cross-sectional study. *BMC cancer*, 18(1), 312.
48. Deressa, B. T., Pierz, A., Jyung, H., Rosario, B., Andoh-B-Baidoo, N., Tibebu, B., . . . Lott, B. (2025). A qualitative study on the psycho-oncological experiences of women navigating breast cancer diagnosis, treatment, and survivorship in Ethiopia. *Journal of Cancer Survivorship*, 12. doi:10.1007/s11764-024-01742-9.
49. Tara, K. B. N., Vadlamudi, N., & Kumar, G. K. (2023, July). A Stacked Ensemble-Based model for the prediction of breast cancer using Decision Tree and XGBoost. In *2023 World Conference on Communication & Computing (WCONF)* (pp. 1-7). IEEE.
50. Ojuka, D., Hungu, E., & Wamalwa, A. (2023). Latissimus Dorsi Myocutaneous Flap Reconstruction Post Resection of a Giant Malignant Phyllodes Tumor of the Breast: A Case Report. *Annals of African Surgery*, 20(3), 103-107.
51. Pace, L. E., Mpunga, T., Hategekimana, V., Dusengimana, J. M. V., Habineza, H., Bigirimana, J. B., ... & Keating, N. L. (2015). Delays in breast cancer presentation and diagnosis at two rural cancer referral centers in Rwanda. *The oncologist*, 20(7), 780-788.
52. Alfadul, E. S., Tebaig, B., Alrawa, S. S., Elgadi, A. T., Margani, E. E., Adam, M. E., ... & Elhassan, M. M. A. (2024). Delays in presentation, diagnosis, and treatment in Sudanese women with breast cancer: a cross-sectional study. *The Oncologist*, 29(6), e771-e778.
53. Gebremariam, A., Addissie, A., Worku, A., Assefa, M., Pace, L. E., Kantelhardt, E. J., & Jemal, A. (2019). Time intervals experienced between first symptom recognition and pathologic diagnosis of breast cancer in Addis Ababa, Ethiopia: a cross-sectional study. *BMJ open*, 9(11), e032228.
54. Ibrahim, N. A., & Oludara, M. A. (2012). Socio-demographic factors and reasons associated with delay in breast cancer presentation: a study in Nigerian women. *The Breast*, 21(3), 416-418.

55. Achan, J., Kasujja, F. X., Opito, R., Wabinga, H., Orach, C. G., & Mwaka, A. D. (2023). Factors associated with diagnostic and pre-treatment intervals among breast cancer patients attending care at the Uganda Cancer Institute: A cross-sectional study. *Cancer Medicine*, 12(19), 19701-19713.

