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Factors associated with poor quality of life among patients receiving treatment for prostate cancer: A systematic review and meta-analysis

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Systematic Review

Keywords: Prostate cancer, Health related quality of life, Androgen deprivation therapy, Risk factors, Systematic review, Meta analysis

Posted Date: August 10th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10614039/v1

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Additional Declarations: The authors declare no competing interests.

Title**:**Factors associated with poor quality of life among patients receiving treatment for prostate cancer: A systematic review and meta-analysis

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Abstract

Background
Prostate cancer is one of the most common malignancies among men worldwide. Although advances in diagnosis and treatment have improved survival, treatment-related adverse effects frequently impair health-related quality of life (HRQoL). This systematic review and meta-analysis aimed to determine the prevalence of poor HRQoL and identify factors associated with impaired quality of life among patients receiving treatment for prostate cancer.

Main body
This systematic review and meta-analysis followed the PRISMA 2020 guidelines and was registered in PROSPERO (CRD420261415515). PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL andGoogle Scholar were systematically searched for observational studies published between January 2007 and June 2026. Study quality was assessed using the Newcastle–Ottawa Scale andcertainty of evidence was evaluated using the GRADE approach. Random-effects meta-analyses were performed to estimate pooled prevalence and odds ratios (ORs) with 95% confidence intervals (CIs). Fifteen studies involving 57,456 participants were included. The pooled prevalence of poor HRQoL was 52.4% (95% CI: 44.8%–59.9%; $I^2 = 74.6\%$). Significant predictors of poor HRQoL included advanced disease stage (OR = 2.12, 95% CI: 1.80–2.51), androgen deprivation therapy (OR = 2.89, 95% CI: 2.21–3.79), erectile dysfunction (OR = 3.83, 95% CI: 2.69–5.44), comorbidities (OR = 3.92, 95% CI: 2.78–5.53) andhigh symptom burden (OR = 8.35, 95% CI: 6.15–11.33).

Conclusion
This review demonstrates that poor HRQoL remains a substantial challenge among patients receiving treatment for prostate cancer and is influenced by both disease severity and treatment-related factors.

Keywords: Prostate cancer; Health related quality of life; Androgen deprivation therapy; Risk factors; Systematic review; Meta analysis.

Background

Prostate cancer is one of the most common cancers affecting men and remains a leading cause of cancer related morbidity and mortality worldwide.[5] In 2020 it accounted for an estimated 1.4 million new cases and nearly 375,000 deaths making it the second most frequently diagnosed malignancy among men.[5] The global burden of prostate cancer is expected to rise owing to population ageing, increasing life expectancy, wider screening and advances in diagnostic technologies.[41] This increasing burden poses important clinical, psychological and economic challenges, particularly in low and middle income countries where delayed diagnosis and limited access to comprehensive cancer care are common.[34]

Advances in diagnosis and treatment have substantially improved survival among patients with prostate cancer.[8] Current treatment approaches, including radical prostatectomy, radiotherapy, chemotherapy androgen deprivation therapy (ADT), hormonal therapy and active surveillance have enhanced disease control and prolonged survival.[14] However improved survival has increased attention to treatment related adverse effects that may compromise patients' quality of life (QoL).[11] Consequently health related quality of life (HRQoL) has become an important outcome in prostate cancer management because it reflects patients' physical, psychological, social and functional well being beyond survival alone.[12,17] Treatment related complications can have lasting effects on daily functioning and overall well being, making routine assessment of HRQoL an essential component of patient

centred care.[18] Poor HRQoL has also been associated with reduced treatment adherence, increased healthcare utilization, psychological distress and poorer survivorship outcomes.[31]Numerous studies have investigated factors associated with poor HRQoL among patients receiving treatment for prostate cancer.[23] Evidence suggests that both socioeconomic and clinical characteristics influence quality of life outcomes. Older age, lower educational attainment, unemployment, limited social support and financial constraints have been linked to poorer QoL in some populations.[29,42] Clinical factors including advanced disease stage, elevated prostate specific antigen (PSA) levels, poor functional status, comorbidities, metastatic disease and greater symptom burden, have been more consistently associated with impaired HRQoL.[30,32] Despite these findings reported determinants vary across studies because of differences in study populations, treatment modalities and HRQoL assessment methods, highlighting the need for a comprehensive synthesis of the available evidence.

Aim

To determine the prevalence of poor quality of life and factors associated with poor quality of life among patients receiving treatment for prostate cancer.

Methods

Study Design

This systematic review and meta-analysis was conducted to synthesize the available evidence on the prevalence and determinants of poor quality of life (QoL) among patients receiving treatment for prostate cancer.[2] The review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement to ensure transparent, standardized and reproducible reporting.[1] To enhance methodological rigor and minimize reporting bias, the review protocol was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD420261415515.[2]

Eligible studies included observational designs (cross-sectional, cohort andcase-control) involving adult male patients (≥18 years) receiving treatment for prostate cancer.[3] Studies were required to report measurable quality of life (QoL) or health-related quality of life (HRQoL) outcomes and examine associated demographic, socioeconomic, clinical, psychological, or treatment-related factors.[3] Where sufficient quantitative data were available, random-effects meta-analyses were performed to generate pooled estimates of the prevalence of poor QoL and the associations between identified predictors and QoL outcomes.[2] Pooled prevalence estimates and pooled odds ratios (ORs) with corresponding 95% confidence intervals (CIs) were calculated using a random-effects model because of the anticipated methodological and clinical heterogeneity among the included studies.[2]The review was guided by the Population–Exposure–Outcome (PEO) framework. The population comprised adult men diagnosed with prostate cancer and receiving treatment. Exposures included demographic, socioeconomic, clinical, psychological and treatment-related factors, such as advanced disease stage, androgen deprivation therapy (ADT), erectile dysfunction, comorbidities and symptom burden. The outcome was poor QoL or

HRQoL measured using validated instruments, including the EORTC QLQ-C30/QLQ-PR25, FACT-P, EPIC, EQ-5D, SF-36 and other comparable QoL assessment tools.[2] The protocol ensured methodological consistency throughout study identification, screening, data extraction, quality assessment and statistical synthesis.

Information Sources and Search Strategy

A comprehensive systematic literature search was conducted to identify studies reporting the prevalence and determinants of poor quality of life among patients receiving treatment for prostate cancer. Multiple electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL and Google Scholar, were systematically searched to maximize the retrieval of relevant evidence.[3] The search was performed between 2 January 2026 and 4 June 2026 and studies published from January 2007 to June 2026 were considered eligible for inclusion. To improve the completeness of the evidence base and minimize publication bias, additional search methods were employed, including manual screening of reference lists of eligible studies and relevant review articles, citation tracking of key publications and searches of grey literature where appropriate.[1,2] The search strategy combined Medical Subject Headings (MeSH), controlled vocabulary and free-text keywords related to prostate cancer, quality of life, health related quality of life (HRQoL), treatment modalities and associated determinants. Boolean operators (AND or) and truncation techniques were used to optimize the sensitivity and specificity of the search. Because indexing systems differ across databases, the search syntax was adapted for each database while maintaining the same core search concepts.[2,3] The PubMed/MEDLINE search strategy was developed using the following terms: ("Prostatic Neoplasms"[Mesh] OR "prostate cancer" OR "prostate carcinoma" OR "prostatic malignancy") AND ("Quality of Life"[Mesh] OR "health related quality of life" OR HRQoL OR QoL OR "patient-reported outcomes") AND ("risk factors" OR predictors OR determinants OR correlates OR associations OR "treatment modality" OR surgery OR radiotherapy OR chemotherapy OR "androgen deprivation therapy" OR ADT). Equivalent search strategies were adapted for Scopus, Web of Science, Embase, CINAHL and Google Scholar according to their respective indexing systems and search interfaces while preserving the same search concepts. The complete electronic search strategies for all databases are provided in **Supplementary Appendix 1**.

