Clinical management outcomes and associated factors among prostate cancer patients receiving follow-up care at Kakamega county general teaching and referral hospital, Kenya

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ABSTRACT

At Kakamega County General Teaching and Referral Hospital, [KCGTRH] 245 of 375 prostate cancer patients— 65.3% — arrived with Stage IV metastatic disease. That single figure frames what this study documents: a cascade from late presentation through constrained treatment to outcomes bounded by palliation rather than cure. PSA screening uptake among eligible Kenyan men is estimated at under 5%, and most men in Western Kenya do not reach specialist care until symptoms have persisted for months. This study examined clinical management outcomes for prostate cancer patients attending follow-up care at KCGTRH between April 2024 and April 2025, drawing on 375 histologically confirmed records and key informant interviews with healthcare providers. Two frameworks guided the analysis: the Donabedian Structure–Process–Outcome (SPO) Model and the Chronic Care Model. Quantitative data were analyzed with SPSS; qualitative interviews were coded thematically through NVivo. Hormonal therapy was near-universal: 95.5% of patients received androgen deprivation therapy (ADT), and radical prostatectomy was entirely absent from the treatment record. Combination ADT plus docetaxel was used in 31.5% of patients. PSA declined in 54.1%; 76.5% achieved improved symptom control. Complete remission occurred in 2.4% of cases. Median event-free survival was 18.2 months (95% CI 15.6–20.8). Combination therapy and sustained ADT adherence independently predicted better outcomes. Bone pain, anaemia, and fatigue were the most common complications. Stage IV disease and metastatic spread were independently associated with shorter event-free survival. Age, rural residence, and educational attainment did not significantly alter outcomes — a finding that points to health-system barriers, not individual characteristics, as the dominant prognostic force. Most men at KCGTRH arrive too late for cure. The 2.4% complete remission rate and 18.2-month median event-free survival simultaneously mark an achievement and a gap. Community-based PSA screening, shorter referral pathways, expanded chemotherapy access, and radiotherapy installation at county level are the most direct responses. Within current infrastructure, the evidence supports prioritising combination ADT–docetaxel protocols and structured adherence support as the most attainable route to better outcomes for men already in the system.

Keywords: Clinical Management; Kenya; Palliative Care; Prostate Cancer; Resource-Limited Settings; Treatment Outcomes

I. INTRODUCTION

The 2020 Global cancer [GLOBOCAN] report counted 19.3 million new cancer diagnoses and 10.0 million cancer deaths worldwide — second only to cardiovascular disease as a cause of global mortality (Sung et al., 2021). By 2030, projections put annual incidence at 23.8 million new cases and deaths at 13 million, driven primarily by population ageing and urbanisation (Lin & Zhi, 2025). The aggregate figures mask sharp geographic divergence. In Africa, cervical, breast, liver, and prostate cancers — together with infection-related malignancies such as Kaposi's sarcoma — account for a disproportionate share of the burden (World Health Organization [WHO], 2023). Weak screening infrastructure, constrained diagnostic capacity, and inadequate treatment resources mean that cancer is routinely undetected until it is far advanced. Limited oncology financing and a shortage of trained specialists extend that delay further; curative treatment is realistically available to only a minority (Ugwu et al., 2026).

Prostate cancer is the second most commonly diagnosed cancer and the fifth leading cause of cancer death in men globally. In 2020, approximately 1.4 million new cases were recorded worldwide, with 375,000 associated deaths (Ugwu et al., 2026). Incidence is highest in developed nations where PSA-based screening is routine. Mortality follows a different distribution: the Caribbean and sub-Saharan Africa carry the heaviest per-capita death burden (Greenberg & Washington, 2021). That gap between where incidence is concentrated and where deaths occur reflects what is available in each setting. In sub-Saharan Africa, men frequently present with locally advanced or metastatic disease: community awareness is low, organised screening barely exists, sociocultural barriers suppress help-seeking, and specialist

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oncology services sit predominantly in major urban centres (Kania et al., 2023). By the time most men reach a facility capable of definitive diagnosis, the window for curative intervention has already closed.