Figures

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

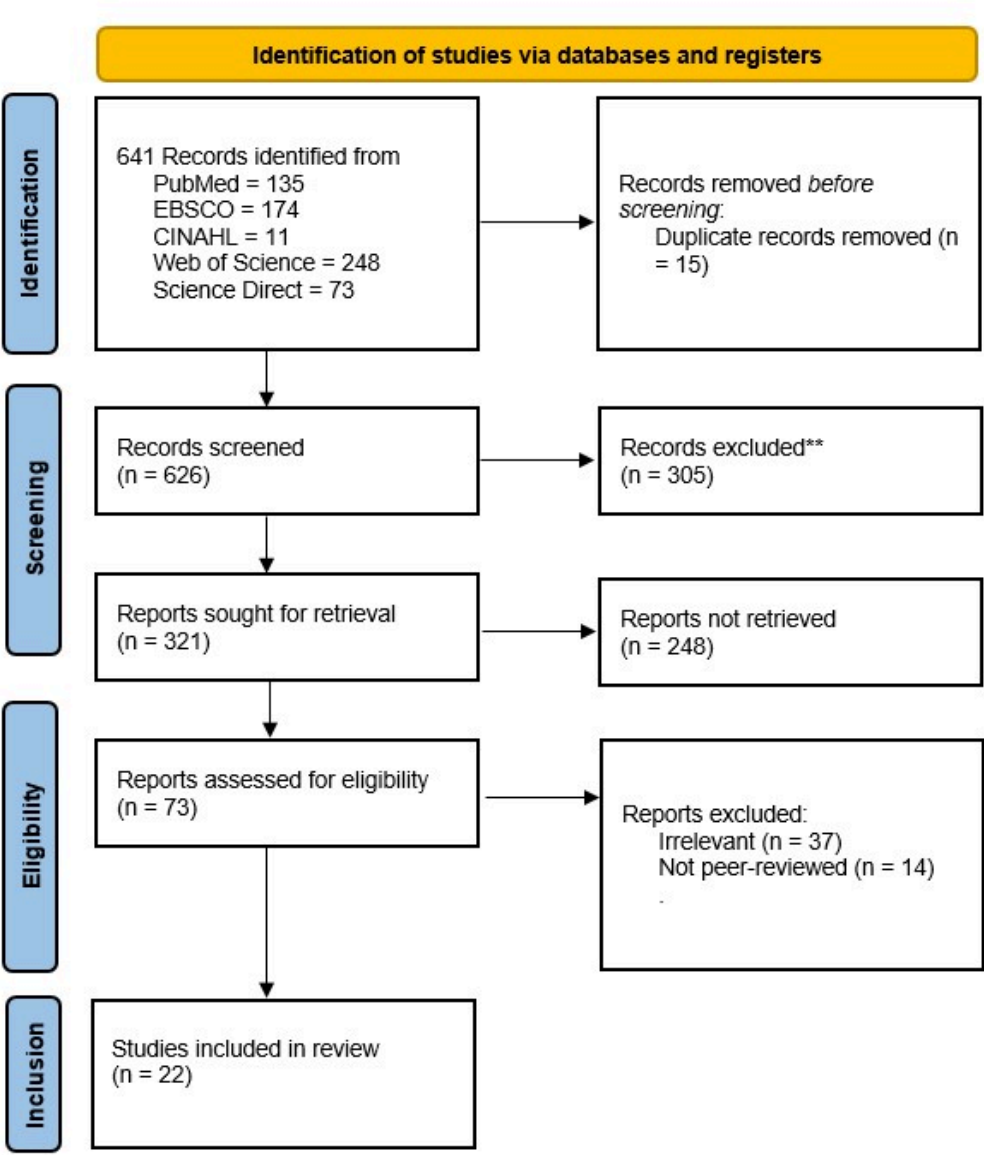


Figure 1

PRISMA Guideline Flowchart showing the study search and selection

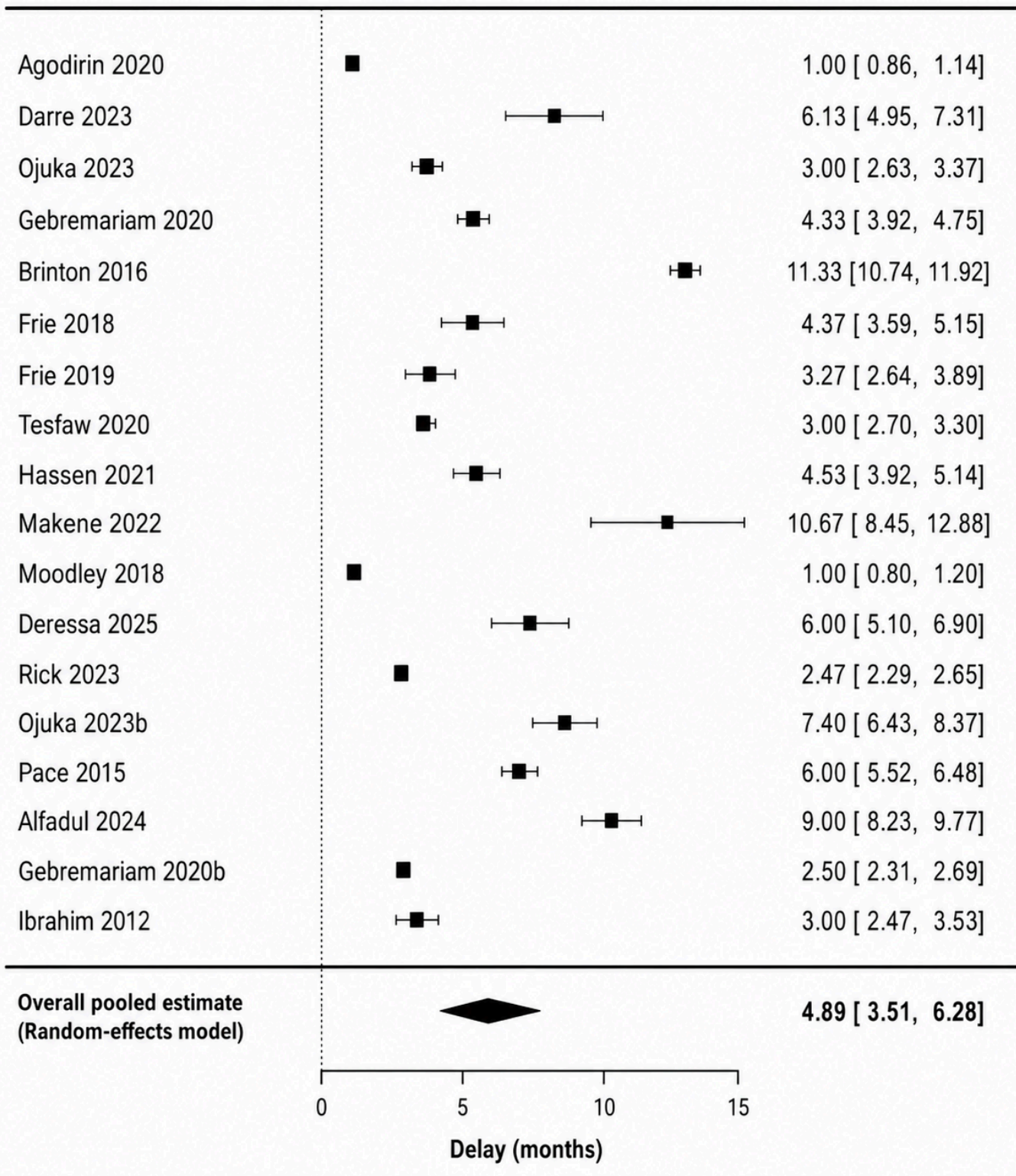


Figure 2

Forest Plot showing patient delay in Breast Cancer in SSA

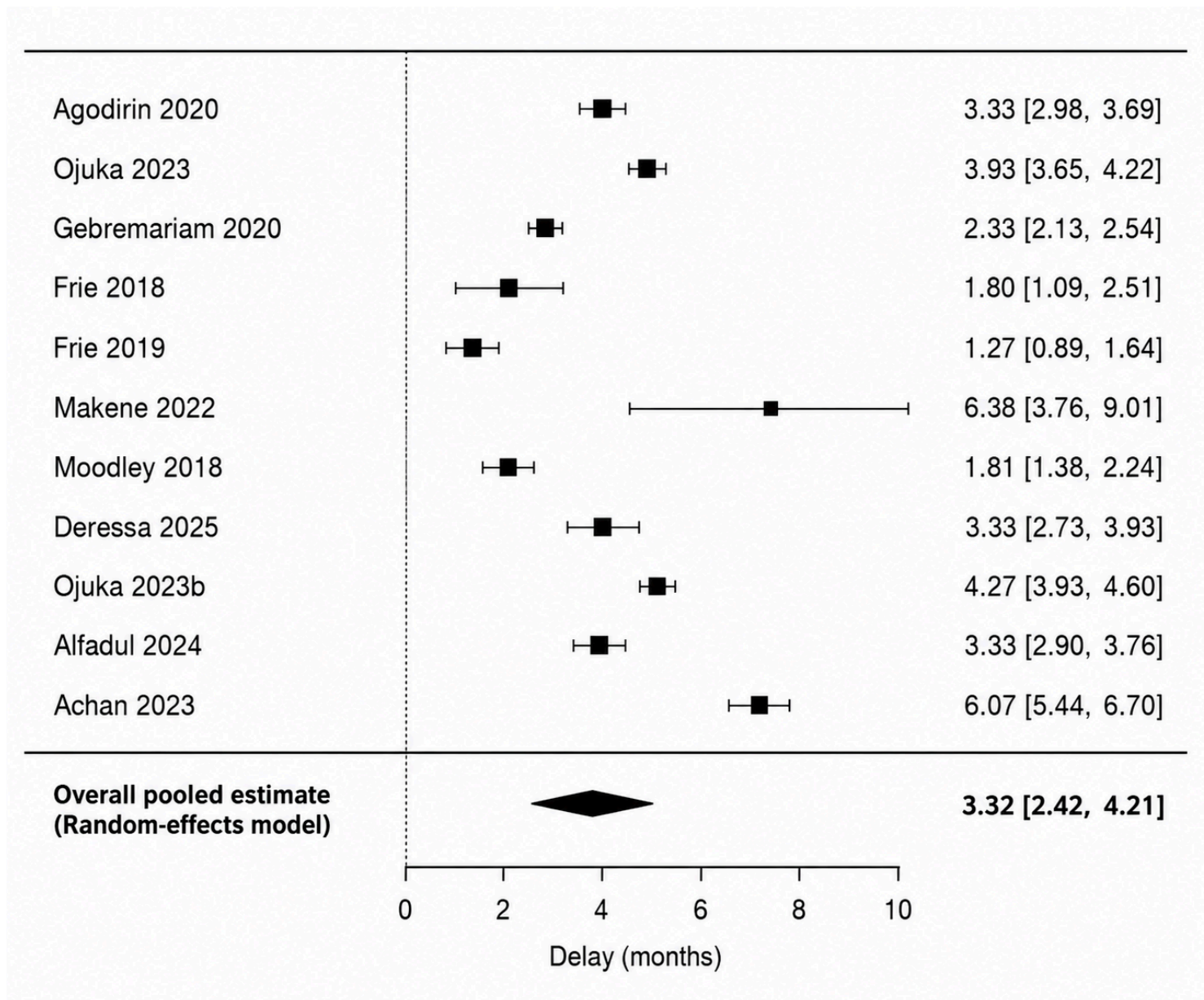


Figure 3