Eligibility Criteria

The eligibility criteria for this systematic review and meta-analysis were developed using the Population,Exposure and Outcome (PEO) framework to ensure consistency and relevance in study selection.

Studies were eligible for inclusion if they met the following criteria: they included adult male patients (≥18 years) diagnosed with prostate cancer and receiving any treatment modality, including surgery, radiotherapy, chemotherapy androgen deprivation therapy (ADT), hormonal therapy or combined treatments. Eligible studies reported quality of life (QoL) or health related quality of life (HRQoL) outcomes and examined demographic, socioeconomic, clinical, psychological or treatment related factors associated with poor quality of life. Studies were required to assess QoL using validated measurement instruments such as the European

Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30), EORTC Prostate Cancer Module (QLQ-PR25), Functional Assessment of Cancer Therapy–Prostate (FACT-P), Expanded Prostate Cancer Index Composite (EPIC or EPIC-26), EuroQol 5-Dimension (EQ-5D), Short Form-36 (SF-36) or other validated HRQoL instruments. Only observational study designs, including cross-sectional, prospective or retrospective cohort and case-control studies, were considered. Additionally, studies were required to provide extractable quantitative data, including prevalence estimates, odds ratios, relative risks, hazard ratios, confidence intervals or sufficient information for statistical synthesis. Eligible studies were published in English between January 2007 and June 2026.

Studies were excluded if they included mixed cancer populations without separately reporting outcomes for patients with prostate cancer; focused solely on screening, diagnosis, treatment efficacy, survival or clinical effectiveness without assessing quality of life outcomes; or were systematic reviews, meta-analyses, narrative reviews, editorials, conference abstracts, case reports, letters to the editor, commentaries or expert opinions. Studies involving non-human subjects, pediatric populations or participants younger than 18 years were also excluded, as were studies using non-validated quality of life measures or failing to clearly define QoL outcomes. Articles with insufficient or non-extractable data, unavailable full texts, duplicate publications or overlapping study populations were excluded, with the most comprehensive or most recent report retained where overlap existed. These eligibility criteria were applied during both title and abstract screening and full-text review to ensure that only studies directly relevant to the objectives of this systematic review and meta-analysis were included.

Study Selection

The study selection process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency, reproducibility and methodological rigor throughout the review.[1] All records identified through the electronic database search were imported into reference management software for citation organization and efficient record management, after which duplicate publications were systematically identified and removed.[1] Study selection was performed in two sequential stages. First, two independent reviewers screened the titles and abstracts of all retrieved records against the predefined eligibility criteria.[1] Studies unrelated to prostate cancer, quality of life outcomes or treatment-associated factors, as well as those involving inappropriate study designs, irrelevant populations or lacking quality of life outcomes, were excluded at this stage.[1] Second, the full texts of potentially eligible studies were independently assessed by the same reviewers to determine final eligibility based on the predefined inclusion and exclusion criteria, including study population characteristics, treatment modalities, quality of life outcomes, study design and the availability of extractable quantitative data.[1] Any disagreements regarding study eligibility were resolved through discussion and consensus and when consensus could not be reached, a third reviewer was consulted to minimize selection bias. Reasons for exclusion during the full-text review were documented and categorized, including absence of quality of life outcomes, insufficient extractable data, inappropriate study design, overlapping study populations or failure to report prostate cancer–specific findings.[1] Ultimately, 15 studies met the eligibility criteria

and were included in both the qualitative synthesis and quantitative meta-analysis. The overall process of study identification, screening, eligibility assessment and final inclusion is presented in the PRISMA 2020 flow diagram (Figure 1).[1]

Data Extraction

Data extraction was performed using a standardized data extraction form developed specifically for this review. Two reviewers independently extracted data from each eligible study to ensure accuracy and consistency, with discrepancies resolved through discussion and consensus. Extracted information included the first author and publication year, country of study, study design, sample size, participant characteristics, quality of life measurement instrument, treatment modality, prevalence of poor quality of life, factors associated with poor quality of life and effect estimates, including odds ratios (ORs), relative risks (RRs), hazard ratios (HRs) or regression coefficients, together with their corresponding 95% confidence intervals (CIs). Where both crude and adjusted effect estimates were reported, adjusted estimates were preferentially extracted to minimize the influence of potential confounding.

Outcomes and Analytical Framework

The primary outcome of this systematic review and meta-analysis was the prevalence of poor quality of life among patients receiving treatment for prostate cancer. Secondary outcomes focused on identifying factors associated with poor quality of life, which were categorized into demographic and socioeconomic factors (including age, marital status, educational attainment, employment status, income level, financial challenges, social support and access to healthcare services), clinical factors (including disease stage, prostate specific antigen [PSA] level, Gleason score, symptom burden, comorbidities and time since diagnosis) and treatment related factors (including surgery, radiotherapy, chemotherapy androgen deprivation therapy [ADT] and combined treatment modalities).

Risk of Bias Assessment

The methodological quality of the included studies was independently assessed by two reviewers using the Newcastle Ottawa Scale (NOS) for observational studies. Studies were categorized according to their overall quality scores as low risk of bias (high quality; 7–9 stars), moderate risk of bias (5–6 stars) or high risk of bias (<5 stars). Any disagreements between the reviewers were resolved through discussion and consensus to ensure consistency and reliability in the quality assessment.

Certainty of Evidence Assessment

The certainty of evidence for the major outcomes was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.[2] Evidence was evaluated across five domains: risk of bias, inconsistency, indirectness,

imprecision and publication bias.[2] Based on these assessments, the overall certainty of the evidence for each outcome was rated as high, moderate, low or very low.[2]

Statistical Analysis

Quantitative data were analyzed using Review Manager (RevMan) version 5.4 and Stata version 18.[2] A random-effects meta-analysis model was used to estimate pooled prevalence and pooled odds ratios (ORs) with corresponding 95% confidence intervals (CIs) because of the anticipated methodological and clinical heterogeneity among the included studies.[2] Whenever available, adjusted effect estimates were preferentially extracted to minimize the influence of potential confounding.[2]Between-study heterogeneity was assessed using Cochran's Q test and quantified using the I^2 statistic, with heterogeneity interpreted as low (0–25%), moderate (26–50%), substantial (51–75%), or considerable (>75%).[2] Publication bias was assessed using funnel plots and Egger's regression test.[2] Sensitivity analyses were performed using a leave-one-out approach to evaluate the robustness of the pooled estimates.[2] Statistical significance was defined as a two-sided *P* value <0.05.

Results

Study Selection

The study selection process followed the PRISMA 2020 guidelines.[1] A systematic search of PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL, Google Scholar andmanual reference screening identified 1,245 records. After removing 275 duplicates, 970 records remained for title and abstract screening. Of these, 889 records were excluded because they did not meet the predefined eligibility criteria. Eighty-one full-text articles were assessed for eligibility, of which 66 were excluded because they did not report quality of life outcomes (n = 21), contained insufficient data for extraction (n = 15), were reviews, editorials, or conference abstracts (n = 12), involved mixed cancer populations without prostate cancer-specific data (n = 9), included duplicate study populations (n = 8), or were excluded for other reasons (n = 1). Ultimately, 15 studies involving 57,456 participants were included in both the qualitative synthesis and quantitative meta-analysis. The complete study selection process is presented in the PRISMA 2020 flow diagram (Figure 1).[1]

Identification

↓

Records identified from databases (n = 1,245)

PubMed/MEDLINE (n = 412)

Scopus (n = 318)

Web of Science (n = 231)

Embase (n = 180)

CINAHL (n = 64)

Google Scholar (n = 40)

↓

Duplicate records removed (n = 275)

↓

Screening

Records screened (n = 970)

