

SYSTEMATIC REVIEW

Quality of Life Among Cancer Survivors Across Different Malignancies: A Systematic Review

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ABSTRACT:

Background: Health-related quality of life (HRQoL) is an important outcome in the field of cancer survivorship as it encompasses the physical, psychological, social and functional impact of cancer and its treatment over the long-term. The objective of this systematic review was to determine the factors associated with HRQoL in the breast, colorectal, lung and prostate cancer survivor populations. **Methods:** The review was done in line with PRISMA 2020 guidelines. A search of PubMed, Scopus, Web of Science and Google Scholar databases was conducted for studies published from March 2019 to May 2026. Studies that assessed HRQoL and its associated factors in adult cancer survivors were included in the observational studies. The Newcastle–Ottawa Scale (NOS) was used to evaluate for risk of bias in cohort studies and the Joanna Briggs Institute (JBI) Critical Appraisal Checklist was used to evaluate for risk of bias in cross-sectional studies. Certainty of evidence was assessed by GRADE approach. **Results:** In all cancer types, advanced disease stages, treatment-related complications, ongoing symptoms, comorbidities, psychological distress and financial hardship were found to be consistently associated with poorer HRQoL. However, healthy lifestyle behaviors, higher levels of physical activity and physical functioning were linked with better HRQoL. Overall, cohort studies had low risk of bias; most cross-sectional studies had moderate risk because of the selection and measurement problems. **Conclusions:** There are several socio-demographic, clinical, psychosocial, treatment and lifestyle factors affecting HRQoL of cancer survivors. Identification of modifiable determinants early and comprehensive survivorship care can enhance long-term quality of life.

Keywords: Quality of Life; Cancer Survivors; Breast Neoplasms; Colorectal Neoplasms; Lung Neoplasms; Prostatic Neoplasms; Survivorship

INTRODUCTION

Cancer survivorship is a growing field in oncology because of improvements in early detection and cancer screening, and the significant improvements in treatment modalities that has led to improved survival for many forms of cancer such as breast, colorectal, lung, and prostate cancer ¹. With the increasing number of cancer survivors, the focus has turned from survival to improving health related quality of life (HRQoL), which encompasses physical, psychological, social and functional health status following diagnosis and treatment of cancer ². HRQoL has become an important patient-reported outcome measure to assess the long-term effects of cancer and cancer therapy on patients' functional status and quality of life ³. Survivors of cancer often have long-term physical issues, emotional problems, disablement, side-effects of their treatment, financial problems and social problems that can last beyond the end of treatment ⁴.

Previous studies have shown that clinical features, treatment options, social and demographic factors, lifestyle behaviours, comorbidities and psychosocial support are all factors that lead to differences in HRQoL in cancer survivors ⁵. Understanding these determinants is critical to creating individualized survivorship care plans and supportive interventions to meet the needs of this increasingly large population ⁶. There have been many studies on HRQoL in people who have survived specific cancers, but the evidence has been scattered across the various types of cancer, health care environment, survivorship stage and tools used to measure HRQoL ⁷. Moreover, there was significant variation in study design and population of survivors, HRQoL questionnaires, and the spectrum of factors assessed, which hindered the ability to draw broad conclusions about the factors associated with HRQoL among all cancer survivors ⁸. Therefore, a review of the existing evidence is needed to establish consistent predictors and to synthesize the findings overall.

The purpose of this systematic review was to examine HRQoL in cancer survivors of breast, colorectal, lung and prostate cancer, and to draw inferences from the evidence to identify the demographic, clinical, treatment-related, psychosocial, lifestyle and socioeconomic factors impacting HRQoL.

METHODOLOGY

The purpose of this systematic review was to systematically review studies on the topic while maintaining transparency, systematic, and reproducible review processes. Due to the direct retrospective design of this systematic review, which relies entirely on previously published, aggregated public data, this study was not prospectively registered in an international repository. This systematic review was conducted using

the Preferred Reporting Items for Systematic Reviews (PRISMA 2020) guidelines to ensure a systematic, transparent, and reproducible review process ⁹.

Inclusion and Exclusion Criteria: Only original research articles that included evaluation of health-related quality of life (HRQoL) in adult survivors of breast, colorectal, lung or prostate cancer were included. Studies were eligible if they examined patient-reported outcome measures (PROMs) of health-related quality of life (HRQoL) and factors that were potentially related to HRQoL such as demographic, clinical, treatment-related, psychosocial, lifestyle or socioeconomic factors in patients with the eligible conditions, using established PROMs. Observational study designs were included in the study, such as prospective and retrospective cohort studies, longitudinal studies, and cross-sectional studies. Only full-text articles were considered which were published in English and provided full methodological information and a DOI. Reviews, systematic reviews, and meta-analysis, conference abstracts, editorials, letters, case reports, qualitative studies, study protocols, animal studies and studies lacking adequate methodological details or HRQoL outcome data were not eligible for inclusion.

