BMC Surgery

RESEARCH

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Extent and pattern of symptom relief following surgical castration in patients with advanced prostate cancer treated at a tertiary referral hospital in Tanzania: a prospective cohort study

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Abstract

Background Advanced prostate cancer leads to many symptoms, notably bone pain and lower urinary tract symptoms (LUTs); however, the degree and duration of pain relief, changes in LUTs severity and underlying factors associated with the extent of symptom relief remain inadequately understood. Surgical castration has proven effective in relieving both bone pain and urinary symptoms for metastatic prostate cancer patients.

Objective To determine the extent and pattern of symptom relief in advanced prostate cancer patients following surgical castration at Muhimbili National Hospital (MNH).

Methods We conducted a prospective cohort study for a period of 6 months involving men with advanced Prostate cancer (PCa) undergoing surgical castration at MNH and followed them for 30 days. The international prostate symptoms score tool was used to assess changes in LUTs, and the pain rating scale was used for assessing changes in bone pain symptoms before and after surgery. Logistic regression model was used to determine factors associated with complete bone pain relief.

Results A total of 210 participants with a mean age of 72.3 years were recruited. The LUTS score showed a decrease of 7.1 points after surgical castration (95% CI: 6.4 to 7.7, $p < 0.001$). The bone pain score showed an absolute decrease of 39.8% (95% CI: 34.7 to 44.9, $p < 0.001$) after surgical castration, with more than half of the patients (111, 52.9%) reporting bone pain relief within the first two weeks. Among the factors associated with greater pain relief were being in a marital union (aOR 2.73, 95% CI: 1.26 to 5.89, $p < 0.011$). Normal BMI was also linked to pain relief in bivariate analysis (OR 1.92, 95% CI: 1.03 to 3.61, $p < 0.035$). Additionally, patients with severe bone pain before surgical castration were more likely to achieve complete pain relief compared to those with mild or moderate pain (odds ratio 8.32, 95% CI: 3.63 to 19.1, $p < 0.001$).

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Conclusion Surgical castration improves both bone pain and lower urinary tract symptoms in patients with advanced prostate cancer. Notably, patients experiencing severe bone pain reported resolution of bone pain symptoms within the first and second weeks, respectively, indicating the prompt effectiveness of the surgery on these symptoms.

Keywords Prostate cancer, Surgical castration, Lower urinary tract symptom, Bone pain relief, Extent of symptom relief

Introduction

Prostate cancer (PCa) is the second most frequently diagnosed cancer and ranks fifth in male cancer-related deaths globally [1]. The incidence of PCa has been increasing over time; it is predicted by 2030, there will be 1.7 million new cases and 499,000 additional deaths annually worldwide [2, 3]. PCa is prevalent in men of African ancestry, and aging is one of the key risk factors [4]. Care for PCa in low income countries is challenged by late presentation [4].

Proper diagnosis of prostate cancer (PCa) is often delayed in low-resource settings due to the slow progression of the disease, which is characterized by non-specific symptoms, and the lack of adequate screening centres. PCa should be suspected in males over 50 years old who present with bone pain symptoms, lower urinary tract symptoms (LUTs), such as visible haematuria or erectile dysfunction [3, 5]. These patients should be thoroughly investigated to rule out malignancy [5]. Nevertheless, in low-resource settings, it has been difficult to diagnose prostate cancer in elderly patients who present with these non-specific symptoms, with many patients being treated for spondylosis or lower back pain and some being treated for chronic or recurrent UTIs [3], while the majority of elderly patients are treated as orthopaedic patients whenever they present with bone pain symptoms.

PCa commonly spreads to the lumbo-sacral vertebrae before reaching the spinal cord. In this stage, a patient may present with metastatic features with or without the inability to walk, with impending cord compression being an emergency condition [6].

In men with metastatic PCa, androgen deprivation therapy (ADT) which include medical or surgical castration continues to be the mainstay treatment [7, 8]. Surgical castration can be achieved through bilateral total orchiectomy, which entails the removal of the entire testis, epididymis, and appendages, or bilateral subcapsular orchidectomy, which leaves behind the tunica albuginea and the epididymis [9]. These patients are anticipated to experience a decrease in the occurrence of metastatic symptoms, especially bone pain, within a few weeks [10].

