

The Effectiveness of Treatment Options for Localized Prostate Cancer: A Meta-Analysis of Cross-Sectional and Cohort Studies

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How to cite this paper: Omolewa, P., Bressan, J. and Nouredine, N. (2026) The Effectiveness of Treatment Options for Localized Prostate Cancer: A Meta-Analysis of Cross-Sectional and Cohort Studies. *Open Journal of Nursing*, 16, 454-467.

<https://doi.org/10.4236/ojn.2026.168033>

Received: July 6, 2026

Accepted: August 11, 2026

Published: August 14, 2026

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Abstract

Background: Prostate cancer is one of the most common malignancies among men worldwide, with incidence rates rising steadily over the past decades. Although the widespread adoption of PSA screening has improved early detection, it has also sparked extensive debate regarding overdiagnosis and overtreatment. Against this backdrop, balancing the avoidance of unnecessary interventions with the need to ensure favorable patient outcomes has become a central challenge in clinical decision-making. **Methods:** Articles published from 2010 through 2025 were searched in five databases. The cross-sectional and cohort studies examined the effects of treatment options on localized prostate cancer. **Results:** From the analysis of the seven studies, the pooled effect on men's sexual functions revealed logQR = 0.93, 95% CI [0.22, 1.64], $p = 0.01$, urinary functions at logQR = 2.38, 95% CI [1.29, 3.48], $p < 0.01$, bowel functions at logQR = 3.76, 95% CI [1.94, 5.59], $p < 0.01$. Age factors pooled at $d = 0.76$, 95% CI [0.11, 1.42], $p = 0.02$, PSA pooled at $g = -0.61$, 95% CI [-1.15, -0.07], $p = 0.03$, and clinical state pooled at logQR = 0.66, 95% CI [0.14, 1.17], $p = 0.01$. **Conclusions:** The quest for better management of prostate cancer among men continues to gain momentum in the face of opposition to radical surgery. Active surveillance has gained more popularity as it allows men to preserve those areas valued for quality of life. It has been observed that radical prostatectomy negatively affects the sexual, urinary, and bowel functions of men more than other treatment options.

Keywords

Prostate Cancer, Prostatectomy, PSA Testing, Sexual Health, Active Surveillance

1. Introduction

The prevalence of prostatic malignancies, specifically in the Western world, continues to raise concerns [1]. This has constituted a healthcare burden as men in America face a one-in-seven lifetime risk of diagnosis [2] [3]. Alarming, the incidence of prostate cancer has been globally reported among men with higher risks in developed countries compared to less developed countries [4] [5]. The high mortality inherent in the disease has been obvious in all ethnic groups, but black men have the highest morbidity and mortality in the United States of America due to lack of access to quality care [2] [6] [7].

The widespread adoption of PSA screening has improved early detection, but a void remains in the process of identifying the best method to manage prostate malignancies [8] [9]. Several factors such as ethnicity, educational level, and age have been noted to influence the choices men make, as evidenced by the overall preference of white men for surgery [10]. A significant survival difference between major treatment modalities of prostatic cancer has not been identified, and no proof exists to show that surgery reduces mortality [2] [11]. The importance of alternative therapies has been gaining more attention as the emotional responses of individuals diagnosed with the disease cannot be underestimated in the decision-making process, considering the vital position of their partners [2] [12]. The experiences of individuals diagnosed with the disease have not been well explored in many studies [13].

Many factors influence the options men take to manage their prostate cancer, but the optimal needs of all men include overall well-being, sexual, bowel, and urinary functions [2] [3]. In the absence of any specific treatment options that stand out, the preferences and values of patients become very essential in the management of prostate cancer in men [14] [15]. In a study, men reported sexual and urinary complications when radical prostatectomy and other methods of management were used [8], and several indications favored the use of AS [16]. With AS, the individual is afforded quality of life in areas important to them, such as sexual activity [17]. The overwhelming reports on the negative consequences of surgery made AS a preferred method of management in many men [18] [19].

In localized prostate cancer still confined within the prostate gland, the concept of AS has become well accepted because of many positive benefits [6] [8]. The process of active surveillance that comes with consumption of healthy diets with immune-boosting properties enables patients to postpone radical interventions with the negative consequences [7] [8] [20]. In view of several factors observed in the treatment of men diagnosed with prostate malignancies, this study summarizes existing evidence, identifies some gaps, and contributes towards safe and effective treatment options for the disease through systematic analysis.