Data Sources: Comprehensive literature research was carried out in PubMed, Scopus, Web of Science, Google Scholar. The literature was reviewed for relevant evidence for HRQoL among breast, colorectal, lung and prostate cancer survivors from January 2015 to February 2026.

Search Strategy: Medical Subject Headings (MeSH) and free-text terms for cancer survivorship and HRQoL were used to develop a search strategy. Typical search terms used were: health-related quality of life, quality of life, cancer survivors, breast cancer, colorectal cancer, lung cancer, prostate cancer, survivorship, patient-reported outcomes and HRQoL. Boolean operators (AND and OR) were employed to improve the search strategy and the reference lists of the eligible articles were hand screened for further relevant articles.

Study Selection: Titles and abstracts were reviewed for possible inclusion in the study after the removal of duplicates. All the articles were then evaluated for inclusion based on the predetermined criteria. Two reviewers selected studies independently and differences in their selections were resolved by discussion, until agreement was reached.

Data Extraction: A standard data extraction form was used to extract the data, and both reviewers independently extracted data. Data gathered were the author, year of publication, country of study, study design, sample size, type of cancer, length of survivorship, HRQoL measurement tool, HRQoL factors, and results of the main study. Where possible, additional methodological features were taken out.

Outcome Measures: The main outcome of interest was health-related quality of life (HRQoL) of cancer survivors. Secondary outcomes encompassed demographic, clinical, treatment, psychosocial, lifestyle and socioeconomic factors impacting on HRQoL, symptom burden, functional status, psychological well-being, and other patient-reported outcomes that affect quality of life.

Quality Assessment: Risk of bias was evaluated in each of the included studies using the appropriate validated risk-of-bias tools, depending on the study design. The Newcastle–Ottawa Scale (NOS) was used to evaluate cohort and longitudinal studies while the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies was used to evaluate cross-sectional studies ^{10,11}. Overall, the risk of bias was judged low, moderate or high according to assessment criteria. GRADE approach used for assessment of certainty of evidence ¹².

Data Synthesis: In addition to the significant variation in study designs, the survivor populations, cancer types, HRQoL assessment tools, and the outcomes reported, a quantitative meta-analysis was not conducted. Rather, findings were synthesized in a narrative way and comprised a summary of the characteristics of the studies, HRQoL instruments used, associated factors, methodological quality, and main findings of the studies included.