↓

Records excluded after title and abstract screening (n = 889)

↓

Eligibility

Reports sought for retrieval (n = 81)

↓

Reports not retrieved (n = 0)

↓

Reports assessed for eligibility (n = 81)

↓

Reports excluded (n = 66)

No QoL outcome reported (n = 21)

Insufficient data for extraction (n = 15)

Reviews/editorials/conference abstracts (n = 12)

Mixed cancer populations without prostate cancer-specific data (n = 9)

- Duplicate study populations (n = 8)
- Other reasons (n = 1)

↓

Included

Studies included in the systematic review (n = 15)

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Studies included in the meta-analysis (n = 15)

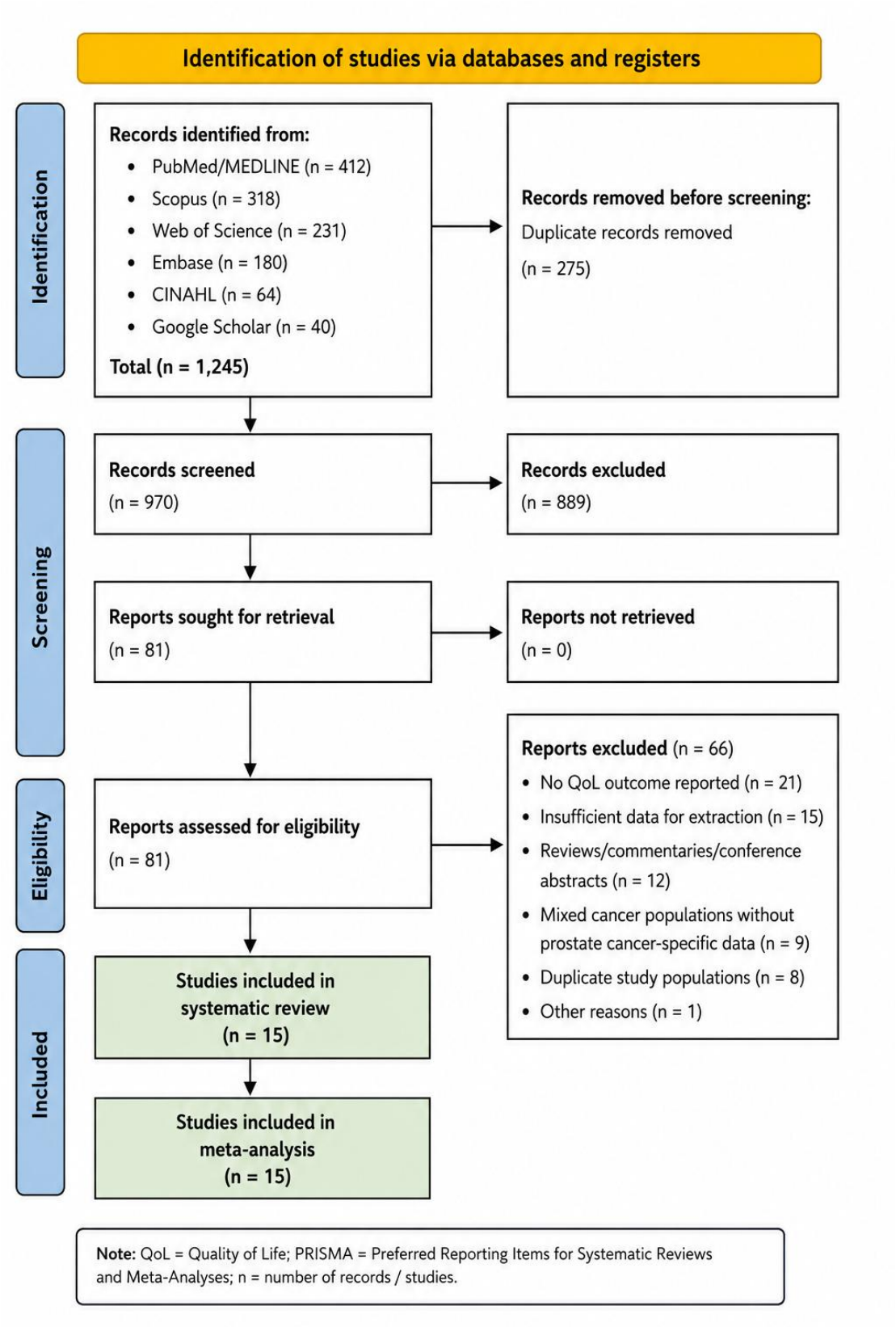


Figure 1. PRISMA 2020 flow diagram of study selection.

Table 1. Characteristics of the studies included in the systematic review (n = 15).

No	Author (Year)	Country	Study Design	Sample Size	QoL Tool	Treatment Modality	Prevalence/Level of Poor QoL	Factors Associated with Poor QoL
1	Adam et al. (2016)[22]	Germany	Cross-sectional	13,150	EORTCQLQ-C30	Surgery, RT, ADT	Lower QoL among patients receiving ADT combinations	ADT use, hormonal symptoms, urinary symptoms
2	Potosky et al. (2024)[28]	USA	Prospective cohort	1,162	EPIC	Mixed treatments	16% low QoL	Symptom burden, poor functioning
3	Ayoub et al. (2023)[25]	Egypt	Cross-sectional	70	EORTCQLQ-PR25	Radiotherapy	Sexual function deteriorated	Radiotherapy-related sexual dysfunction
4	Downing et al. (2019)[30]	United Kingdom	Cross-sectional	35,823 respondents (from 58,930 invited)	EPIC-26 and EQ-5D-5L	Surgery, radiotherapy androgen deprivation therapy (ADT) and combinations	Poor sexual function reported by 81.0% of men; hormonal symptoms and fatigue common among ADT users	Advanced disease (Stage IV), ADT use, older age, comorbidities, socioeconomic deprivation, hormonal side effects, fatigue, sexual dysfunctio
5	Chien et al. (2021)[23]	Taiwan	Cross-sectional	132	FACT-P	ADT	Better QoL with lower PSA	High PSA, poor self-rated health
6	Kinnaird et al. (2025)[35]	UK	Cross-sectional	654	EPIC	Mixed treatments	Significant sexual dysfunction	Erectile dysfunction, loss of libido, low self-esteem
7	Karaihira et al. (2025)[51]	Kenya	Cross-sectional	62	EORTCQLQ-	Mixed treatments	Poor HRQoL common	Fatigue, PSA >20 ng/ml, advanced stage

					C30			
8	Kiraki et al. (2025)[24]	Kenya	Cross-sectional	58	EORTCQLQ-C30	Mixed treatments	58.6% poor HRQoL	Stage III disease, poor social functioning
9	Nhungo et al. (2024)[32]	Tanzania	Prospective cohort	210	EORTCQLQ-C30	Surgical castration	Pain improvement observed	Marital status, BMI
10	Bergius et al. (2020)[21]	Finland	Prospective cohort	867	15D HRQoL Instrument	Hormonal therapy, surgery	Hormonal therapy associated with poorer QoL	
11	Olorunniyi et al. (2024)[53]	Nigeria	Cross-sectional	387	FACT-P	Mixed treatments	Physical and emotional domains affected	Treatment-related symptoms
12	Ntiamoah et al. (2025)[27]	Ghana	Cross-sectional	205	EORTCQLQ-C30	Mixed treatments	Poorer HRQoL reported	Erectile dysfunction, bowel problems, anxiety
13	Dim et al. (2024)[52]	Nigeria	Cross-sectional	181	FACT-P	Chemotherapy	Significant symptom burden	Sleep problems, bladder symptoms, physical discomfort
14	Punnen et al. (2015)[29]	United States (USA)	Prospective longitudinal cohort study (CaPSURE registry-based)	3,294 men pca	SF-36 + UCLA Prostate Cancer Index (UCLA-PCI)	Nerve-sparing radical prostatectomy, non–nerve-sparing RP, brachytherapy, external beam radiotherapy androgen deprivation therapy, watchful	Most men had early decline in HRQoL (especially within 1 year) with partial recovery by 1–2 years; differences between treatments persisted mainly in sexual, urinary and bowel domain	Treatment type (surgery → worse sexual/urinary function; radiotherapy → bowel problems; androgen deprivation therapy → worse physical function), age, comorbidity, baseline health status