Forest Plot showing diagnostic delay in Breast Cancer in SSA

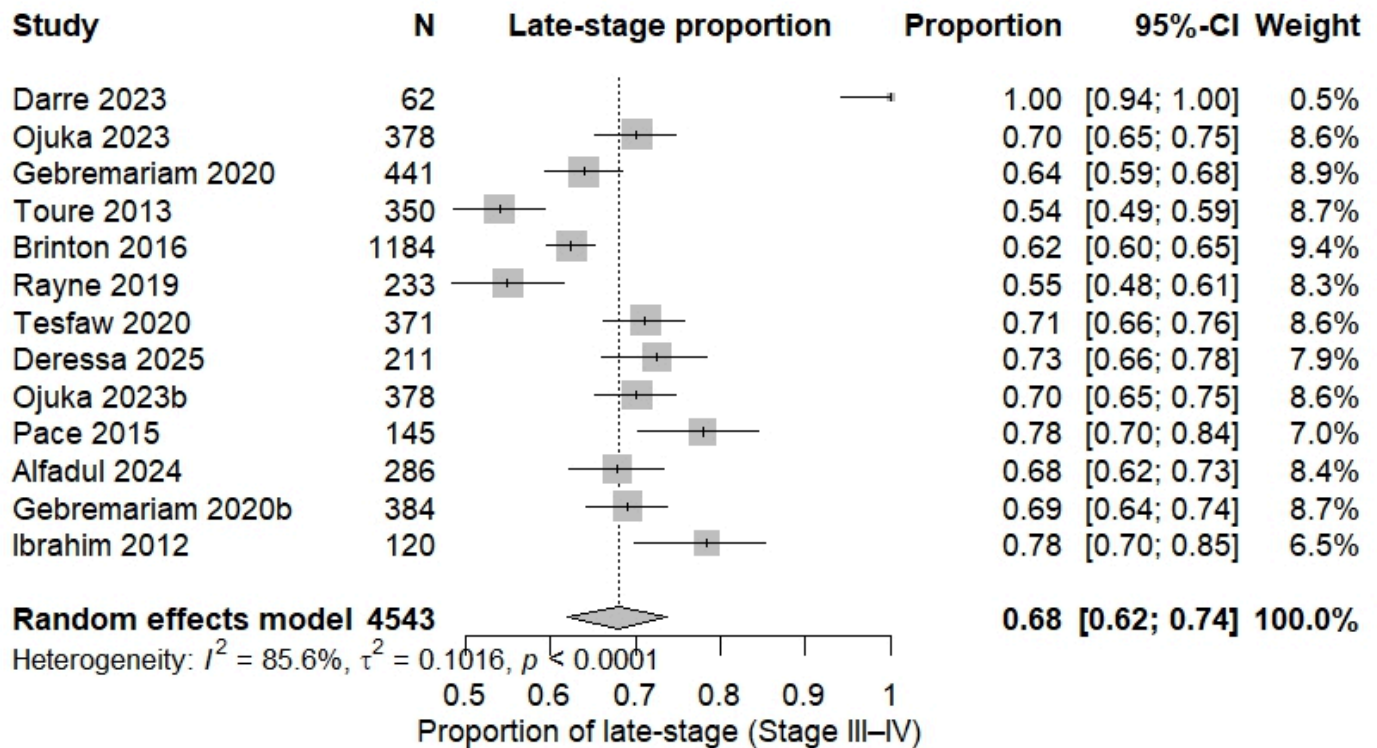


Figure 4

Forest Plot showing late-stage diagnosis of breast cancer in SSA

	Selection					Comparability		Outcome		
Study	S1	S2	S3	S4	S5	C1	C2	O1	O2	O3
Achan 2023	★	★	★	★	★	★	★	★	★	★
Gebremariam 2020b	★	★	★	★	★	★	★	★	★	★
Alfadul 2024	★	★	★	★	★	★	★	★	★	★