Kenya's cancer profile reflects these regional dynamics. Prostate cancer stands as one of the most prevalent malignancies among Kenyan men, and its incidence has risen steadily over the past decade. Despite this, PSA screening uptake among eligible men remains critically low — estimated at 1.3% to 4.3% (Shanko et al., 2022; Mbugua et al., 2021). Financial barriers, geographic distance to health facilities, social stigma, and limited public awareness all suppress help-seeking. The practical result is that most patients arrive at health facilities with advanced disease, and treatment goals shift from cure to palliation. Kenya's tiered referral health system places county general hospitals at a pivotal position: they are the main nodes at which complex cancer care is attempted outside of national referral centres, yet they often function with constrained specialist workforces, interrupted medicine supplies, and limited diagnostic and imaging capacity. This structural reality shapes what is possible at the point of care.

KCGTRH sits in Kakamega County, Western Kenya — one of the most densely populated counties in the country. The hospital functions as the primary referral facility for several surrounding counties, including Vihiga, Bungoma, and Trans-Nzoia, drawing a large and predominantly rural catchment population. Its oncology clinic offers histopathological diagnosis, hormonal therapy, chemotherapy administration, follow-up care, and palliative support. Notably, the hospital lacks on-site radiotherapy capacity; patients requiring external beam radiotherapy (EBRT) must be referred to Moi Teaching and Referral Hospital in Eldoret or to Kenyatta National Hospital in Nairobi — a journey that imposes substantial financial, logistical, and time costs on patients and their families. Understanding clinical outcomes at KCGTRH is therefore directly relevant to resource allocation decisions, workforce planning, and service delivery reform at both the county and national levels.

Clinical management of prostate cancer draws on a range of modalities: radical prostatectomy, radiotherapy, androgen deprivation therapy (ADT), chemotherapy, immunotherapy, targeted agents, and palliative care. Treatment selection is guided by disease stage, tumour biology, patient performance status, comorbidities, and available infrastructure (Sung et al., 2026). Advances in systemic therapy have extended survival and improved quality of life in high-income settings, but outcomes across Africa remain markedly poorer, shaped primarily by the stage at which disease is first treated (Kania et al., 2023). Kenyan research has concentrated predominantly on screening uptake, risk factors, and disease prevalence. Rigorous data on clinical management outcomes at county referral hospital level — where a large fraction of the country's cancer patients receive care — remain scarce. Without context-specific evidence on which modalities are being used and what outcomes they produce, investment decisions at county level rest on weak ground. This study reports clinical management outcomes among prostate cancer patients attending KCGTRH and examines the variables associated with those outcomes.

1.1 Research Objective

To evaluate the Clinical Management Outcomes and Associated Factors Among Prostate Cancer Patients Receiving Follow-Up Care at Kakamega County General Teaching and Referral Hospital, Kenya

1.2 Specific Objectives

1. To determine the clinical management outcome of prostate cancer at Kakamega County General Teaching and Referral Hospital.
2. To analyze the outcomes of the clinical management strategies for prostate cancer patients at Kakamega County General Teaching and Referral Hospital.
3. To assess the factors influencing the clinical management outcomes for prostate cancer patients at Kakamega County General Teaching and Referral Hospital.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Donabedian Structure–Process–Outcome Model

The Donabedian Structure–Process–Outcome (SPO) Model frames this study's conceptual approach to evaluating health system performance. Donabedian (1988) proposed that health outcomes are not random but are systematically determined by two upstream dimensions: the structures within which care is delivered, and the processes through which care is enacted. Structure encompasses physical infrastructure, diagnostic and treatment equipment, staffing, and accessibility. Process includes the diagnostic decisions, treatment protocols, monitoring strategies, and follow-up practices applied to each patient. Outcome — the dimension of primary interest here — covers survival, disease progression, symptom burden, and quality of life.

Applied to prostate cancer management, the SPO framework predicts that structural deficits translate directly into process limitations, which in turn produce worse outcomes. This is not merely theoretical at KCGTRH: the absence of on-site radiotherapy, delays in histopathological services, and a limited oncology specialist cadre are structural

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features that constrain the processes of care that clinicians can realistically offer. A patient who requires combined ADT and external beam radiotherapy as standard of care cannot receive that combination if radiotherapy is unavailable without a six- to nine-month referral wait. The framework provides a principled basis for identifying where system investments are most likely to translate into measurable improvements in patient outcomes.