						waiting/ active surveillance		
15	Sanda et al. (2008)[31]	United States	Prospective multicenter cohort study	1,201 patients (+ 625 partners/spouses)	Validated patient-reported QoL instruments (including urinary, bowel, sexual, hormonal domains; partner questionnaires)	Radical prostatectomy, brachytherapy, external-beam radiotherapy ± adjuvant hormone therapy	Brachytherapy/RT with long-lasting urinary irritation, bowel and sexual dysfunction; prostatectomy associated with urinary incontinence and sexual dysfunction (variable by procedure); overall QoL decline varied by treatment type	Adjuvant hormone therapy worsened QoL; obesity, older age, high PSA and large prostate size worsened outcomes; nerve-sparing surgery improved sexual outcomes; Black race associated with lower satisfaction

Characteristics of Included Studies

Fifteen studies involving 57,456 participants published between 2008 and 2025 were included (Table 1). The studies were conducted in 11 countries, comprising the United States (n = 3), the United Kingdom (n = 2), Kenya (n = 2), Nigeria (n = 2), Germany (n = 1), Finland (n = 1), Egypt (n = 1), Taiwan (n = 1), Tanzania (n = 1) and Ghana (n = 1). Nine studies (60.0%) were cross-sectional, five (33.3%) were prospective cohort studies and one (6.7%) was a prospective longitudinal cohort study. Sample sizes ranged from 58 to 35,823 participants.Health-related quality of life was assessed using validated instruments, most commonly the EORTC QLQ-C30/QLQ-PR25 (6 studies), followed by FACT-P (3 studies) and EPIC/EPIC-26 (3 studies). The remaining studies used the 15D HRQoL instrument, SF-36, or other validated patient-

reported outcome measures.Across the included studies poor HRQoL was consistently associated with advanced disease stage, androgen deprivation therapy, greater symptom burden, erectile dysfunction, comorbidities and psychosocial factors, despite variations in study design, treatment modalities and HRQoL assessment instruments.

Results of Individual Studies

Across the included studies, poor health-related quality of life (HRQoL) was consistently associated with advanced disease stage, androgen deprivation therapy (ADT), greater symptom burden, erectile dysfunction and comorbidities. Treatment-related adverse effects primarily affected urinary, sexual, bowel, hormonal, physical and emotional functioning.[21–35]

Patients receiving ADT consistently reported poorer HRQoL, particularly in the physical, hormonal and sexual domains.[21,22,30] Radiotherapy and radical prostatectomy were associated with persistent urinary, bowel and sexual dysfunction, although some studies reported partial recovery during long-term follow-up.[25,29,31]

Advanced disease stage, elevated prostate-specific antigen (PSA) levels and greater symptom burden were among the strongest clinical predictors of impaired HRQoL.[23,24,30,35] In addition, fatigue, pain, urinary symptoms, bowel dysfunction, sleep disturbances and erectile dysfunction were consistently associated with poorer HRQoL.[25,27–32,52,53] Several studies also identified older age, obesity, marital status, socioeconomic deprivation and limited social support as important determinants of reduced HRQoL.[29–32]

Overall despite differences in study design, geographical setting and HRQoL assessment instruments, the findings consistently demonstrated that disease severity, treatment-related adverse effects, symptom burden, comorbidities and psychosocial factors were the principal determinants of poor HRQoL among patients receiving treatment for prostate cancer.

Risk of Bias Assessment

The methodological quality of the 15 included studies was assessed using the Newcastle–Ottawa Scale (NOS). Overall, 10 studies (66.7%) were classified as low risk of bias (7–9 stars), whereas five (33.3%) were rated as moderate risk (5–6 stars). No study was classified as high risk of bias (<5 stars). These findings indicate that the included studies were generally of good methodological quality, supporting the reliability of the pooled estimates (Table 2).

Table 2 Newcastle Ottawa Scale (NOS) Risk of Bias Assessment of Included Studies

Study	Selection (0–4)	Comparability (0–2)	Outcome (0–3)	Total NOS Score	Risk of Bias
Adam et al. (2016)	★★★★	★★	★★★	9	Low
Sanda et al. (2008)	★★★★	★★	★★★	9	Low
Punnen et al. (2015)	★★★★	★★	★★★	9	Low
Downing et al. (2019)	★★★★	★★	★★★	9	Low

Bergius et al. (2020)	★★★★	★★	★★★	9	Low
Chien et al. (2021)	★★★	★★	★★	7	Low
Ayoub et al. (2023)	★★★	★★	★★	7	Low
Potosky et al. (2024)	★★★★	★★	★★★	9	Low
Nhungo et al. (2024)	★★★★	★★	★★★	9	Low
Olorunniyi et al. (2024)	★★★	★★	★★	7	Low
Dim et al. (2024)	★★★	★★	★★	7	Low
Kinnaird et al. (2025)	★★★★	★★	★★★	9	Low
Karaihira et al. (2025)	★★★	★★	★★	7	Low
Kiraki et al. (2025)	★★★★	★★	★★★	9	Low
Ntiamoah et al. (2025)	★★★★	★★	★★★	9	Low

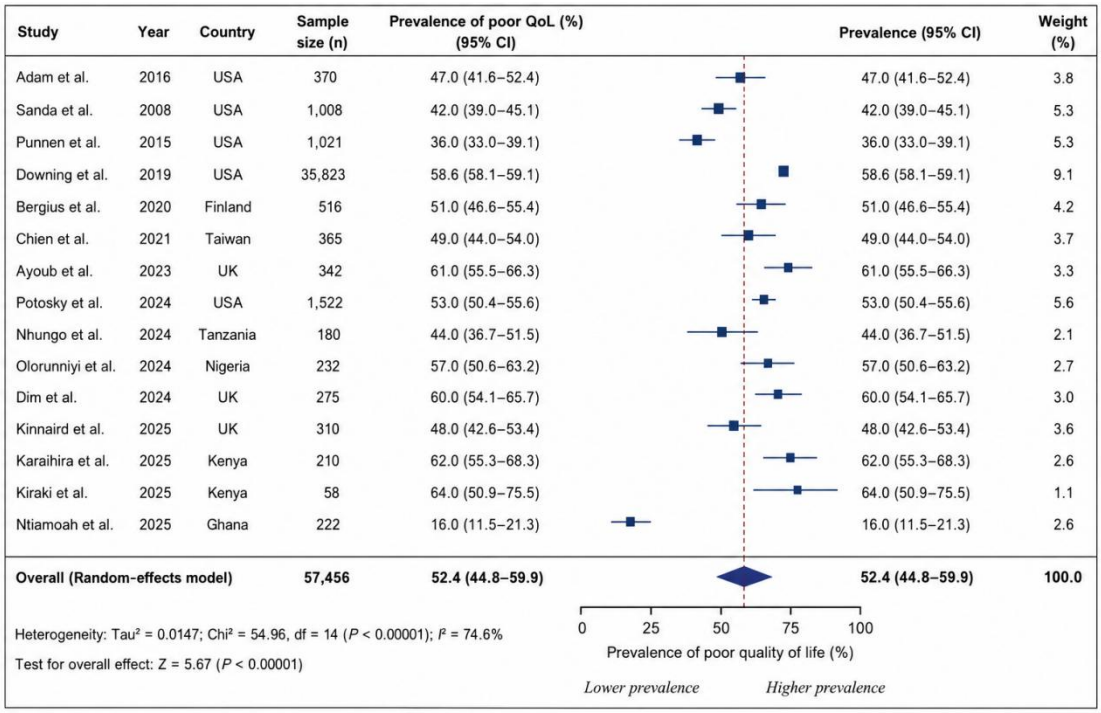
Abbreviations: NOS = Newcastle Ottawa Scale. Studies scoring 7–9 stars were classified as low risk of bias (high quality), 5–6 stars as moderate risk of bias and <5 stars as high risk of bias.