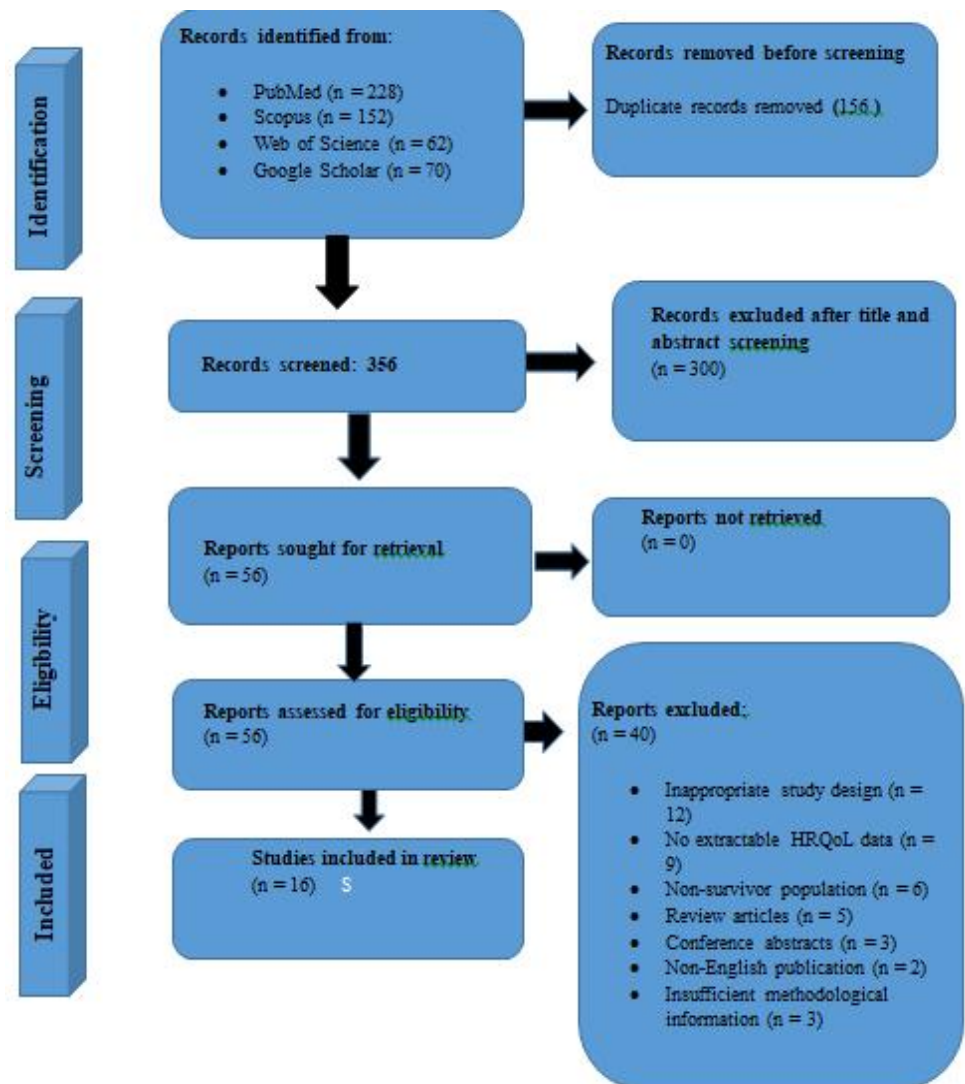


Figure 1: PRISMA 2020 flow diagram illustrating the study selection process for the systematic review of health-related quality of life (HRQoL) among cancer survivors.

RESULTS

A total of 512 records were initially found using four electronic databases: PubMed (n = 228), Scopus (n = 152), Web of Science (n = 62), and Google Scholar (n = 70). 156 duplicate records were removed and 356 articles were then subject to title and abstract screening. At this step, 300 articles were excluded due to irrelevance to the review topic, not being an evaluation of HRQoL for cancer survivors, or not being eligible according to the defined inclusion/exclusion criteria. As a result, 56 full-text articles were evaluated for eligibility, and 40 were excluded because of inappropriate study design, inadequate HRQoL data extraction, non-survivor population, insufficient methodology information, review articles, abstracts from conferences, or publication in a language other than English. Finally, 16 studies were found to be eligible and included in this systematic review. The process of selecting the studies is described in the PRISMA flow diagram (Figure 1). The characteristics of the studies included are shown in Table I, and encompass study design, study characteristics, cancer type, duration of survivorship, HRQoL instruments, outcomes measured, and findings. Overall, the studies examined factors associated with HRQoL in breast, colorectal, lung and prostate cancer survivors who completed validated quality of life measures.

Table I: Characteristics of the included studies assessing health-related quality of life (HRQoL) and associated factors among cancer survivors