Medical castration is often expensive and impractical in many African settings due to limited access to medications and the high costs of those available [3]. Additionally, some patients discontinue treatment due to adverse side effects [3]; In our region, the most efficient ADT approach has been surgical castration. Cost-effective guidelines for addressing advanced prostate cancer in emerging nations are urgently needed [3].

In the UK, 97% of men receiving prostate cancer treatment report LUTs, including incontinence, radiation cystitis, and urinary retention [11]. A study from Nishinomiya Hospital, Japan, showed that 12 weeks of medical ADT significantly reduced moderate to severe LUTs to mild symptoms [12].

In Tanzania, many prostate cancer patients report symptom relief within days after surgical castration, though exact data on improvement timelines are limited. Studies show over 72% experience relief post-surgery. Surgical castration, unlike medical options, provides rapid bone pain relief, eases LUTs, and is cost-effective [13–15].

To our knowledge, although studies show significant symptomatic relief after surgery, the degree and duration of pain relief, changes in LUT severity, and factors predicting the extent of relief are still poorly understood.

Methods and materials

Study design

We performed a prospective cohort study, which was conducted at Muhimbili National Hospital (MNH) from October 2023 to March 2024, using the IRB approval number MUHAS-REC-09-20231916 to determine the extent and pattern of symptom relief in advanced prostate cancer patients who underwent surgical castration. Candidates were followed for 30 days in a 6-month study after surgical castration.

Study population

The study population consisted of male patients diagnosed with prostate cancer (PCa) who attended the Urology Department at Muhimbili National Hospital.

Inclusion and exclusion criteria

We included all patients with a histopathological diagnosis of prostate cancer presenting with metastatic features (bone pain), Confirmed by radiological investigation with or without LUTs who were receiving care at the Urology Department of MNH. Patients who received supplementary medical androgen deprivation therapy or who had a previous medical history of castration and developed

hormone-refractory prostate cancer were excluded. A total of 210 patients who met the inclusion criteria were included in the study.

Study area

The study was conducted at Muhimbili National Hospital, which is a tertiary referral hospital with two campuses, Upanga and Mloganzila, and serves as a teaching university hospital for the Muhimbili University of Health and Allied Sciences (MUHAS). It is in the city of Dar es Salaam and has a capacity of 1,600 beds and serves 1,000–1,200 outpatients per week. MNH serves prostate cancer patients who reside in every region of Tanzania. The study involved advanced prostate cancer patients admitted to both campuses and to the outpatient department (OPD) urology clinic. On average, 55–65 patients suspected of having advanced prostate cancer on both campuses are admitted monthly for true cut biopsy, and the tissue is collected by using Max-core disposable, with a core biopsy needle of 16Gauge.

The Urology Department handles all urological surgical cases, employing both open and endoscopic techniques. Surgical castration stands out among the top ten treated urological procedures, with around 295 annual castration surgeries performed based on hospital records.

Data collection and measurements

An electronic data collection tool (REDCap) was used to collect data from participants diagnosed with advanced prostate cancer who presented with symptoms. Informed consent forms were signed by each patient after explaining the study's importance before providing their information.

A two-week history of patient symptoms before surgical intervention was documented the day before surgery and 30 days after surgery. Radiological images for metastasis, such as lumbosacral X-ray, CT scan and MRI, were reviewed before surgery and conclusion from the review of images were recorded in this study. To ascertain the number of patients who had metastatic symptoms prior to surgery, the metastasis features of patients identified via radiological investigations were documented. Due to resource limitations, bone scans were not available.

The D'Amico risk stratification system categorized patients into low, intermediate, or high-risk groups based on PSA levels, Gleason scores, and clinical stages. To understand tumour pathology within the D'Amico risk stratification system, we utilized the International Society of Urological Pathology (ISUP) grading system. This system categorizes patients into ISUP grade groups based on histopathological findings, providing a clearer and more accurate stratification of prostate cancer aggressiveness with five distinct grade groups.

Following surgical castration, participants were monitored for 30 days to assess outcomes. Follow-up assessments were conducted in the urology clinic on designated clinic days, where post-surgical outcomes were evaluated. Patients reported symptom relief dates during their clinic visits. For participants unable to attend their appointments, their post-surgery information was obtained through telephone interviews.

Changes in lower urinary tract symptoms before and after surgery were assessed using the International Prostate Symptoms Score (IPSS), a tool that categorizes symptoms into mild (score 1–7), moderate (score 8–19), or severe (score 20–35), with a total possible score of 35.