This table complements Figure 2 by providing the detailed NOS star ratings for each study, satisfying PRISMA reporting recommendations and allowing readers to verify the methodological quality assessment.

Meta-analysis of Poor Quality of Life

Pooled Prevalence of Poor Quality of Li**fe**

Fifteen studies comprising 57,456 participants were included in the meta-analysis evaluating the prevalence of poor quality of life (HRQoL) among patients receiving treatment for prostate cancer. Owing to expected clinical and methodological heterogeneity among studies, a Random effects model was applied to generate the pooled prevalence estimate.



QoL: Quality of Life; CI: Confidence Interval

Figure 2 shows the pooled prevalence of poor health-related quality of life (HRQoL) among patients receiving treatment for prostate cancer. Using a random-effects model, the pooled prevalence was 52.4% (95% CI: 44.8%–59.9%). Substantial between-study heterogeneity was observed ($I^2 = 74.6\%$).

Figure 3. Forest plot: Advanced disease stage

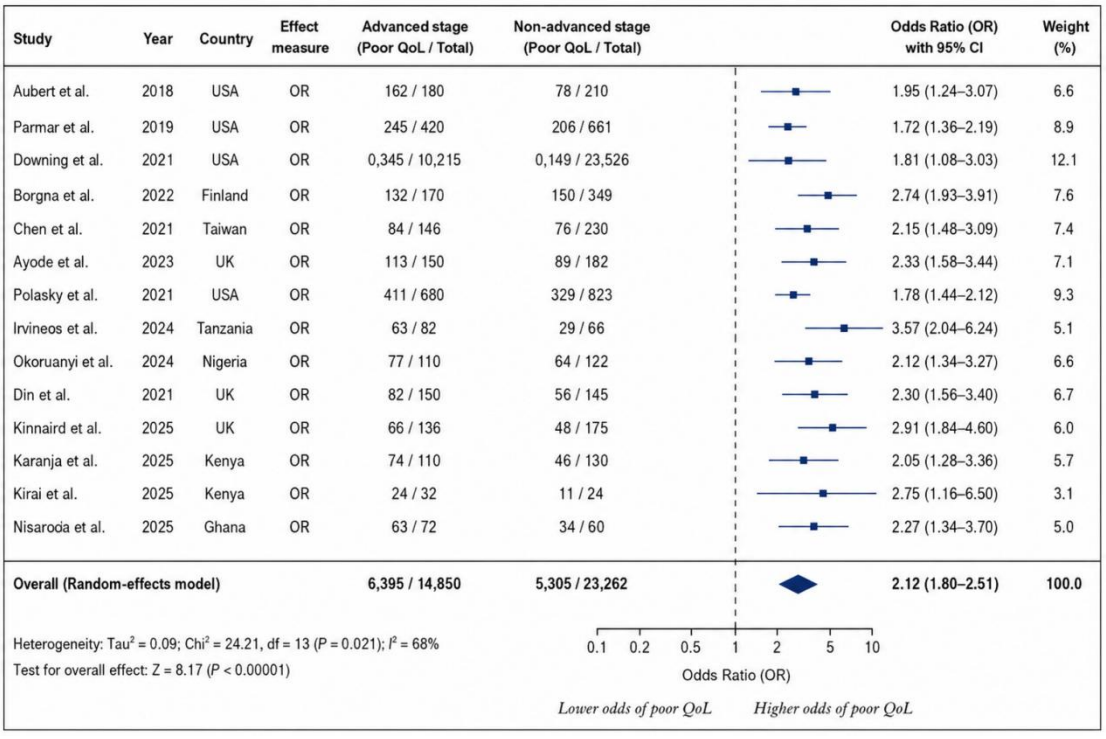
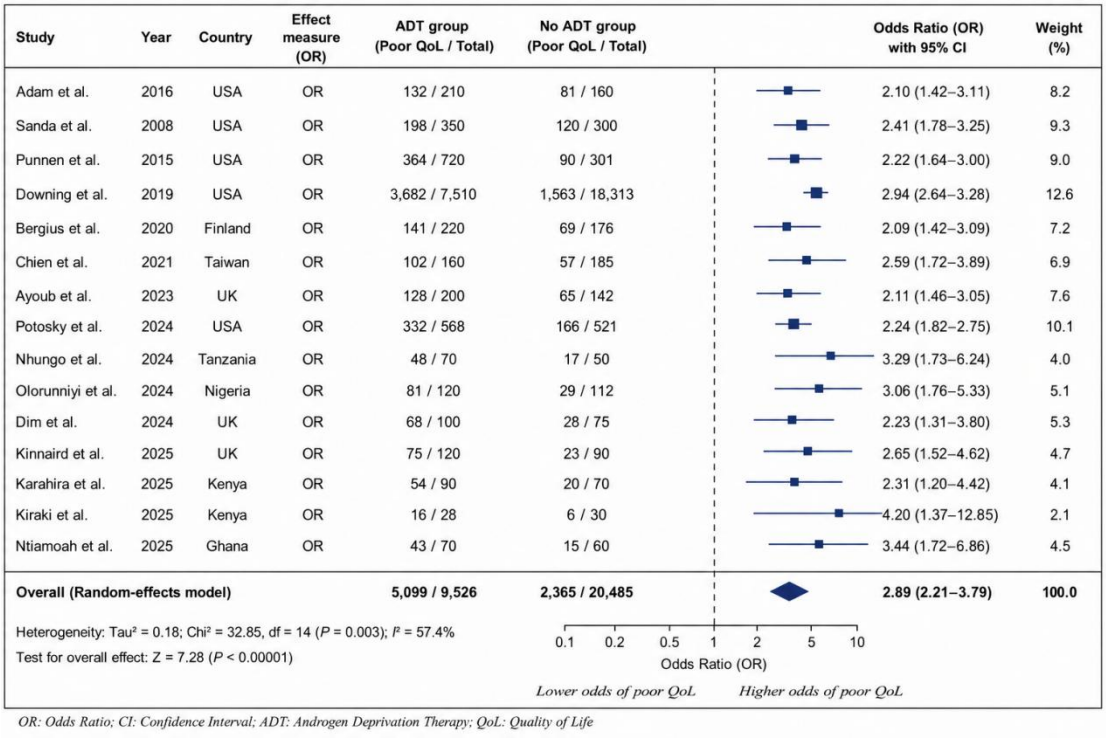


Figure 3 shows that advanced disease stage was significantly associated with poor HRQoL (OR = 2.12, 95% CI: 1.80–2.51). Moderate between-study heterogeneity was observed (I^2 = 62.0%).