Author, Year	Study Design	Sample Size and Survivor Population	Malignancy	Survivorship Duration	HRQoL Instrument	Outcomes and Factors Assessed	Key Findings
Country							
Park et al., 2021 ¹³	Observational cohort study	2,453 female breast cancer survivors	Breast cancer	Mean 4.9 years after diagnosis	PROMIS Global-10	Stage, comorbidities, treatment complications, recurrence and mortality	Advanced stage, comorbidities, complications and recurrence were linked with poorer HRQoL; lower HRQoL was associated with higher mortality.
USA							
Maurer et al., 2021 ¹⁴	Population-based longitudinal cohort study	1,123 breast cancer survivors and 3,453 controls; women aged 50–74 years	Breast cancer	Assessed before treatment and at 1, 5 and ≥10 years after diagnosis	EORTC QLQ-C30	Overall HRQoL, functioning, symptoms and age-related differences	HRQoL improved during the first five years and was similar to controls after 10 years; younger survivors experienced greater long-term impairment.
Germany							
Herbert et al., 2023 ¹⁵	Prospective multicentre cohort study	759 women enrolled; 456 completed the 5-year follow-up	Breast cancer	Five years after surgery	EORTC QLQ-C30 and QLQ-BR23	Global QoL, physical and social functioning, treatment, psychological factors and physical activity	Poor QoL affected 20%–50% of survivors. Mastectomy, chemotherapy, psychiatric problems, depression and low physical activity predicted poorer functioning.
Germany							
Alvarez-Pardo et al., 2022 ¹⁶	Cross-sectional descriptive study	183 women aged 30–80 years with breast cancer	Breast cancer	Time since first treatment, including ≤5 and >5 years	EORTC QLQ-C30 and QLQ-BR23	Age, surgery type, time since treatment and QoL domains	Younger women had poorer social and sexual functioning. Breast-conserving surgery was associated with better QoL than mastectomy, while survivors beyond five years reported better sexual functioning and fewer breast symptoms.
Mexico							
Marcos-Delgado et al., 2024 ¹⁷	Cross-sectional analysis of a follow-up cohort	805 colorectal cancer survivors; 486 men and 319 women	Colorectal cancer	Median 7.9 years after diagnosis	SF-12 and FCSI	Physical and mental HRQoL; age, sex, region, recurrence and surgery	Older age, female sex and geographic area were associated with poorer HRQoL. Recurrence and radical surgery also affected physical and mental health.
Spain							
Miller et al., 2021 ¹⁸	Cross-sectional online survey	196 colorectal cancer survivors diagnosed at age 18–39 years	Colorectal cancer	6–36 months after diagnosis or relapse	FACT-C	Global, physical, emotional, social and functional HRQoL; age, disease stage, treatment intensity and time since diagnosis	Overall HRQoL was low. Longer survivorship and older age were linked with better HRQoL, while advanced stage and intensive treatment were linked with poorer HRQoL.
USA							
Abu-Helalah et al., 2022 ¹⁹	Multicentre cross-sectional study	115 adult colorectal cancer survivors	Colorectal cancer	12–36 months after diagnosis; no active treatment for ≥6 months	EORTC QLQ-C30, QLQ-CR29 and HADS	Overall and colorectal-specific QoL, physical functioning, symptoms, anxiety and depression	Survivors had poor overall QoL, with fatigue and appetite loss as major symptoms; 55% had moderate-to-severe depression and 31% had moderate-to-high anxiety.
Saudi Arabia							

Kenkhuis et al., 2022 ²⁰ Netherlands	Prospective longitudinal cohort study	459 adults with stage I–III colorectal cancer	Colorectal cancer	6 weeks to 24 months post-treatment	EORTC QLQ-C30	Lifestyle adherence, HRQoL, physical functioning, fatigue and peripheral neuropathy	Greater adherence to lifestyle recommendations was associated with better physical functioning and less fatigue, but not with peripheral neuropathy.
Hsu et al., 2024 ²¹ USA	Cross-sectional survey study	232 non-small-cell lung cancer survivors; median age 69 years	Non-small-cell lung cancer	More than 1 year after diagnosis	EORTC QLQ-C30	Physical, social, emotional and medical needs; QoL and financial toxicity	Greater unmet needs were associated with poorer QoL and higher financial toxicity. Social needs were strongly related to both outcomes.
Fonseca et al., 2024 ²² Portugal	Cross-sectional study	158 long-term lung cancer survivors identified; 100 completed the PRO survey	Lung cancer	More than 5 years after diagnosis	EORTC QLQ-C30 and PHQ-4	Overall QoL, functioning, symptoms, anxiety and depression	Emotional functioning was most affected, while pain and fatigue reduced QoL. Anxiety or depression was more common among survivors with poorer QoL.
Heiden et al., 2022 ²³ United States	Prospective longitudinal cohort study	334 patients after NSCLC resection assessments	Non-small cell lung cancer	Preoperative to 1 year after surgery	PROMIS	Pain, dyspnea, physical function, HRQoL	Pain and physical function recovered within 6 months, while dyspnea persisted up to 1 year, indicating ongoing QoL impairment after surgery.
Riccetti et al., 2022 ²⁴ Germany	Multicenter cross-sectional study	665 primary lung cancer survivors (49 TKI-treated stage IV, 121 non-TKI stage IV, 495 stage I–III non-TKI)	Primary lung cancer	Survivors after primary lung cancer treatment	EORTC QLQ-C30, PHQ-4	HRQoL, symptom burden, psychological distress	Survivors receiving TKI therapy reported lower HRQoL and greater treatment-related symptom burden, indicating the need for targeted symptom management to improve quality of life.
Mason et al., 2022 ²⁵ United Kingdom	Population-based longitudinal cohort	21,700 prostate cancer survivors from the LAPCD cohort	Prostate cancer	18–42 months post-diagnosis with 12-month follow-up	EQ-5D-5L, EPIC-26	HRQoL, urinary, bowel, sexual function, self-rated health	HRQoL remained stable for most survivors without additional treatment, while men receiving new treatment experienced greater declines in quality of life and functional outcomes.
Spampinato et al., 2024 ²⁶ Italy	Prospective multicenter observational study	293 prostate cancer survivors treated with radical radiotherapy	Localized prostate cancer	Up to 5 years after radiotherapy	EORTC QLQ-C30, IPSS, ICIQ-SF, LENT-SOMA	HRQoL, urinary symptoms, gastrointestinal symptoms, pain, fatigue, insomnia	Persistent urinary and gastrointestinal symptoms, particularly urinary incontinence and rectal pain, were associated with poorer HRQoL. Fatigue had the greatest negative impact on quality of life.
Potosky et al., 2024 ²⁷ United States	Population-based cohort study	1,162 prostate cancer survivors	Prostate cancer	Median 9 months after diagnosis (699 completed follow-up)	PROMIS-29	Physical, emotional, and social HRQoL, symptom burden, functional status, sociodemographic and clinical predictors	Approximately one in six survivors had poor HRQoL. Younger age, Black race, comorbidities, financial hardship, and lower social/spiritual support were associated with persistently poorer quality of life.
Donnelly et al., 2019 ²⁸ United Kingdom	Population-based cross-sectional study	35,823 prostate cancer survivors	Prostate cancer	18–42 months post-diagnosis	EPIC-26	Urinary, bowel, sexual, hormonal function, HRQoL	Symptomatic survivors reported poorer urinary, bowel, sexual, and hormonal functioning than PSA-detected survivors, indicating lower quality of life and greater supportive care needs.