2.1.2 Chronic Care Model

The Chronic Care Model (CCM) addresses long-term disease management with an emphasis on patient-centeredness, self-management support, clinical decision-making tools, integrated delivery systems, and sustained follow-up. Prostate cancer, particularly in advanced stages where the disease becomes a chronic condition managed over years, fits squarely within the CCM's scope (Jalloh et al, 2023). Effective long-term management requires medication adherence, regular monitoring, symptom control, and coordinated interdisciplinary care — all dimensions the CCM is designed to optimize.

Critically, the CCM recognizes that health outcomes are not solely a product of clinical interventions. The organization of the care system, availability of community resources, and the degree to which patients are supported to engage actively in their own care each play determinative roles. At KCGTRH, applying a CCM lens reveals structural gaps: fragmented care pathways, insufficient patient self-management education, and limited connections between hospital-based oncology care and community-level health workers. These gaps translate into missed adherence opportunities and deteriorating functional status between clinic visits — patterns that contribute directly to the suboptimal outcomes documented in this study.

2.2 Empirical Review

2.2.1 Clinical Management Approaches for Prostate Cancer

Prostate cancer management draws on a spectrum of modalities, matched to disease risk group, stage, patient performance status, and available resources. Radical prostatectomy and radiotherapy offer curative intent in localized and selected locally advanced disease; ADT addresses androgen-sensitive advanced disease; chemotherapy with docetaxel targets fit patients with metastatic hormone-sensitive disease; and palliative care underpins management at every stage where symptoms require attention.

Evidence clearly favors multimodal approaches for high-risk and locally advanced disease. Roldán et al. (2024) reported that patients with locally advanced prostate cancer treated with combined modality strategies — pairing hormonal therapy with either surgery or radiotherapy — achieved better long-term oncological outcomes than those managed with single-modality treatment, including lower rates of biochemical recurrence and superior disease-specific survival. Di Terlizzi and Bossi (2022) reached consistent conclusions in a European cohort, characterizing combination approaches as the cornerstone of management for high-risk locally advanced disease and demonstrating their consistent superiority over monotherapy in terms of disease control and survival. These findings establish the evidence-based benchmark against which the predominantly monotherapy environment at KCGTRH must be measured.

The STAMPEDE trial transformed the management of metastatic hormone-sensitive prostate cancer. James et al. (2016) demonstrated that adding docetaxel to long-term androgen deprivation therapy significantly extended overall survival in this population, reshaping international clinical guidelines and establishing ADT plus docetaxel as the recommended standard of care. Adopting this evidence in resource-limited settings requires cytotoxic agents, chemotherapy administration infrastructure, skilled nursing, and toxicity monitoring capacity — all of which remain variable or limited across sub-Saharan African county hospitals.

Treatment realities in sub-Saharan Africa diverge sharply from the multimodal ideal. Degu et al. (2022) documented that treatment decisions across the region are predominantly resource-driven rather than guideline-driven: hormonal therapy predominates because patients present with advanced, often incurable disease, while curative procedures are applied in only a minority of cases owing to delayed diagnosis and inadequate oncology infrastructure. Kania et al. (2023) confirmed this picture in a systematic review of treatment approaches across the region, finding that most men received primary ADT — most frequently through bilateral surgical orchiectomy — as first-line management, with very few receiving curative-intent multimodal therapy. Radiotherapy facility shortages, limited oncologist availability, and interrupted medicine supply chains compound the structural barriers that drive this pattern.

2.2.2 Outcomes of Clinical Management of Prostate Cancer

Clinical outcomes in prostate cancer management are tracked through multiple domains: overall survival, progression-free survival, biochemical response (PSA decline), disease stabilization, symptom control, quality of life, and treatment-related complications. In high-income settings, where localized disease is common and multimodal treatment is routinely available, five-year survival for localized prostate cancer typically exceeds 95%. The contrast with sub-Saharan Africa is stark.

Seraphin et al. (2021) examined prostate cancer presentation, patterns of care, and outcomes across multiple countries in the region using population-based cancer registry data. Widespread advanced-stage presentation, markedly

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elevated PSA values at diagnosis, and predominantly metastatic disease characterized the study populations. The authors concluded that treatment in most settings was oriented towards symptom control, disease stabilization, and quality-of-life maintenance rather than cure — a consequence of the structural and diagnostic failures that precede any treatment decision. In a companion analysis, Seraphin et al. (2021b) identified age, disease stage at diagnosis, and the human development index of the treating country as independent predictors of prostate cancer survival across the region, illuminating the role of broader socioeconomic context in shaping oncological outcomes.