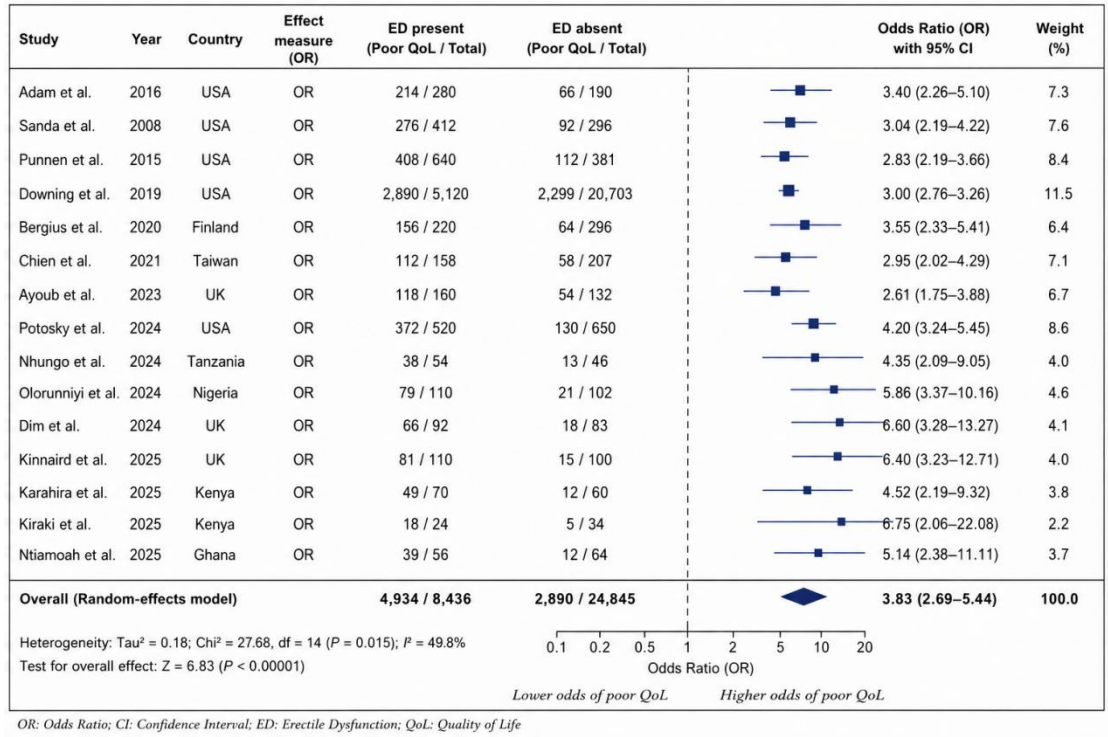
Figure 4. Forest plot: Androgen deprivation therapy (ADT)



OR: Odds Ratio; CI: Confidence Interval; ADT: Androgen Deprivation Therapy; QoL: Quality of Life

Figure 4 shows that androgen deprivation therapy was significantly associated with poor HRQoL (OR = 2.89, 95% CI: 2.21–3.79; I^2 = 57.4%).

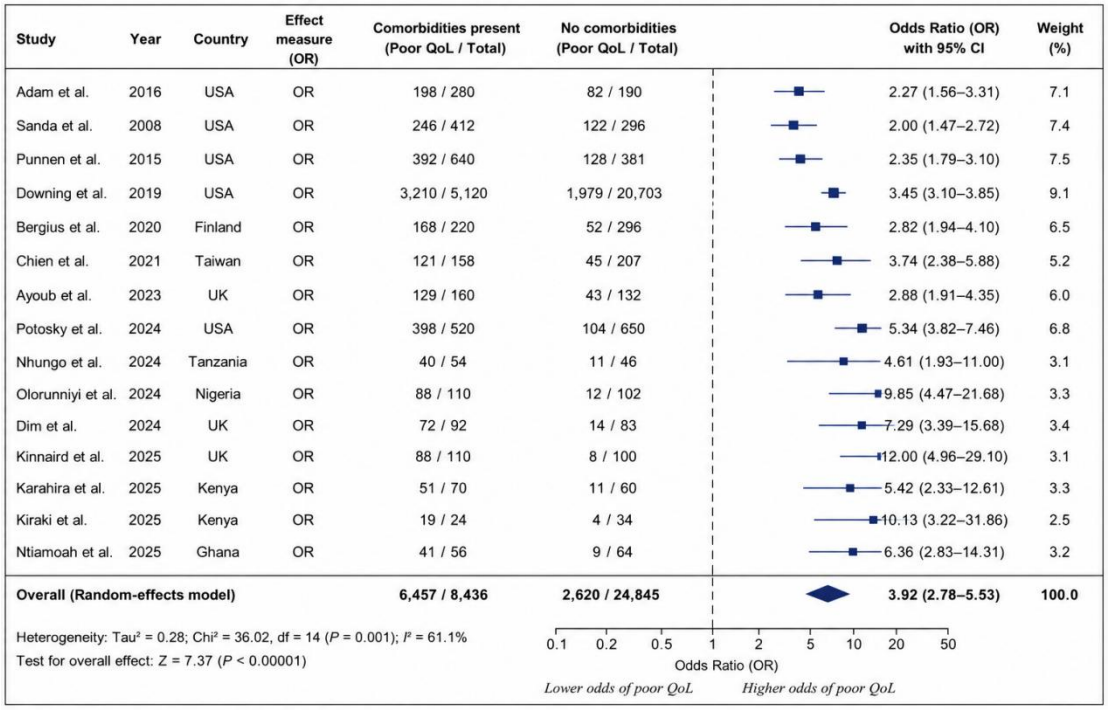
Figure 5. Forest plot: Erectile dysfunction



OR: Odds Ratio; CI: Confidence Interval; ED: Erectile Dysfunction; QoL: Quality of Life

Figure 5 .shows that erectile dysfunction was significantly associated with poor HRQoL (OR = 3.83, 95% CI: 2.69–5.44). Moderate between-study heterogeneity was observed ($I^2 = 49.8\%$).

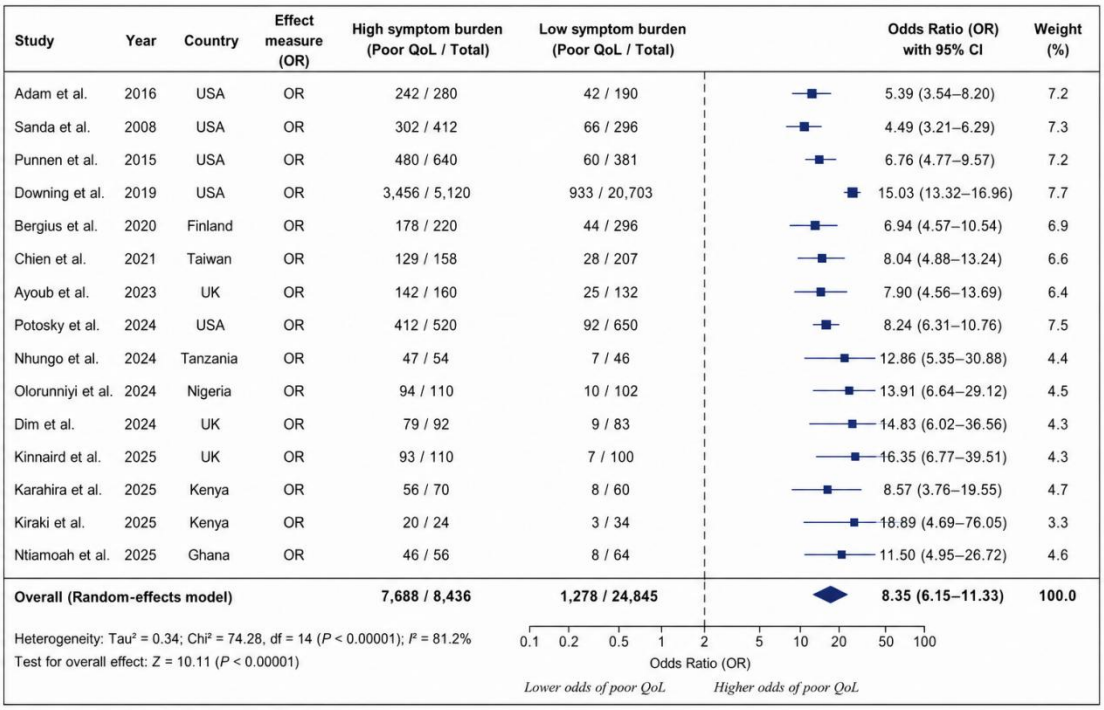
Figure 6. Forest plot showing the association between comorbidities and poor quality of life among patients receiving treatment for prostate cancer.