HRQoL, health-related quality of life; PROMIS, Patient-Reported Outcomes Measurement Information System; EORTC QLQ-C30, European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30; FACT-C, Functional Assessment of Cancer Therapy-Colorectal; SF-12, 12-Item Short Form Health Survey; PHQ-4, Patient Health Questionnaire-4; HADS, Hospital Anxiety and Depression Scale; EQ-5D-5L, EuroQol 5-Dimension 5-Level questionnaire; EPIC-26, Expanded Prostate Cancer Index Composite-26.

The 16 studies that were incorporated into this systematic review were conducted in 10 countries (USA, Germany, Mexico, Spain, Saudi Arabia, the Netherlands, Portugal, Italy, the United Kingdom) and included cohort, longitudinal, prospective and cross-sectional designs. The studies assessed health-related quality of life (HRQoL) in breast, colorectal, lung and prostate cancer survivors, and the length of time since treatment varied from 6 weeks to over 10 years. A range o-f validated questionnaires were employed, primarily the EORTC QLQ-C30, disease-specific modules and other standardized questionnaires (e.g., PROMIS, FACT-C, SF-12, EPIC-26, and EQ-5D-5L). In overall terms, all studies have confirmed a role for demographic, clinical, treatment-related, psychosocial and lifestyle factors in explaining HRQoL, with more advanced disease, multiple comorbidities, intensive treatment, persistent symptoms and unmet supportive care needs being related to lower HRQoL scores. A summary of unique contributions, methodological strengths, clinical significance and limitations of selected studies reviewed is summarized in **Table II**. This overview serves to give more context to the evidence and to identify certain considerations for cancer survivorship research.

Table II: Summary of the Unique Contributions, Methodological Strengths, Clinical Significance, and Limitations of Selected Studies Included in the Systematic Review.

Author & Year	Unique Contribution to the Review	Study Strength	Clinical Significance	Limitation
Hsu et al., 2024 ²¹	Examined the combined impact of unmet supportive care needs and financial toxicity on HRQoL in lung cancer survivors	Large multicenter survivor cohort with validated PROMs	Supports integration of financial and supportive care into survivorship programs	Cross-sectional design
Fonseca et al., 2024 ²²	Characterized patient-reported outcomes in long-term lung cancer survivors	Comprehensive assessment using validated HRQoL and psychological instruments	Highlights the need for multidisciplinary long-term follow-up	Single-country study
Heiden et al., 2022 ²³	Evaluated longitudinal patient-reported recovery after NSCLC surgery	Prospective assessment with repeated PROMIS measurements	Supports routine monitoring of postoperative symptoms	Single-center surgical cohort
Riccetti et al., 2022 ²⁴	Compared HRQoL between TKI-treated and non-TKI lung cancer survivors	Multicenter study using validated patient-reported outcome measures	Provides evidence for tailored symptom management in targeted therapy survivors	Cross-sectional design
Mason et al., 2022 ²⁵	Investigated long-term stability of HRQoL after prostate cancer diagnosis	National population-based longitudinal cohort	Reinforces long-term survivorship monitoring after treatment	Self-reported outcomes may introduce reporting bias
Potosky et al., 2024 ²⁷	Identified demographic, clinical, and psychosocial predictors of poor HRQoL	Population-based cohort with longitudinal follow-up	Helps identify survivors at high risk for poor quality of life	Follow-up cohort smaller than baseline sample
Donnelly et al., 2019 ²⁸	Compared HRQoL according to method of prostate cancer detection	Large nationwide patient-reported outcomes study	Suggests presentation method should be considered in survivorship care planning	Cross-sectional design limits causal inference
Spampinato et al., 2024 ²⁶	Examined persistent symptoms after radiotherapy and their effect on HRQoL	Prospective multicenter observational study	Supports long-term management of treatment-related toxicities	Restricted to radiotherapy-treated survivors