Bone pain changes before and after surgery were evaluated using the pain rating scale developed by the British Pain Society for metastatic bone pain symptoms (https://www.britishpainsociety.org/static/uploads/resources/files/pain_scales_eng.pdf). This scale categorizes pain into four levels:

1. **Pain-free**: 100% No pain at all.
2. **Minor pain**: 70–99% pain relief; pain is annoying but does not significantly interfere with daily activities.
3. **Moderate pain relief**: 40–69% pain relief; pain significantly interferes with daily activities.
4. **Severe pain/no relief**: 0–39% pain relief; severe pain indicating disability and inability to perform daily activities independently.

Statistical analysis

Analysis was performed using Stata version 18 (Stata Corp LLC). Cross-tabulation with Pearson chi-square tests were used to test differences in pain relief across different participants' characteristics. Paired t-tests were used to assess the mean differences in LUTs symptom scores or bone pain scores between the measures taken before and after surgical castration. We used ordinary logistic regression to determine factors associated with complete bone pain relief. Both bivariate and multivariate analyses were performed. Variables with $p<0.2$ in bivariate analyses were carried further in a multivariate analysis to identify independent factors associated with complete pain relief while controlling for bone pain before surgical castration. Both odds ratios (OR) of achieving complete relief from bone pain and adjusted odds ratios (aOR) with their corresponding 95% confidence intervals (CIs) were presented. A p-value <0.05 was considered statistically significant.

Results

Overview analysis

A total of 210 men diagnosed with prostate cancer and scheduled to receive surgical castration for metastatic

Table 1 Demographic and clinical characteristics

Variable	*n* (%)
Total	**210**
Age (mean ± SD)	72.3 ± 8.8
Below 65	44 (21.0%)
65+	166 (79.0%)
Marital status	
Married	152 (72.4%)
Not married	8 (3.8%)
Separated	48 (22.9%)
Divorced	2 (1.0%)
Education level	
Informal	20 (9.5%)
Primary	88 (41.9%)
Secondary	59 (28.1%)
College and above	43 (20.5%)
BMI categories	
Underweight	21 (10.0%)
Normal	87 (41.4%)
Overweight	83 (39.5%)
Obese	19 (9.0%)
Place of residence	
Dar es salaam	115 (54.8%)
Out of Dar es salaam	95 (45.2%)
Pre-operative D'amico risk group	
Low	11 (5.2%)
Intermidiate	26 (12.4%)
High	173 (82.4%)
Family history of prostate cancer	
No	144 (68.6%)
Yes	66 (31.4%)
History of any comorbidities	
No comorbidity	56 (26.7%)
Hypertensive	113 (53.8%)
Diabetes	11 (5.2%)
HIV	4 (1.9%)
Both DM/HTN	26 (12.4%)

Key: SD-Standard deviation

ISUP-International society of urological pathology

Table 2 Prostate cancer clinical profile

Variable	*n* (%)
Total	**210**
Metastasis location	
Lumbosacral	106 (50.5%)
Pelvic region	59 (28.1%)
Spinal cord compression	12 (5.7%)
Vertebrae	24 (11.4%)
Brain	1 (0.5%)
Lungs	5 (2.4%)
Mixed Metastasis	3 (1.4%)
Symptoms Score (IPSS) Before Surgical castration	
Mild	12 (5.7%)
Moderate	167 (79.5%)
Severe	31 (14.8%)
Symptoms Score (IPSS) After surgical castration	
Mild	145 (69.0%)
Moderate	58 (27.6%)
Severe	7 (3.3%)
PSA Level before surgery	
Low risk	5 (2.4%)
Intermediate risk	6 (2.9%)
Severe risk	199 (94.8%)
ISUP grade	
Grade 1	7 (3.3%)
Grade 2	11 (5.3%)
Grade 3	36 (17.2%)
Grade 4	83 (39.7%)
Grade 5	72 (34.4%)

Key: ISUP-International society of urological pathology

PSA-Prostatic specific antigen

bone pain symptoms were identified. Of these, 111 (52.9%) experienced bone pain symptom relief within the first two weeks ($P<0.001$) and 55 (26.2%) within the first seven days respectively. The mean IPSS score dropped significantly from 15.1 to 8.0 post-surgery (decrease of 7.1, $P < 0.001$, indicating improvement in urinary symptoms. Among the factors associated with greater pain relief were being in a marital union (aOR 2.73, 95% CI 1.26-5.89, $P = 0.011$), residing in Dar es Salaam region, likely due to proximity to the hospital (aOR 2.28, 95% CI 1.09-4.79, $P = 0.030$). Additionally, normal BMI was also linked to pain relief in bivariate analysis (OR 1.92, 95% CI 1.03-3.61, $P = 0.035$).