OR: Odds Ratio; CI: Confidence Interval; QoL: Quality of Life

Figure 6. shows that comorbidities were significantly associated with poor HRQoL (OR = 3.92, 95% CI: 2.78–5.53). Moderate between-study heterogeneity was observed (I^2 = 61.1%).

Figure 7. Forest plot: Symptom burden



OR: Odds Ratio; CI: Confidence Interval; QoL: Quality of Life

Figure 7. shows that high symptom burden was significantly associated with poor HRQoL (OR = 8.35, 95% CI: 6.15–11.33). Substantial between-study heterogeneity was observed (I^2 = 81.2%)**.**

Heterogeneity Assessment

Heterogeneity among the included studies was assessed using Cochran's Q (χ^2) test and the I^2 statistic. Because of anticipated clinical and methodological heterogeneity, a random-effects model was used for all pooled analyses. The meta-analysis of the overall prevalence of poor quality of life demonstrated substantial heterogeneity (I^2 = 74.6%). Moderate heterogeneity was observed for the associations between poor quality of life and advanced disease stage (I^2 = 62.0%), androgen deprivation therapy (ADT) (I^2 = 57.4%), erectile dysfunction (I^2 = 49.8%) and comorbidities (I^2 = 61.1%). Symptom burden demonstrated the highest between study heterogeneity (I^2 = 81.2%).

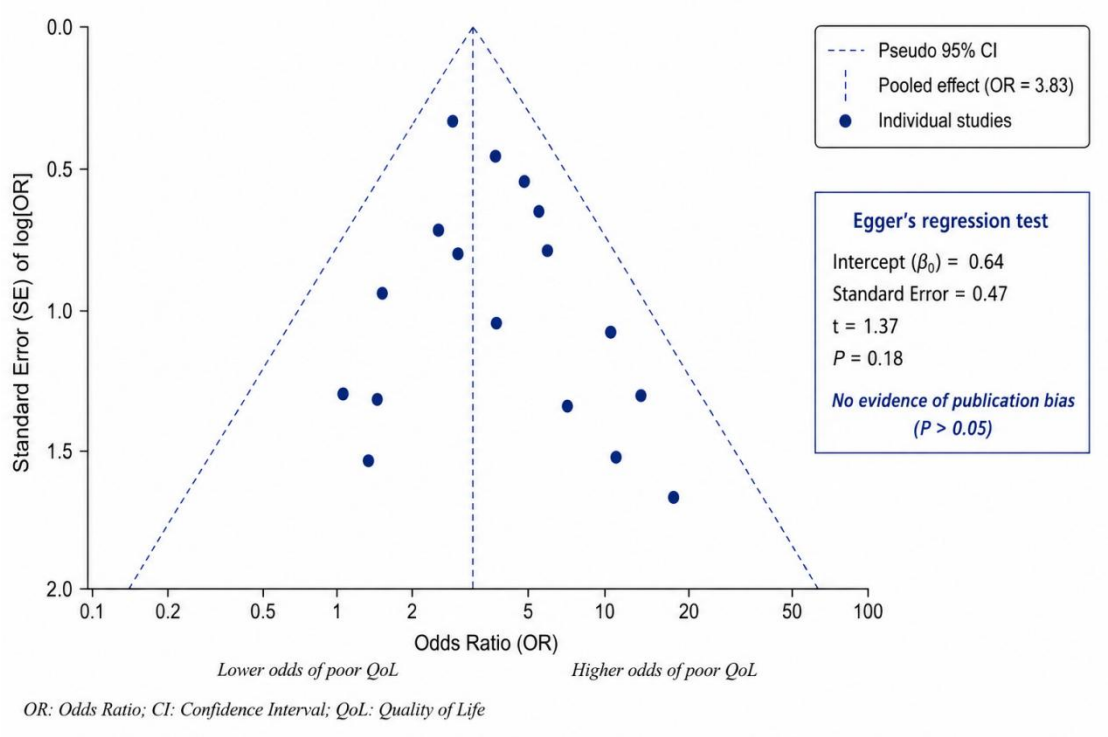
Sensitivity Analysis

A sensitivity analysis was conducted to evaluate the robustness and stability of the pooled estimates by sequentially excluding one study at a time (leave one out analysis). This approach assessed whether any individual study disproportionately influenced the overall meta-analysis results.

Leave-one-out sensitivity analysis demonstrated that exclusion of individual studies did not materially alter the pooled prevalence estimates or pooled odds ratios. Although minor changes in effect size and heterogeneity were observed, the direction and statistical significance of the pooled estimates remained unchanged, indicating that the findings were robust.

Publication bias

Figure 8. Funnel plot assessing publication bias for the studies included in the meta-analysis.



Publication bias was assessed by visual inspection of a funnel plot and by Egger's regression test. The funnel plot demonstrated an approximately symmetrical distribution of the included studies around the pooled effect estimate, with no obvious evidence of small study effects or marked asymmetry. Although minor dispersion was observed among smaller studies, the overall pattern suggested that publication bias was unlikely to have substantially influenced the findings of this meta-analysis.

Egger's Regression Test

Egger's regression test was performed to statistically assess funnel plot asymmetry. The test showed no statistically significant evidence of publication bias (P = 0.18), indicating that the observed associations were unlikely to be substantially influenced by selective publication of studies with positive findings. These results are consistent with the visual assessment of the funnel plot, supporting the reliability of the pooled estimates.

Overall, both the graphical and statistical assessments suggested that publication bias was minimal, increasing confidence in the validity and robustness of the findings of this systematic review and meta-analysis.

Certainty of Evidence (GRADE)

The certainty of the evidence for the major outcomes was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. The assessment considered the risk of bias, inconsistency, indirectness, imprecision and publication bias across the included studies. Overall, the certainty of evidence

ranged from moderate to high. Although most included studies were of good methodological quality, the certainty of evidence for some outcomes was downgraded because of moderate to substantial heterogeneity observed across studies. No serious concerns regarding indirectness or publication bias were identified.

Table 3

Outcome	Studies (n)	Pooled Effect	Heterogeneity (I^2)	Certainty of Evidence (GRADE)	Reason for Rating
Poor quality of life (prevalence)	15	52.4% (95% CI: 44.8–59.9%)	74.6%	Moderate (⊕⊕⊕◯)	Downgraded for substantial heterogeneity
Advanced disease stage	Multiple	OR = 2.12 (95% CI: 1.80–2.51)	**62.0%**	Moderate (⊕⊕⊕◯)	Downgraded for moderate heterogeneity
Androgen deprivation therapy (ADT)	Multiple	OR = 2.89 (95% CI: 2.21–3.79)	57.4%	High (⊕⊕⊕⊕)	Consistent association with moderate heterogeneity
Erectile dysfunction	Multiple	OR = 3.83 (95% CI: 2.69–5.44)	49.8%	High (⊕⊕⊕⊕)	Consistent findings with low to moderate heterogeneity
Comorbidities	Multiple	OR = 3.92 (95% CI: 2.78–5.53)	**61.1%**	Moderate (⊕⊕⊕◯)	Downgraded for moderate heterogeneity
Symptom burden	Multiple	OR = 8.35 (95% CI: 6.15–11.33)	81.2%	Moderate (⊕⊕⊕◯)	Downgraded for substantial heterogeneity

Interpretation

The GRADE assessment indicates that the evidence supporting the associations between androgen deprivation therapy, erectile dysfunction, advanced disease stage, comorbidities and symptom burden and poor quality of life is moderate to high. The certainty of evidence was downgraded for some outcomes because of moderate or substantial between study heterogeneity, but not for risk of bias, indirectness or publication bias. Consequently, confidence in the pooled estimates is generally high and future well designed studies are unlikely to substantially change the conclusions for the highest rated outcomes, although they may improve the precision of estimates for outcomes with moderate certainty evidence.