Based on the Newcastle–Ottawa Scale (NOS) the overall methodological quality of the cohort and longitudinal studies was mostly good. The majority of the studies were found to have a low risk of bias, having clearly defined survivor cohorts, validated HRQoL instruments, appropriate statistical analyses, and adjustment for important confounding variables. Several studies were considered to have moderate risk of bias, mostly because they lacked long-term follow-up of participants or they recruited participants from single centers, and this may have reduced the generalizability of the results. None of the studies had a high overall risk of bias **Table III**. Overall evidence was rated as low to moderate. Consistent associations were seen across the included studies; however, the majority of studies were observational, methodological diversity and risk of bias lowered the certainty of the evidence. More carefully planned prospective, multicenter studies are needed to build on the existing evidence base.

Table III: Risk of Bias Assessment of Cohort and Longitudinal Studies (Newcastle–Ottawa Scale)							
Author, Year	Selection Bias	Comparability (Confounding)	Outcome Assessment	Attrition Bias	Reporting Bias	Other Bias	Overall Risk
Park et al., 2021 ¹³	Low (Large national cohort)	Low (Multivariable adjusted)	Low (Validated PROMIS)	Moderate (Survey responders only)	Low (Outcomes reported)	Low	Low
Maurer et al., 2021 ¹⁴	Low (Population cohort)	Low (Matched controls)	Low (Validated EORTC)	Moderate (Long follow-up loss)	Low	Low	Low
Herbert et al., 2023 ¹⁵	Low (Prospective multicentre)	Low (Regression adjusted)	Low (Validated questionnaires)	Moderate (Follow-up attrition)	Low	Low	Moderate
Kenkhuis et al., 2022 ²⁰	Low (Prospective recruitment)	Low (Confounders adjusted)	Low (Repeated validated measures)	Low (High retention)	Low	Low	Low
Heiden et al., 2022 ²³	Moderate (Single centre)	Low (Mixed-effects models)	Low (PROMIS validated)	Low (Prospective follow-up)	Low	Moderate (Institution-specific)	Moderate
Mason et al., 2022 ²⁵	Low (Population-	Low (Adjusted analyses)	Low (Validated EPIC/EQ-5D)	Low (Repeat survey)	Low	Low	Low

	based cohort)						
Spampinato et al., 2024 ²⁶	Low (Prospective multicentre)	Low (Adjusted models)	Low (Validated PROMs)	Moderate (Long follow-up)	Low	Low	Moderate
Potosky et al., 2024 ²⁷	Low (Population cohort)	Low (Multivariable analysis)	Low (PROMIS-29 validated)	Moderate (699 follow-up)	Low	Low	Low

Figure 2 presents the traffic light plot of the risk of bias assessment for the cohort studies. Overall, most studies demonstrated a low risk of bias across the assessed domains, particularly for comparability, outcome assessment, reporting bias, and other bias. Moderate concerns were mainly observed in the domains of selection bias and attrition bias, resulting in an overall moderate risk of bias for three studies, while the remaining studies were judged to have a low overall risk of bias.

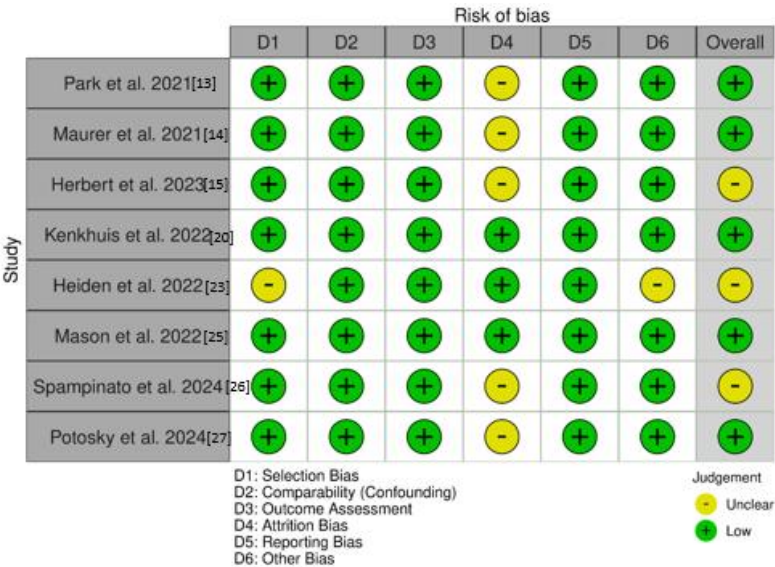


Figure 2: Traffic light plot showing the risk of bias assessment of the included cohort studies across individual methodological domains using the Newcastle–Ottawa Scale (NOS).