Demographic and clinical characteristics of patients

A total of 210 adult men with a mean age of 72.3±8.8 (±SD) years were recruited for this study. Most of the participants were married 152 (72.4%) and resided in Dar es Salaam 115 (54.8%). More than three-quarters of the participants, 173 (82.4%), had a high pre-operative risk group (D'Amico prostate cancer risk stratification), and more than two-thirds, 144 (68.6%), reported no family history of prostate cancer. Additionally, more than half of the participants, 113 (53.8%), were hypertensive, and only 56 patients (26.7%) had no comorbidities.

(Tables 1 and 2).

Out of Dar es Salaam region includes the Iringa, Morogoro, Singida, Mara, Kilimanjaro, Songea, Mwanza, Njombe, Tabora, Shinyanga, Lindi, Mtwara, Pwani, and Ruvuma Regions.

Impact of surgical castration on lower urinary tract symptoms

The severity of LUTs was measured by using the international prostate symptom score (IPSS) administered before and after surgical castration. Mild LUTs were defined as an IPSS of 1–7, moderate LUTs were defined

as an IPSS of 8–19, and severe LUTs were defined as an IPSS of 20–35. The mean IPSS before surgical castration was 15.1 (95% CI 14.4 to 15.7), which was significantly greater than the score after surgical castration (mean score 8.0, 95% CI 7.4 to 8.6). This represented a decrease of 7.1 (95% CI 6.4 to 7.7, $p<0.001$) in the IPSS after surgical castration (Table 3).

Table 4: shows that there was a decrease in the percentage of participants reporting moderate symptom scores from 79.5% before surgical castration to 27.6% after surgical castration. On the other hand, the proportion of participants reporting mild symptoms increased from 5.7% before surgical castration to 69.1% after surgical castration.

Table 3 Results of the paired sample t-test for comparing lower urinary tract symptoms by IPSS before and after surgical castration

Symptom score	*N*	Mean (95% CI)	*p*- value [a]
Before	210	15.1 (14.4–15.7)	
After	210	8.0 (7.4–8.6)	
Difference	210	7.1 (6.4–7.7	< 0.001

[a] Paired t-test

Table 4 Lower urinary symptoms before and after surgical castration

Lower urinary tract symptoms	Before Surgery (%)	After Surgery (%)
Mild	5.7	69.1
Moderate	79.5	27.6
Severe	14.8	3.3

Table 5 Results of paired sample t-tests for comparisons of bone pain scores before and after surgical castration

Bone pain score	*N*	Mean (95% CI)	*p*-value
Before	210	74.3 (72.4–76.3)	
After	210	34.5 (30.6–38.4)	
Difference	210	39.8 (34.7–44.9)	< 0.001

Duration of bone pain relief following surgical castration

In this study, more than half of the participants, 111 (52.9%) reported symptom relief within the first two weeks (within 8–14 days), and more than one-quarter of the participants, 55 (26.2%) reported symptom relief within the first seven days. (Fig. 1).

Bone pain symptoms before and after surgical castration

Most participants presented with bone pain symptoms such as lower back pain, pelvic pain, lower limb bone pain and isolated hip pain before surgical castration. The mean score for bone pain symptoms before surgical castration was 74.3 (95% CI 72.4 to 76.3), which was significantly greater than the mean score after surgical castration (mean score 34.5, 95% CI 30.6 to 38.4). This represented an absolute decrease of 39.8 (95% CI 34.7 to 44.9, $p<0.001$) in the bone pain score after surgical castration. (Table 5).