2. Objective

The study aims to determine the effects treatment options have on patients with

localized prostate cancer and identify factors that influence treatment options.

Specifically, this systematic analysis was guided by the following research questions:

Research question 1: What effects do active surveillance and radical prostatectomy have on patients with localized prostate cancer?

Research question 2: What factors influence localized prostate cancer treatment options?

Protocol and registration

Registered with the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD420261289313).

3. Materials and Methods

The researchers' interest was to determine the effects that active surveillance and prostatectomy have on patients with localized prostate cancer and identify factors that influence treatment options. The review and report followed PRISMA guidelines [21], and all empirical evidence that met pre-specified eligibility criteria was included to answer the above research questions. The systematic reviews used in the study minimized bias and produced reliable findings that inform decision-making among authors [22]. Institutional Review Board of the University approved the study (IRB2026-10).

3.1. Search Methods

The systematic review of cross-sectional and cohort studies was conducted in MEDLINE, EBSCohost, ProQuest, CINAHL, and PsycINFO for articles published between 2010 and 2025. The search strategy included a combination of SMART searching of the effects of active surveillance and prostatectomy on patients with localized prostate cancer and factors that influence localized prostate cancer treatment options using the Joanna Briggs Institute (JBI) critical appraisal tool [23]. The institution's Librarian assisted with the search for articles. Quantitative data were analyzed using a meta-analysis approach.

3.2. Study Selection and Quality Appraisal

The eligibility criteria were independently selected by two authors, and at the initial selection process, all the authors checked for duplication using Mendeley reference manager [24]. The inclusion and exclusion criteria were confirmed through an interactive process between the authors in the review of title, abstract, and full text relevant to the topic of focus. The Joanna Briggs Institute (JBI) critical appraisal checklist was used by the authors to determine appropriate scores of 70% or above [23].

Consistency was maintained, and all authors unanimously agreed on selected studies. The selected seven studies were identified as enumerated on the flow diagram (**Figure 1**). The authors assessed the risk of bias independently; discrepancies in the assessment results were collectively reviewed before consensus was

reached [25] [26]. The studies were low risk on the standard scale comparable to a high-quality randomized trial, and very few were of moderate risk, also considered sound evidence for a non-randomized study (see **Figure 2**).