Kenyan data reinforce these regional trends. A substantial proportion of men diagnosed with prostate cancer in Kenya present with aggressive, high-grade tumors and markedly elevated PSA levels, and studies have found significant correlations between tumor aggressiveness and PSA magnitude — underlining the potential impact of earlier detection and treatment initiation on clinical trajectories.

Quality-of-life (QoL) assessment represents an important and often under-utilized dimension of clinical outcomes evaluation, particularly in settings where most disease is incurable and the primary treatment goal is preserving patient function and relieving suffering. Validated patient-reported outcome instruments — including the Functional Assessment of Cancer Therapy – Prostate (FACT-P) and the EORTC QLQ-PR25 — capture multiple symptom domains in a standardized, comparable format. These tools are gaining traction in African oncology research as they provide patient-centered evidence that complements purely clinical endpoints.

2.2.3 Factors Influencing Clinical Management Outcomes

Disease stage at diagnosis is the most consistently documented predictor of prostate cancer outcomes. Across the African literature, advanced-stage presentation is associated with worse prognosis, reduced survival, and greater complication burden (Jalloh et al., 2023). Patients with localized disease who receive appropriate treatment achieve substantially better survival and functional outcomes than those with advanced or metastatic disease. In much of Africa, bone, lymph node, and visceral metastases are present at diagnosis in a large proportion of men, who delay care-seeking until symptoms become severe enough to be disabling. Bosland et al. (2023) catalogued the systemic factors perpetuating this delay — limited PSA testing infrastructure at primary facilities, absent community health worker involvement in cancer awareness campaigns, and geographic barriers to specialist services — and argued that addressing these upstream determinants is as important as improving treatment at the hospital level.

Beyond disease stage, several other factors modulate outcomes. Timely treatment initiation and sustained adherence to hormonal therapy each independently predict better clinical results; delays between diagnosis and therapy have been shown to worsen prognosis and undermine treatment efficacy in prostate cancer patients across sub-Saharan Africa. Broader health system factors — including medicine supply, staffing levels, referral system functionality, and the availability of structured follow-up — further condition what any individual patient experiences. Recent reviews consistently flag inadequate oncology infrastructure as the central systemic barrier to improving prostate cancer outcomes across the continent (Kania et al., 2023; Jalloh et al., 2023).

2.2.4 Palliative Care in Prostate Cancer Management

In settings where curative treatment is inaccessible to most patients, palliative care is not a secondary concern — it is the primary framework within which the majority of prostate cancer management takes place. Effective palliative management of advanced prostate cancer encompasses WHO analgesic ladder–based pain management, treatment of urinary obstruction, nutritional support, psychological counseling, and structured family caregiver support. Evidence from sub-Saharan Africa consistently demonstrates that integrating palliative care early — from the point of diagnosis rather than at end of life — is associated with better symptom control, improved quality of life, and reduced emergency presentations (Bosland et al., 2023).

Palliative care capacity at the county hospital level in Kenya remains severely underdeveloped. Gaps include limited training among oncology nurses in palliative assessment and prescribing, irregular supply of oral morphine and other essential palliative medicines, and inadequate psychosocial support and bereavement services. These shortfalls are not peripheral: they directly shape the day-to-day experience of the majority of prostate cancer patients who present at an incurable stage. Closing them represents a concrete, achievable target for system improvement that would yield immediate patient benefit.

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III. METHODOLOGY

3.1 Study Design

This study adopted a cross-sectional analytical design embedded within a mixed-methods framework, integrating quantitative record review with qualitative provider interviews. The quantitative component generated measurable clinical and demographic data on patient outcomes and treatment patterns; the qualitative component captured healthcare provider perspectives on care delivery, system constraints, and contextual factors shaping outcomes. Triangulating findings across these two data streams strengthened interpretive validity, enabling convergent analysis of patterns identified in patient records and themes emerging from provider experience.