The table below shows that there was a decrease in the percentage of participants reporting severe/extreme pain from 79% before surgical castration to 16.7% after surgical castration. On the other hand, the proportion of participants reporting pain-free/mild pain increased from 1.9% before surgical castration to 76.7% after surgical castration. (Table 6)

Distribution assessment of complete bone pain relief by participants' characteristics

Overall, 148 (70.5%) reported having achieved complete pain relief. Table 4 shows that a higher proportion of participants with complete pain relief were observed among those in marital union (77% vs. 53%, $p=0.001$), those residing in Dar es Salaam (84% vs. 55%, $p<0.001$), and among those reporting no history of comorbidities (82% vs. 66%, $p=0.025$). Table 7.

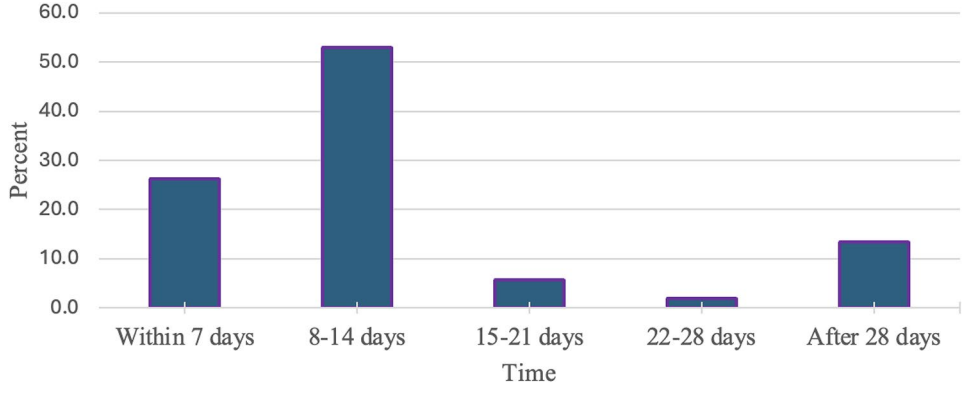

Fig. 1 Distribution of participants by duration of pain relief after surgical castration

Table 6 Shows participants by bone pain before and after surgical castration

Degree of bone pain	Before surgical castration. (%)	After surgical castration. (%)
Pain free/minor	1.9	76.7
Moderate	19.0	6.7
Severe/extreme	79.0	16.7

Factors associated with complete bone pain relief

Table 8 summarizes the results of the logistic regression for the factors associated with complete pain relief. According to the bivariate analysis, being in a marital union (OR 2.91, 95% CI 1.54–5.52, $p=0.001$), having a normal BMI (OR 1.92, 95% CI 1.03–3.61, $p=0.035$), and residing in Dar es Salaam (OR 4.18, 95% CI 2.21–7.90, $p<0.001$) were associated with a greater prevalence of complete pain relief. Furthermore, those who reported a history of any comorbidities had a lower prevalence of complete pain relief (OR 0.43, 95% CI 0.20–0.91; $p=0.028$).

According to the multivariate analysis and after adjusting for pain before surgical castration, two factors (being in marital union and residing in Dar es Salam) were associated with a greater Prevalence of complete bone pain relief. Men in marital union had 30% increased prevalence of bone pain relief compared to those not in marital union (aOR 2.73, 95% CI 1.26–5.89, $p=0.011$). Those residing in Dar es Salaam had a 21% greater prevalence of bone pain relief (aOR 2.28, 95% CI 1.09–4.79, $p=0.030$) compared with those residing outside of Dar es Salaam. On the other hand, participants reporting a history of comorbidities had a 16% lower incidence of experiencing bone pain relief after surgical castration (aOR 0.34, 95% CI 0.13–0.91; $p=0.031$).

Furthermore, participants who experienced severe/extreme bone pain before surgical castration were more than two times more likely to experience pain relief after

Table 7 Shows Distribution of demographic and clinical characteristics by bone pain relief