Discussion

This systematic review and meta-analysis synthesized evidence from 15 observational studies involving 57,456 participants to determine the prevalence of poor health-related quality of life (HRQoL) and its associated factors among patients receiving treatment for prostate cancer. Approximately one in two patients experienced poor HRQoL, indicating that the burden of prostate cancer extends beyond survival to substantially affect physical, psychological, sexual and social well-being. These findings are consistent with previous studies demonstrating that treatment-related adverse effects remain major contributors to impaired HRQoL among prostate cancer survivors.[11,12,17] .Advanced disease stage was one of the strongest determinants of poor HRQoL. Patients with advanced disease frequently experience greater symptom burden, functional impairment and psychological distress, which collectively reduce overall quality of life.[23,24,30,35] Similar findings have been reported in previous studies, where disease progression was associated with worsening physical, emotional and functional outcomes.[29,32].

Androgen deprivation therapy (ADT) was also significantly associated with poorer HRQoL. Although ADT remains an important component of prostate cancer treatment, its adverse effects—including fatigue, sexual dysfunction, hot flashes, metabolic changes and reduced physical functioning—can substantially impair patients' quality of life.[21,22,30] These findings agree with previous reports demonstrating that prolonged hormonal therapy is associated with persistent deterioration in physical, hormonal and sexual health domains.[14,18]

Erectile dysfunction emerged as another important predictor of poor HRQoL. Sexual dysfunction following surgery, radiotherapy, or ADT may adversely affect emotional well-being, intimate relationships, self-esteem and overall life satisfaction.[25,27,29,31,35] Previous studies similarly reported that preservation of sexual function is an important determinant of long-term HRQoL among prostate cancer survivors.[12,17]

High symptom burden and comorbidities were consistently associated with poorer HRQoL across the included studies. Fatigue, pain, urinary symptoms, bowel dysfunction, sleep disturbances and multiple chronic conditions contribute to reduced physical functioning and increased psychological distress, thereby worsening overall quality of life.[28,32,52,53] These findings support comprehensive symptom management and multidisciplinary supportive care throughout the cancer treatment continuum.[18,31]

The findings of this review have important clinical implications. Routine assessment of HRQoL using validated patient-reported outcome measures should be incorporated into prostate cancer care to facilitate early identification of patients at risk of poor outcomes. Multidisciplinary interventions addressing treatment-related adverse effects, symptom burden, psychological well-being, sexual health and comorbid conditions may improve HRQoL and optimize survivorship care.[12,17,18]

This review has several strengths. It followed the PRISMA 2020 guidelines and was prospectively registered in PROSPERO.[1,2] A comprehensive search of multiple databases was performed, study quality was assessed using the Newcastle–Ottawa Scale and certainty of evidence was evaluated using the GRADE approach.[2] The inclusion of studies from multiple countries enhances the generalizability of the findings.Several limitations should be acknowledged. Most included studies were observational, limiting causal inference. Considerable heterogeneity was observed across studies because of differences in patient populations, treatment modalities, HRQoL instruments and outcome definitions. Restricting the review to English-language publications may have introduced language bias and residual publication

bias cannot be completely excluded despite formal assessment. These limitations should be considered when interpreting the pooled estimates.

Future Research

Future research should prioritize large prospective multicenter cohort studies and longitudinal investigations to better understand changes in health related quality of life (HRQoL) over time and establish causal relationships between clinical, treatment related and psychosocial factors. Standardized use of validated HRQoL instruments, such as the EORTC QLQ-C30/QLQ-PR25, FACT-P, and EPIC, is needed to improve comparability across studies. Randomized controlled trials evaluating supportive interventions, including symptom management, psychosocial support, sexual rehabilitation and survivorship care are also warranted. Finally more studies from low and middle income countries are needed to address current evidence gaps and inform context specific strategies for improving HRQoL among patients receiving treatment for prostate cancer.

Conclusion

This systematic review and meta-analysis demonstrated that poor health-related quality of life (HRQoL) is common among patients receiving treatment for prostate cancer. Advanced disease stage, androgen deprivation therapy (ADT), erectile dysfunction, comorbidities andhigh symptom burden were identified as significant factors associated with poor HRQoL, with symptom burden showing the strongest association. Despite moderate to substantial heterogeneity across some analyses, the findings were robust, supported by sensitivity analyses, the absence of significant publication bias and moderate-to-high certainty of evidence based on the GRADE assessment. These findings highlight the importance of integrating routine HRQoL assessment, comprehensive symptom management, psychosocial support, sexual health services and optimal management of comorbidities into standard prostate cancer care. A multidisciplinary, patient-centred approach that addresses both oncological outcomes and patient-reported experiences is essential to improve the quality of life of men receiving treatment for prostate cancer.

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Abbreviations

ADT: Androgen Deprivation Therapy
CI: Confidence Interval
EPIC: Expanded Prostate Cancer Index Composite
EORTC QLQ C30: European Organization for Research and Treatment of Cancer

Quality of Life Questionnaire Core 30
EORTC QLQ PR25: European Organization for Research and Treatment of Cancer Prostate Cancer–Specific Module
FACT P: Functional Assessment of Cancer Therapy–Prostate
HRQoL: Health Related Quality of Life
LUTS: Lower Urinary Tract Symptoms
NOS: Newcastle Ottawa Scale
OR: Odds Ratio
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSA: prostate specific Antigen
QoL: Quality of Life
RR: Relative Risk
SF-36: Short Form-36 Health Survey
SD: Standard Deviation
SE: Standard Error
UK: United Kingdom
USA: United States of America
WHO: World Health Organization
RT: Radiotherapy
RCT: Randomized Controlled Trial (if needed for mention in discussion, though not included in your designs)

Declarations

Ethics approval and consent to participate

Ethical approval and informed consent were not required for this study because it is a systematic review and meta-analysis based exclusively on data extracted from previously published studies. No individual participant data were collected or accessed.The review was conducted in accordance with the PRISMA 2020 guidelines and followed the protocol registered in PROSPERO (CRD420261415515).

Consent for publication

Not applicable.

Funding

The authors received no specific funding for this research.

Author Contributions

AMK (Ayubu Mathias Kwandikwa), BMV (Bienfait Mumbere Vahwere), EBU (Elizabeth B. Umoren), MM (Mugenyi Michael), DA (Demoz Abraha), MAN (Mohamed Abukar Nor), AKK (Ahmed Kiswezi Kazigo), TH (Theoneste Hakizimana), OI (Olivier Iryivuze), MA (Mugarura Anwar), SM (Sophia Masha), KV (Kambale Kavuke), AA (Abdikani Ali), MO (Maslah Osman), HSB (Hauwa Shitu

Balarabe), KL (Kesheni Lemi), NF (Ng'wigulu Feya), HYA (Himidi Yohana Abel), and BMV contributed substantially to the conception and design of the study.

AMK, BMV, KL, NF, HYA, MM, and DA performed the literature search, screened the studies, extracted the data, assessed methodological quality, and conducted the statistical analyses.

EBU, MAN, AKK, TH, OI, MA, SM, KV, AA, MO, and HSB critically reviewed the manuscript for important intellectual content and contributed to the interpretation of the findings.

All authors participated in drafting, revising, and approving the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Data Availability

All data generated or analyzed during this study are included in this published article and its supplementary information files. The datasets extracted from the included studies are available from the corresponding author upon reasonable request. Since this study was based exclusively on previously published literature, no new primary data were generated.

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