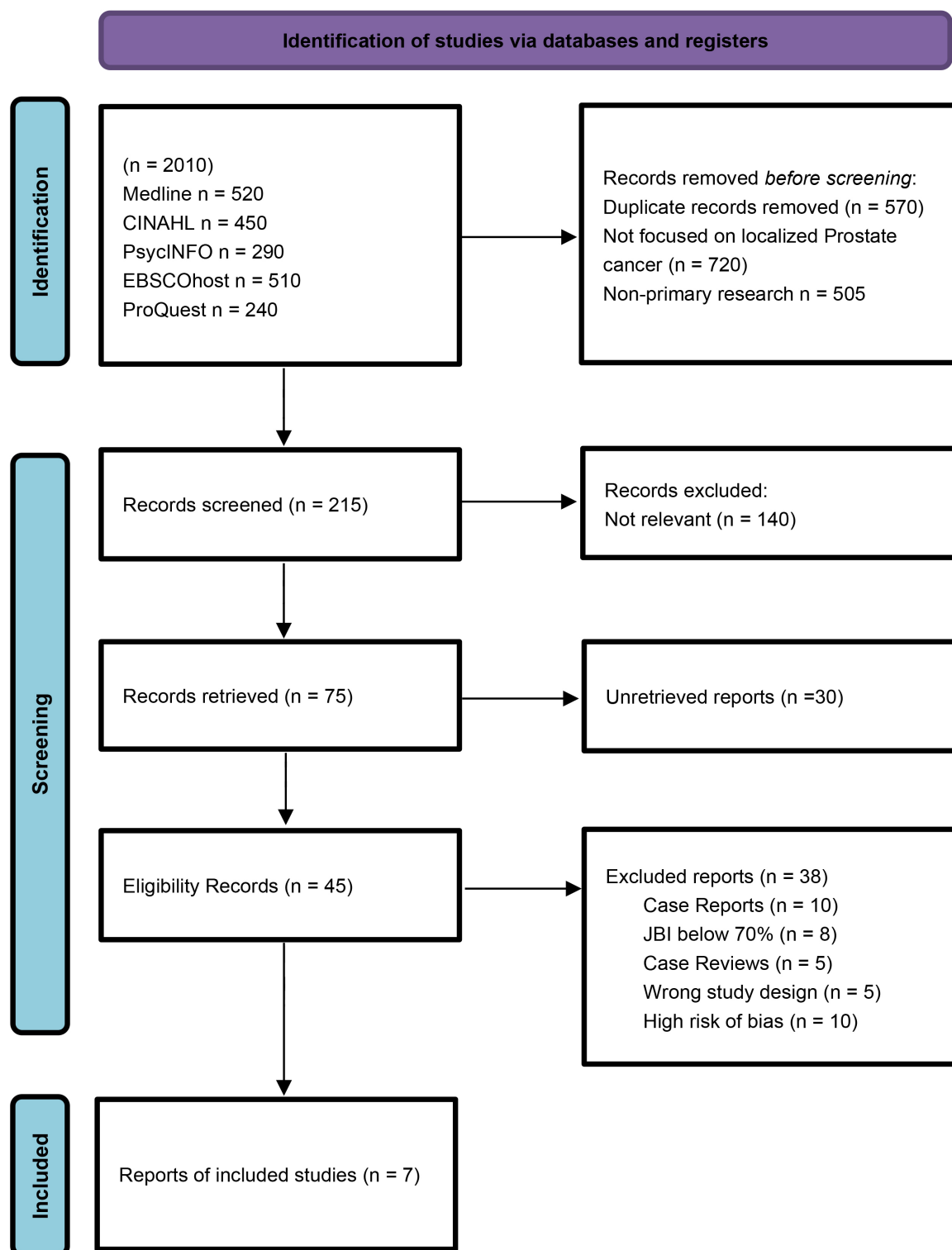


Figure 1. Flow chart of the study selection process (PRISMA 2021).