Pace 2015	★	★	★	★	★	★	★	★	★	★
Ojuka 2023b	★	★	★	★	★	★	★	★	★	★
Rick 2023	★	★	★	★	★	★	★	★	★	★
Ntekim 2025	★	★	★	★	★	★	★	★	★	★
Deressa 2025	★	★	★	★	★	★	★	★	★	★
Moodley 2018	★	★	★	★	★	★	★	★	★	★
Makene 2022	★	★	★	★	★	★	★	★	★	★
Hassen 2021	★	★	★	★	★	★	★	★	★	★
Tesfaw 2020	★	★	★	★	★	★	★	★	★	★
Rayne 2019	★	★	★	★	★	★	★	★	★	★
Frie 2019	★	★	★	★	★	★	★	★	★	★
Frie 2018	★	★	★	★	★	★	★	★	★	★
Brinton 2016	★	★	★	★	★	★	★	★	★	★
Toure 2013	★	★	★	★	★	★	★	★	★	★
Gebremariam 2020	★	★	★	★	★	★	★	★	★	★
Ojuka 2023	★	★	★	★	★	★	★	★	★	★
Darre 2023	★	★	★	★	★	★	★	★	★	★
Agodirin 2021	★	★	★	★	★	★	★	★	★	★
Agodirin 2020	★	★	★	★	★	★	★	★	★	★

★

= Criterion fulfilled (Low risk of bias)

★

= Criterion not fulfilled (High risk of bias)