Variable	Complete relief: *n* (%)	No relief/partial relief: *n* (%)	*p*-value [b]
Total	148 (70)	62 (30)	NA
Age groups			0.459
Below 65	33 (75)	11(25.0)	
65+	115 (69.3)	51(30.7)	
In marital union			< 0.001
Not in marital union	31 (53.4)	27 (46.6)	
Current in marital union	117 (77)	35 (23)	
Secondary+			0.240
Primary or below	80 (74.1)	28 (25.9)	
Secondary+	68 (66.7)	34 (33.3)	
BMI categories			0.120
Underweight	12 (57.1)	9 (42.9)	
Normal	68 (78.2)	19 (21.8)	
Overweight	57 (68.7)	26 (31.3)	
Obese	11 (57.9)	8 (42.1)	
Place of residence			< 0.001
Dar	96 (83.5)	19 (16.5)	
Out of Dar	52 (54.7)	43 (45.3)	
Preoperative risk group			0.482
Low	6 (54.6)	5 (45.4)	
intermediate	19 (73.1)	7 (26.9)	
High	123 (71.1)	50 (28.9)	
Family history of prostate cancer			0.622
No	103 (71.5)	41 (28.5)	
Yes	45 (68.2)	21 (31.8)	
History of any comorbidities			0.025
No	46 (82.1)	10 (17.9)	
Yes	102 (66.2)	52 (33.8)	
PSA Grading			0.062
Low risk/intermediate risk	5 (45.4)	6 (54.6)	
Severe risk	143 (71.9)	56 (28.1)	

[b]Pearson chi-squared test

Table 8 Odds ratios and adjusted odds ratios of complete bone pain relief after surgical castration from logistic regression models

Variable	OR (95% CI)	*p*-value	aOR (95% CI)	*p*-value
Age groups				
Below 65	1.33(0.62–2.84)	0.460		
65+	Ref.	-	Ref.	-
Current in marital union	2.91 (1.54–5.52)	0.001	2.73(1.26–5.89)	< 0.011
Education level				
Primary or below	Ref.	-	Ref.	-
Secondary or higher	0.7(0.39–1.27)	0.240		
Normal BMI	1.92(1 0.03-3.61)	0.042	1.54(0.73–3.25)	0.261
Overweight BMI	Ref	-	Ref	-
Place of residence				
Residing in Dar es Salaam	4.18(2.21–7.90)	< 0.001	2.28(1.09–4.79)	< 0.030
Reported family history of prostate cancer	0.85(0.45–1.60)	0.622		
Had history of any comorbidities	0.43(0.20–0.91)	0.028	0.34(0.13–0.91)	0.031
PSA before Surgical castration				
Mild	Ref.	-	Ref.	-
Moderate	Ref	-	Ref	
Severe	3.06 (0.90-10.45)	0.740		
Preoperative risk before Surgical castration.				
Low risk	Ref.	-	Ref.	-
Intermediate risk	???			
High risk	1.18 (0.55–2.53)	0.669		
Severe bone pain before surgical castration	8.97 (4.27–18.85)	< 0.001	8.32 (3.63–19.1)	< 0.001

OR: (Odds ratio); aOR: (Adjusted Odds ratio)

surgical castration than those with moderate or mild/free pain (aOR 8.32, 95% CI 3.63–19.1, $p<0.001$). Table 7.

Discussion

This study investigated the extent and pattern of symptom relief following surgical castration for patients with advanced prostate cancer. Both irritative and obstructive lower urinary tract symptoms were investigated together with bone pain symptoms before and after surgical castration. The results of this study revealed that several factors play a role in the relief of symptoms. Bone pain relief was common and rapid after surgical castration. Almost 53% of prostate cancer patients reported bone pain symptom relief in the first two weeks. On other hand, the average improvement in IPPS score by 7.1 points after surgical castration was significant in absolute terms, but not large enough for every patient to shift from the severe to moderate category or moderate to mild. The factors that play a role in the relief of symptoms are residence, marital status, history of comorbidities and severe bone pain before surgical castration.

In our study, the mean age of patients who were diagnosed with prostate cancer was 72.3 years, with a standard deviation of 8.8 years; the minimum age was 55 years, and the maximum age was 93 years, which is the same as that reported in a study performed at the Singapore General Hospital, Department of Urology, in which the mean age was 73 years [15].

In our study, 53.8% and 5.2% of advanced prostate cancer patients older than 65 years who underwent surgical castration were found to have hypertension, diabetes, or both with only 4 patients (1.9%) having HIV and were receiving regular medications. A substantial proportion of prostate cancer patients have at least one comorbidity or chronic condition that is distinct from their primary prostate cancer diagnosis.

Previous research in the Surveillance, Epidemiology, and Endpoints Registry (SEER) has shown that being diagnosed with prostate cancer and having a comorbid condition (e.g., diabetes, hypertension, cardiovascular disease) is associated with an increased risk of complications from causes other than prostate cancer and delay symptoms improvements after Androgen deprivation therapy (ADT) [16]. In this study we found that comorbidities such as hypertension and diabetes or cardiovascular diseases cause delay in symptom improvements for patients with advanced prostate cancer after surgical castration.