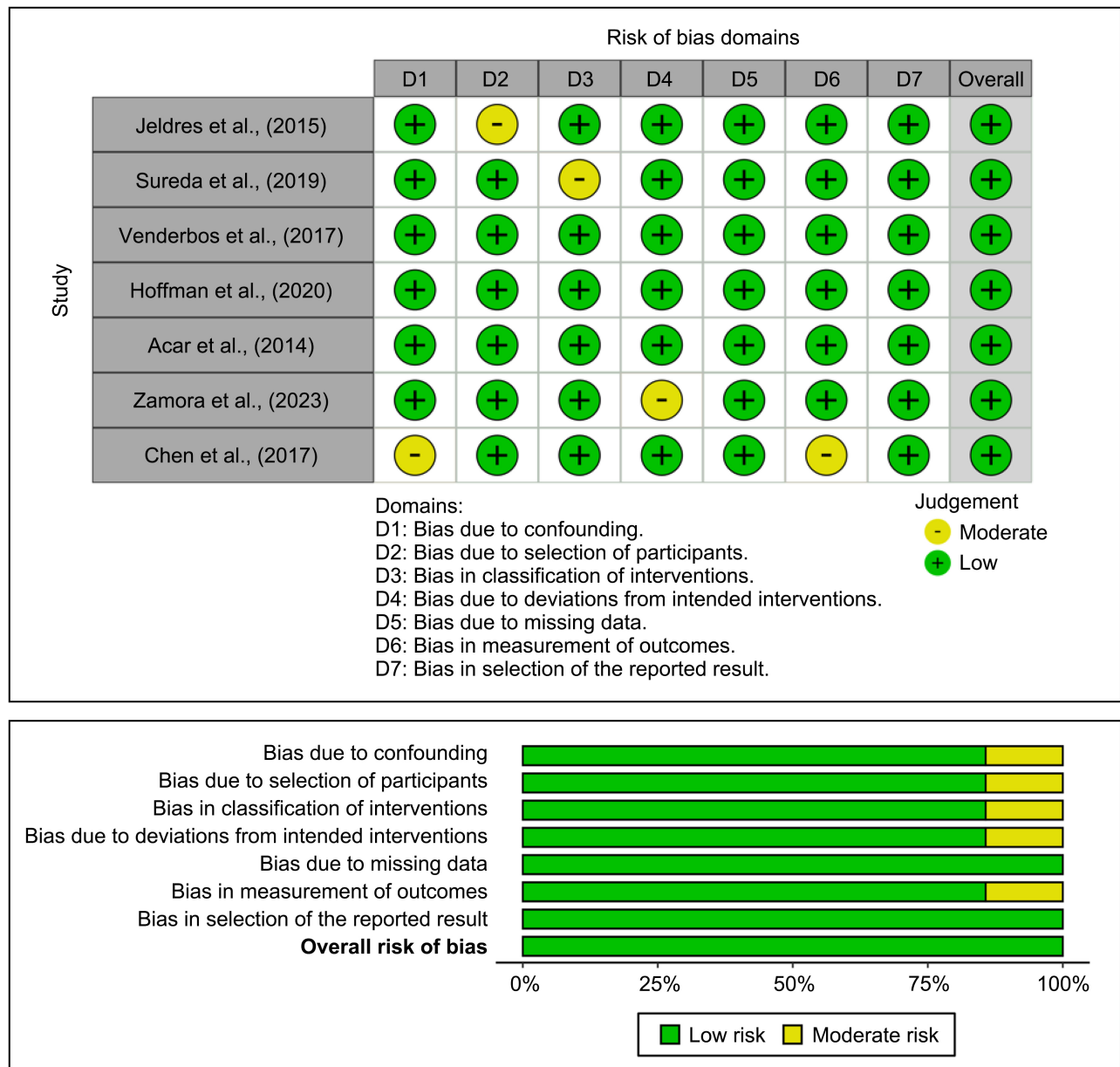


Figure 2. Risk of bias domains assessment.

4. Criteria for Selecting Studies

4.1. Types of Studies

Cohorts and cross-sectional studies that evaluated the health-related quality of care of patients diagnosed with low-risk prostate cancer and who received active surveillance and radical prostatectomy treatment options were included in this review.

4.2. Types of Participants

Men diagnosed with prostate malignancy and using active surveillance and radical prostatectomy treatment options to manage the disease.

5. Type of Intervention

The health-related quality of life of men who received active surveillance and prostatectomy in terms of sexual, urinary, and bowel functions. The primary endpoint was the difference in health-related quality between active surveillance and prostatectomy from baseline at early and late time points.

6. Data Collection

The eligibility criteria of articles were determined by interactive processes among the authors who at first independently assessed them, followed by collective discussion before consensus was reached. All relevant data from all articles were succinctly reviewed and later discussed on ZOOM for solid agreement.

Data Analysis

The SPSS version 31 software [27] was used to perform the meta-analysis. The effect size, weight, standard deviation, and 95% confidence interval (CI) were calculated for each study. The overall effect size, no effect value, and overall effect size value from pooled studies were also calculated on the forest plot using a random-effects model in all analyses.

7. Result

Description of Studies

All seven studies compared the health-related qualities of men with low-risk prostate cancer who participated in active surveillance and radical prostatectomy treatment options [28]-[34]. There was a total of 2636 participants diagnosed with localized prostate cancer in the studies, and the average age of the men was 40 to 85 years. All participants were from diverse regions of North America, Northwestern Europe, and Northwestern Europe; the ethnicity of participants was classified as Caucasian/white, African American/Black, Asian, Hispanic, black, white, and Other (see **Table 1** and **Table 2**).

Table 1. Study characteristics.

Author(s)	Year	Country	Participants	Data collection	Method of data analysis
Jeldres <i>et al.</i>	2015	USA	228 underwent Radical prostatectomy and 77 underwent Active Surveillance.	Validated questionnaires short form were used to collect data from patients by the Center for Prostate Disease Research in a multicenter national database.	The health-Related Quality of Life scores were compared between treatment cohorts using standardized statistical analysis.
Sureda <i>et al.</i>	2019	Spain	99 participants in Active Surveillance and 99 participants in Radical prostatectomy	Cross-sectional study of patients undergoing AS in two hospitals, matched with patients treated with Radical Prostatectomy in a Spanish hospital.	The analysis determined the differences of twelve points (effect size of 0.5 SD) on the sexual score of questionnaires Between the groups.