The cross-sectional studies were evaluated using the Critical Appraisal Checklist for Analytical Cross-Sectional Studies by JBI. Overall, the level of risk of bias of the studies included was low to moderate [Table IV](#). Low-risk studies typically employed validated HRQoL questionnaires, well-defined study populations, and valid statistical analysis, and adjusted for potential confounders. Convenience or hospital-based sampling, online volunteer recruitment and the inherent limitations of cross-sectional designs in establishing temporal relationships were the most prevalent reasons for moderate risk ratings.

Table IV: Risk of Bias Assessment of Cross-sectional Studies (JBI Checklist)

Author, Year	Selection Bias	Exposure Measurement	Outcome Measurement	Confounding	Statistical Analysis	Other Bias	Overall Risk
Alvarez-Pardo et al., 2022 ¹⁶	High (Convenience sampling)	Low (Clinical records)	Low (Validated EORTC)	Moderate (Limited adjustment)	Low (Appropriate tests)	Moderate	Moderate
Marcos-Delgado et al., 2024 ¹⁴	Low (Established cohort)	Low (Registry data)	Low (Validated SF-12)	Low (Regression adjusted)	Low	Low	Low
Miller et al., 2021 ¹⁸	High (Online volunteers)	Moderate (Self-reported treatment)	Low (FACT-C validated)	Moderate (Residual confounding)	Low	Moderate (Selection bias)	Moderate
Abu-Helalah et al., 2022 ¹⁹	Moderate (Hospital sample)	Low (Clinical information)	Low (Validated tools)	Moderate (Limited adjustment)	Low	Moderate	Moderate
Hsu et al., 2024 ²¹	Moderate (Single cancer center)	Low (Medical records)	Low (Validated EORTC/COST)	Low (Adjusted regression)	Low	Moderate	Moderate
Fonseca et al., 2024 ²²	Moderate (Responder sample)	Low (Clinical records)	Low (Validated questionnaires)	Moderate (Limited adjustment)	Low	Moderate	Moderate
Riccetti et al., 2022 ²⁴	Low (Multicenter recruitment)	Low (Clinical records)	Low (Validated instruments)	Moderate (Residual confounding)	Low	Low	Low
Donnelly et al., 2019 ²⁸	Low (National survey)	Low (Clinical information)	Low (Validated EPIC-26)	Low (Adjusted analyses)	Low	Low	Low

The traffic light plot of the risk of bias assessment of the included cross-sectional studies is shown in **Figure 3**. The overall quality of the studies was generally low in terms of exposure, outcome and statistical analyses. Overall, most studies exhibited moderate risk of bias, primarily due to moderate or high concerns with selection bias, confounding, and other bias; three studies were determined to have low overall risk of bias.

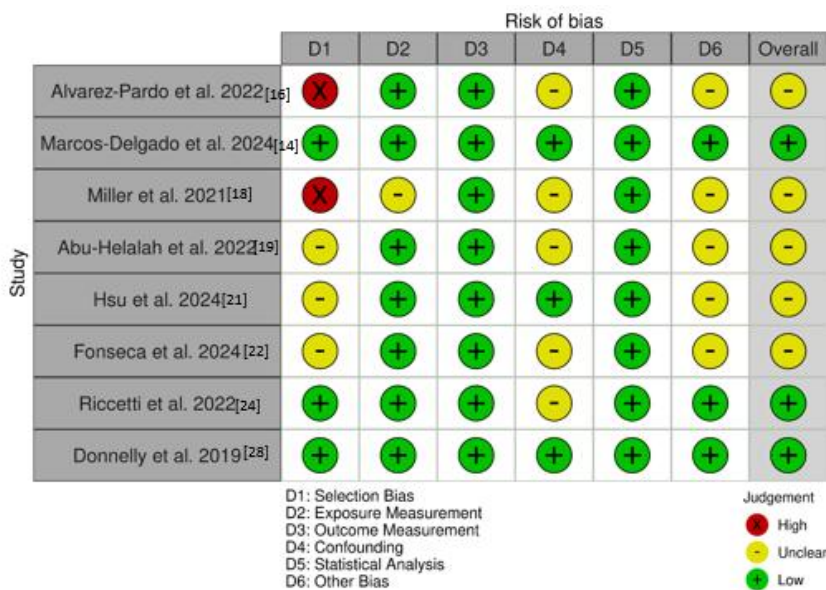


Figure 3: Traffic light plot showing the risk of bias assessment of the included cross-sectional studies across individual methodological domains using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist.