We also observed 123 patients (71.1%) in high preoperative risk group experienced improvements in bone pain after surgical castration; however, the difference was not statistically significant ($p=0.482$). In the bivariate analysis, we found that a normal BMI was associated with complete bone pain relief (OR 1.20, 95% CI 1.01–1.43, $p=0.035$); however, no association was found in the multivariate analysis.

In this study, we found that the percentage of participants who reported severe bone pain decreased from 79% before surgical castration to 16.7% after surgical castration. On the other hand, the proportion of participants reporting mild pain or pain-free status increased from 1.9% before surgical castration to 76.7% after surgical castration in the bone pain score after surgical castration. This finding is also similar to that of a study performed at Dodoma Tanzania, which revealed a significant improvement in bone pain symptoms in prostate cancer patients (61.1–45.8%, respectively) after surgical castration (p value < 0.001) [17].

Regarding period between castration and beginning of bone pain relief after surgical castration our study revealed that most participants reported to have experienced symptom relief within first two weeks, 111 (52.9%) reporting to have had symptom relief within 8–14 days and more than a quarter, 55 (26.2%) to have had symptom relief within the first seven days; however, more studies should be performed to assess the time interval for bone pain relief after surgical castration.

Additionally, all 12 (5.7%) patients with impending cord compression due to prostate cancer metastasis to the vertebrae and lumbosacral regions reported improvements in bone pain and were able to stand and walk within the first week after surgical castration. This finding was similar to that of a study performed at the University Hospital of South Manchester for patients with obstructive renal failure, impending cord compression and other aggressive symptomatic complications of metastatic disease (pain, pathological fractures, etc.) who underwent surgical castration and reported improvements within seven days [18].

According to a study performed at Saitama Medical Centre in Japan for patients with advanced prostate cancer on ADT for 12 weeks assessing the impact of ADT on LUTs, the IPSS decreased from 11.7 ± 1.6 to 9.3 ± 1.0 ($P < 0.05$) [12]. Our study revealed a decrease in the moderate lower urinary tract (LUT) symptom from 79.5% before surgical castration to 27.6% after 4 weeks following surgical castration. On the other hand, the proportion of participants reporting mild LUTs increased from 5.7% before surgical castration to 69.1% after surgical castration; this difference was statistically significant, with a p value < 000.1. Most patients experienced meaningful LUTS relief after surgical castration, particularly patients with moderate or severe symptoms. This alleviation of LUTS occurred during the first 4 weeks after surgery. We recommend that additional studies be performed to assess the effect of surgical castration on LUTs to determine the efficacy of castration.

Among the factors and predictors influencing the prognosis of advanced prostate cancer patients are marital status, age, and comorbidities. Married and unmarried individuals differ greatly in their lifestyle choices after the diagnosis and treatment of prostate cancer. According to a study performed in Anhui, China, married men have healthier lifestyles after surgery than unmarried men, while smoking and alcohol use are more common among single, divorced, and widowed individuals [19], and physical inactivity is more common among men with inadequate social support [19]. Studies have shown that women often monitor the health behaviour of their family members and ensure that family members play an important role in seeking medical care [20, 21]. Likewise, in a study done in Holden Comprehensive Cancer Centre, Iowa, USA found that higher age and history of comorbidities such as diabetes, hypertension are associated with poor prognosis after surgery [22]. Our study revealed several factors associated with bone pain relief. Compared with those who did not experience marital union, married patients who lived with their family and relatives had a 30% greater incidence of bone pain relief after surgical castration (aOR 1.30, 95% CI 1.04–1.64, $p = 0.024$). This finding was similar to that of a study in China, which showed postoperative improvements in men who were married (HR: 0.648; $P < 0.001$) [19].

In our study, we observed that patients from Dar es Salaam region, where the hospital is located, had a 21% greater prevalence of bone pain relief (aOR 2.28, 95% CI 1.09-4.79, $p = 0.030$). These patients generally had stronger social support systems compared to those traveling from more distant regions, many of whom arrived with minimal support. We hypothesize that proximity to the hospital allowed patients to access timely follow-ups and medical care in case of complications, which likely contributed to better outcomes. Additionally, many patients from distant areas faced financial hardships, making it more challenging to attend follow-up appointments or seek immediate care when needed.