Continued

Venderbos <i>et al.</i>	2017	Netherlands	120 participants in Active Surveillance and 69 in Radical prostatectomy	Validated measurement tools were used to evaluate prostate-specific Health of the men.	The study reported the mean and standard deviation (SD) of patient-reported outcomes per group. ANOVA used to determine differences in the quality of life and symptoms between all groups.
Hoffman, <i>et al.</i>	2020	USA	363 participants in active surveillance and 402 in prostatectomy.	Men with clinically localized prostate cancer from 5 population-based cohorts were recruited. Surveys were completed at baseline and 6 months and 1, 3, and 5 years after enrollment. Tumor characteristics, initial treatment, and treatment dates were determined from medical charts Abstraction 1 year after enrollment.	Analysis compared the differences between treatment groups in sexual, urinary incontinence, urinary irritative, bowel, and hormone domain scores.
Acar <i>et al.</i>	2014	Netherlands	Participants included 65 patients with Robot-Assisted Laparoscopic Prostatectomy and 50 whose cancer was managed with Active Surveillance.	Patients with localized prostate cancer completed the questionnaires routinely sent by regular mail or e-mail before patients visited the hospital for the first time. Then, after treatment, the patients completed the same questionnaires again at regular intervals of 6 months.	Completed questionnaires on quality-of-life scores among the groups were compared using statistical tests.
Zamora <i>et al.</i>	2023	Spain	Active Surveillance = 87, Robot-Assisted Radical Prostatectomy = 194.	Prospective cohort of men diagnosed with clinically localized prostate cancer from 18 Spanish hospitals, with 24 months of follow-up.	Instruments were administered via telephone interviews at intervals after active treatment and radical prostatectomy treatments. All analyses were performed with propensity score weights to solve treatment selection bias.
Chen <i>et al.</i>	2017	USA	Active surveillance = 314 Radical prostatectomy = 469	Data collected on age, race, insurance, education, household income, marital status. Assessment based on patients' report on the baseline survey from medical record, cancer registry, prostatectomy, and active surveillance.	Weighted Quality of life scores. Quantitative analysis.

Table 2. Demographic Characteristics of participants in the study.

Author(s)	Year	# of participants	Age range	Country	Ethnicity	Region
Jeldres <i>et al.</i>	2015	305	40 - 75	USA	Caucasian/African American/Asian	North America
Sureda <i>et al.</i>	2019	198	68 - 73	Spain	Caucasian	Southwestern Europe
Venderbos <i>et al.</i>	2017	189	65 - 76	Netherlands	Caucasian	Northwestern Europe
Hoffman <i>et al.</i>	2020	Active surveillance = 363 Prostatectomy = 402	60 - 71	USA	Asian/Hispanic, black/white	North America
Acar <i>et al.</i>	2014	115	44 - 85	Netherlands	Caucasian	Northwestern Europe
Zamora <i>et al.</i>	2023	Active Surveillance = 87 Radical Prostatectomy = 194	50 - 75	Spain	Caucasian	Southwestern Europe
Chen <i>et al.</i>	2017	783	62 - 67	USA	White/African American/Other	North America

8. Results of the Meta-Analysis

Statistical significance was demonstrated through the pooled results of analysis on both research questions #1 and #2. **Table 3** shows the summary of meta-analysis on specific effects and factors.

Table 3. Results of meta-analysis.

Sexual Summary in prostate cancer	logQR = 0.93, 95% CI [0.22, 1.64], $p = 0.01$
Urinary function	logQR = 2.38, 95% CI [1.29, 3.48], $p < 0.01$
Bowel function	logQR = 3.76, 95% CI [1.94, 5.59], $p < 0.01$
Age factors in prostate cancer treatment	$d = 0.76$, 95% CI [0.11, 1.42], $p = 0.02$
PSA level in prostate cancer treatment	$g = -0.61$, 95% CI [-1.15, -0.07], $p = 0.03$
Clinical stage T1	logQR = 0.66, 95% CI [0.14, 1.17], $p = 0.01$.

9. Discussion

Prostate cancer among men has become a global issue despite advancements in technology and evidence-based practices surrounding the healthcare industry. In view of many types of treatment modalities available, individuals diagnosed with the disease still find it difficult to make the best choice due to many factors such as age and overall health status. The overall health condition can be dependent on the level and characteristics of the malignancy, either localized or metastasized [35]. In many instances, young individuals with localized prostate cancer opted

for surgery to preserve their sexual function, but aggressive surgery has many negative effects that often lead to regret [31].