DISCUSSION

The results of this systematic review show that health-related quality of life (HRQoL) is affected by many demographic, clinical, psychosocial and treatment factors in various cancer survivor populations ²⁹. The studies included were survivors of breast, colorectal, lung, and prostate cancer, and included a prospective cohort, longitudinal, observational, and cross-sectional study design. While the type of cancer and duration of survivorship varied among studies, and a range of tools were used to measure HRQoL, most studies found that having advanced disease, complications of treatment, comorbidities, psychological distress and enduring symptoms were related to lower HRQoL, while better physical functioning, healthy lifestyle behaviours and higher levels of social support were associated with better HRQoL ^{30,31}.

HRQoL is most commonly affected in breast cancer survivors, studies consistently showed that HRQoL is impacted well after the end of treatment ³². The stage of the disease, disease recurrence, treatment-related complications, mastectomy, chemotherapy, psychiatric disorders, and low physical activity were the significant factors predicting less favorable HRQoL ³³. Younger survivors had also suffered more dysfunction in their social, emotional and sexual functioning than older women ³⁴. Although in general HRQoL improved with time and was similar to the general population in long-term survivors, the HRQoL scores of a number of patients continued to show specific functional and psychosocial problems that require ongoing survivorship care post active treatment ³⁵.

Lifestyle behaviours, disease recurrence, treatment intensity, and demographic characteristics were found to have an impact on HRQoL among colorectal cancer survivors ³⁶. Increased age, female gender, advanced disease, disease recurrence, and intensive treatment were linked to worse physical and mental health ³⁷. The adherence to lifestyle was related to improved physical functioning and decreased fatigue, especially the regular physical activity and ensuring a healthy body weight ³⁸. The lung cancer studies have shown that there is still significant symptom burden following successful treatment ³⁹. Persistent dyspnoea, fatigue, pain, anxiety and depression were all factors that were consistently associated with poorer HRQoL whilst met supportive care needs and financial toxicity were associated with better HRQoL ⁴⁰. The quality of life of survivors was significantly poorer if they were taking targeted therapies or were aware that their physical and social needs were not being met as well as those with less supportive care needs ⁴¹. This study highlights the need to incorporate the treatment of symptoms, psychosocial support, and financial counseling in lung cancer survivorship programs.

Likewise, prostate cancer survivors had long-term ED, urinary incontinence, bowel dysfunction and hormonal dysfunction which significantly impacted HRQoL ⁴². Important factors associated with lower QOL were persistent urinary and GI symptoms, extra cancer treatments, comorbidities, financial problems, and lack of social support ⁴³. The majority of the survivors had stable HRQoL over time, but significant declines were seen in those who received further treatment or had persistent treatment-related symptoms, indicating the need for long-term functional assessment and/or support ⁴⁴.

The systematic review has some limitations including inclusion of only English language studies (where full texts were available); the diversity of cancer types, HRQoL instruments, and outcome measures prevented direct comparisons across studies and prevented quantitative meta-analysis. Also, the studies included in the review had some methodological limitations such as mostly observational studies, mostly cross-sectional designs and variable sample sizes. Future studies should focus on large prospective multicenter studies with standardized HRQoL instruments with extended follow-up periods to fully elucidate changes in HRQoL over the survivorship period. More emphasis also needs to be placed on psychosocial interventions, lifestyle modification, financial assistance and symptom management interventions which can enhance long-term HRQoL among a wide range of cancer survivor groups.

CONCLUSION

This systematic review shows that there are several demographic, clinical, treatment related, psychosocial and lifestyle factors affecting the health-related QOL of cancer survivors. In all cancer survivors (breast, colorectal, lung, prostate), advanced disease, persistent symptoms, co-

morbidities, psychological distress and financial burden were all correlated with poor HRQoL. On the other hand, healthy lifestyle behaviors, social support and good physical functioning were associated with higher quality of life level. Efforts are needed to further validate the evidence and maximize HRQoL survivorship care through large multicenter prospective studies using standardized HRQoL measures.

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