S1–S5: Selection domain

C1–C2: Comparability domain

O1–O3: Outcome domain

Figure 5

Risk of Bias assessment of the included studies

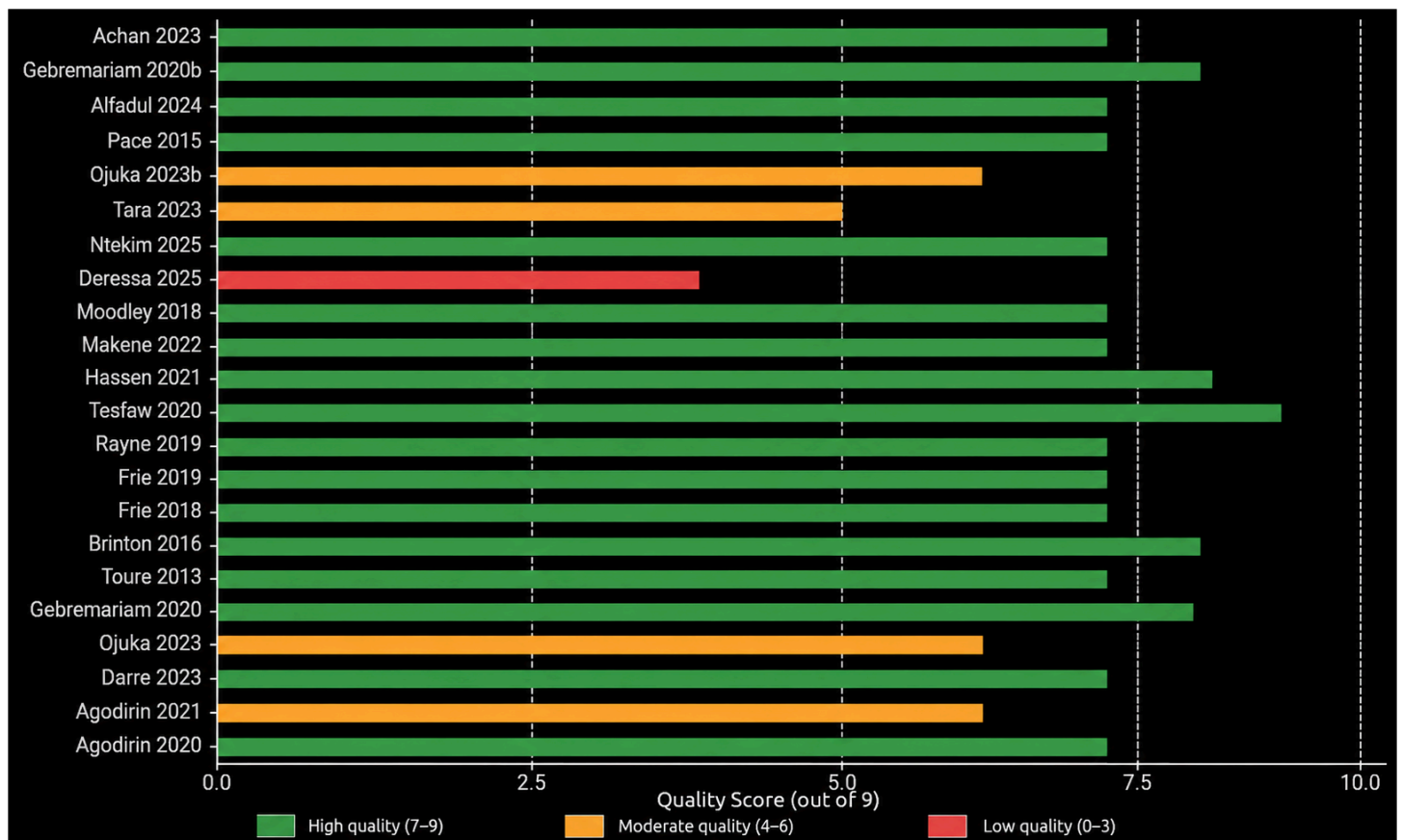


Figure 6

The overall NOS scores for each study