Many men have started to see the use of active surveillance as an alternative option to avoid the negative consequences that surgery portends, because it allows ongoing observation and waiting until surgery is ultimately considered [16] [29] [36]. The provision of more information to healthcare providers and the public can sensitize more usage of active surveillance in view of the very low percentage of clinicians recommending the management option [28]. Individuals diagnosed with prostate cancer do have serious concerns about their sexual performance, and the use of AS has demonstrated efficacy in preserving the sexual functions of men [31]. In many studies, active surveillance has been identified as a viable and safe alternative to manage localized prostate cancer in the face of lack of superiority in surgical intervention [16] [37]. In addition, surgical intervention does not decrease the mortality rate among diagnosed individuals, thereby necessitating the importance of taking essential steps to avoid unnecessary treatments that can be consequential [38].

Men who underwent active surveillance showed improved health qualities in areas of sexual and urinary functions than those who opted for radical prostatectomy [30] [32] [39], and negative outcomes were observed more in the case of prostatectomy [40]. In the adjusted urinary function and incontinence domains, radical prostatectomy scored significantly worse at all time points up to 5 years in comparison with active surveillance [41]. Although bowel complaints in prostate cancer are typically not symptoms of the cancer itself but are common side effects of treatment such as rectal bleeding after prostatectomy, exploration of alternate therapies can prevent post-treatment unwanted consequences [33] [42].

10. Strengths and Limitations

The inclusion of studies on localized prostate cancer conducted across three countries and three regions comprising different ethnic groups, searched across five databases. Adding to the strength is the demographic characteristics of the participants in the pooled studies. [28]-[34]. A total of 2636 participants diagnosed with localized prostate cancer were included in the review. The study was limited to articles written in English, which was a limitation because articles in other languages might have contained valuable information, but interpretation could be a challenge for all authors.

11. Implications for Practice and Research

This review proposes key areas for future research and practice. Future studies should explore factors that make the active surveillance option better than radical prostatectomy in the treatment of localized prostate cancer. The effectiveness of radical prostatectomy cannot be overemphasized in certain situations based on the grade of prostate cancer. However, opting for surgery in low-risk cancer may be due to other psychological components like fear of the unknown and lack of

appropriate information. It has been noted that prostatectomy prevents further metastasis of cancerous cells, but it's very important to explore other interventions based on the level of the malignancy. On the analysis of PSA level, four studies were not statistically significant, but the overall pooled effect of the studies was statistically significant with a p -value of 0.03, indicating that patients' and practitioners' awareness of PSA level plays a significant role in treatment choices. More studies required to explore what makes many urologists favor surgery instead of active surveillance in low-risk prostate cancer.

Regular PSA tests allow patients to avoid invasive treatments like surgery or radiation unless the cancer shows signs of progression. Perhaps low PSA levels can benefit more from non-invasive interventions. More studies may be required to determine the impact of nutrition and the use of complementary alternative therapies among various ethnic groups. The clinical stage of the disease also plays an important role, based on statistical significance with a p -value of 0.01. Both T1 and T2 are considered localized because they have not spread beyond the prostate capsule. Therefore, more studies need to be done on this in combination with PSA and Gleason scores to always determine the right interventions and prevent complications of low-risk prostate cancer. Age continues to be a factor in the treatment options, and it's good to quantify the empirical benefits derived from surgery by patients in their 40's and 50's. Future studies can review the effectiveness of other interventions such as radiotherapy and chemotherapy.

12. Conclusion

It has been observed that radical prostatectomy negatively affects the sexual, urinary, and bowel functions of men more than other treatment options. However, most neurologists still prefer surgery over all other treatment options for localized prostate cancer. Making surgery a last resort will make other non-invasive interventions more acceptable in the management of low-risk prostate malignancy. In our studies, a few of the selected studies were not statistically significant, but the overall pool effects were statistically significant. The results validated the effects that treatment options like active surveillance and radical prostatectomy have on localized prostate cancer patients' sexual, urinary, and bowel functions. From the results, we were able to discern factors that influence treatment options among men diagnosed with prostate malignancy.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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