Love, hope, and faith are considered important motivators in the lives of prostate cancer patients for better prognosis and postoperative improvements [19]. With the support of their spouse and the responsibility of their family, prostate cancer patients can regain their hope in life, and with the encouragement of their spouses, they can take active coping measures and listen to the advice of specialists for active treatment [19]. Patients below 65 years were not found to have bone pain relief compared to patients above 65 years (aOR 1.08,95% CI 0.89–1.32; $P < 0.434$). This is contrary to many studies which have revealed positive association of lower age and bone pain improvements [15, 23].

This study provides valuable insights into the extent and pattern of symptom relief for patients with advanced prostate cancer treated by surgical castration. These findings suggest that surgical castration influences improvement on bone pain and urinary symptoms. It is evident

that most of patients reported a decrease in moderate lower urinary symptoms to mild lower urinary symptoms within a month after surgical castration and improvement in bone pain alleviation within the first and second weeks.

Conclusion

Our observations in this study indicate that surgical castration significantly alleviates both bone pain and lower urinary tract symptoms in patients with advanced prostate cancer. The rapid relief from severe symptoms highlights the potential of surgical castration to improve quality of life in patients with advanced stages of the disease. Patients in the low-risk group had a favourable prognosis with a lower likelihood of disease progression and metastasis. The intermediate-risk group included patients with a moderate risk of disease progression, requiring closer monitoring and possibly more aggressive treatment than the low-risk group. High-risk patients had a higher likelihood of disease progression and metastasis, necessitating aggressive treatment and close follow-up. Further research is warranted to evaluate the duration of bone pain relief following surgical castration and to explore its long-term impact on overall survival and disease progression. Investigating the comparative effectiveness of surgical castration against other treatment modalities could also provide valuable insights into optimizing management strategies for advanced prostate cancer.

Study strengths and limitations

Our study had several limitations. First, it was performed at a single center with a relatively small number of patients, which may limit the generalizability of our findings. A larger, multicenter study would help validate these results across diverse populations. Second, we did not investigate objective parameters for assessing the degree of lower urinary tract symptoms (LUTS), such as urodynamic studies or bladder diaries, which could provide a more comprehensive evaluation of symptom severity.

Despite these limitations, our results suggest an optimal duration for achieving maximal alleviation of LUTS in patients with moderate to severe symptoms, potentially guiding the timing of neoadjuvant androgen deprivation therapy (ADT) before brachytherapy or external beam radiotherapy for patients with metastatic prostate cancer. Furthermore, to the best of our knowledge, this is the first study to document an association between the duration of bone pain alleviation and surgical castration, highlighting the need for further research to confirm these findings in larger cohorts.

Abbreviations

ADT	Androgen Deprivation Therapy
AR	Androgen Receptor
BTO	Bilateral Total Orchiectomy
CLBP	Chronic Lower Back Pain
GnRH	Gonadotropin Releasing Hormone
LUTs	Lower Urinary Tract Symptoms
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
PCA	Prostate Cancer
IPSS	International Prostate Symptom Score
ISUP	International Society of Urological Pathologists

Acknowledgements

We would like to express our sincere gratitude to the D43 research team for their unwavering support throughout this project. We are also deeply thankful to Prof. Katherine Van Loon from UCSF for her invaluable technical guidance, which was instrumental in the successful completion and publication of this work.

Author contributions

The principal investigator prepared the full text article of this article, and all other authors reviewed and contributed their expert opinions. C.N had access to entire data in this study, he took full responsibility for data integrity and ensured the accuracy of data analysis. Concept and Design: CN and CMAcquisition, analysis, and interpretation of data: AP, AADrafting of Manuscript: CN and CMCritical revision of the manuscript for intellectual content: CN, VS and CM Statistical Analysis: FM, ON, AM&AP.Administrative, technical, or material support: C N & AM.Supervision: CM, ON, FM, KN & VS. All authors approved the final draft of the manuscript for publication.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability

All materials pertinent to this research are available and will be provided by the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the IRB of Muhimbili University of Health and Allied Sciences REF: MUHAS-REC-09-20231916. All methods were carried out in accordance with relevant guidelines and regulations. All participants signed informed consent for participation in the study and provided their information for use in this research.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 13 August 2024 / Accepted: 7 October 2024
Published online: 16 October 2024

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