3.2 Study Setting

The study was conducted at Kakamega County General Teaching and Referral Hospital (KCGTRH), located in Kakamega County, Western Kenya. KCGTRH functions as the main regional referral hospital for several surrounding counties — Vihiga, Bungoma, and Trans-Nzoia — serving a large, predominantly rural catchment population. The hospital's oncology department offers histopathological diagnosis, hormonal therapy, chemotherapy administration, and palliative care. Critically, KCGTRH has no on-site radiotherapy unit; patients requiring EBRT must be referred to either Moi Teaching and Referral Hospital (Eldoret) or Kenyatta National Hospital (Nairobi), both of which are distant from most patients' homes. This referral gap imposes substantial delays and costs, and it directly influences both treatment patterns and outcomes at the facility.

3.3 Study Population

The quantitative study population comprised all patients with histologically confirmed prostate cancer attending the KCGTRH oncology clinic during the study period, April 2024 to April 2025. Requiring histological confirmation ensured diagnostic accuracy and excluded cases managed purely on the basis of elevated PSA without tissue diagnosis — a precaution relevant in lower-resource settings where empirical management sometimes occurs. The qualitative study population comprised KCGTRH healthcare professionals actively involved in prostate cancer diagnosis, treatment, and follow-up, including oncologists, clinical officers, nurses, and oncology support staff.

3.4 Eligibility Criteria

Inclusion Criteria:

- Histologically confirmed prostate cancer diagnosis
- At least six months of follow-up care received at KCGTRH during the study period
- For the qualitative component: healthcare professionals directly involved in prostate cancer patient management at KCGTRH

Exclusion Criteria:

- Incomplete or inaccessible medical records
- Patients with a concurrent separate primary cancer diagnosis

3.5 Sampling Technique and Sample Size

A census sampling approach was used for the quantitative component, incorporating all eligible patient records meeting the inclusion criteria within the study window. This approach ensured comprehensive data capture, minimized selection bias, and maximized statistical power for subgroup and multivariable analyses. The final quantitative sample comprised 375 patient records. For the qualitative component, purposive sampling was used to select healthcare providers with direct prostate cancer management experience. Key informant interviews continued until thematic saturation was achieved — the point at which additional interviews generated no new themes or categories in the data.

3.6 Data Collection

3.6.1 Quantitative Data Collection

Quantitative data were extracted from patient medical records using a structured data abstraction tool developed by the research team and pilot-tested on twenty records before the main data collection phase began. The tool captured sociodemographic variables (age, sex, residence, and education), disease characteristics (clinical stage at diagnosis, PSA level at presentation, Gleason score, presence of metastases, comorbidity status), treatment modalities received, treatment-related complications, and clinical outcome indicators including PSA response, symptom status, disease stabilization at twelve months, and survival status at last follow-up. Where available, quality-of-life data were extracted from documented FACT-P and EORTC QLQ-C30 plus QLQ-PR25 assessments. Baseline functional status was characterized using the Eastern Cooperative Oncology Group (ECOG) performance status scale, a validated instrument widely employed in oncology research across sub-Saharan Africa.

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3.6.2 Qualitative Data Collection

Semi-structured key informant interviews gathered qualitative data from KCGTRH healthcare professionals. The interview guide was developed from the study's theoretical frameworks and the existing literature on prostate cancer care in resource-limited settings; it addressed current clinical management practices, perceived barriers to optimal care, health system challenges, and provider experiences with patient outcomes. Interviews were audio-recorded following written informed consent and supplemented with field notes taken during each session. Recordings were transcribed verbatim within 48 hours. Data collection continued until the research team confirmed thematic saturation through iterative transcript review.

3.7 Data Analysis

Quantitative data were analyzed using SPSS version 22. Descriptive statistics — frequencies, percentages, means, and standard deviations — characterized patient sociodemographic and clinical profiles. Chi-square tests assessed associations between categorical variables. Binary logistic regression identified independent predictors of clinical outcomes including PSA response, symptom improvement, and disease stabilization. Cox proportional hazards regression examined factors associated with event-free survival, with time calculated from diagnosis to the first recorded event (disease progression, treatment failure, or death) or to last follow-up for censored observations. The proportional hazards assumption was tested using Schoenfeld residuals. Statistical significance was set at $p < 0.05$ for all analyses, and 95% confidence intervals accompanied all effect estimates.

Qualitative transcripts were analyzed thematically in NVivo version 12. Coding proceeded in two rounds: an open-coding phase identified preliminary categories; focused coding refined and consolidated these into final themes. Themes related to clinical management practices, health system constraints, and perceived determinants of outcomes were developed through iterative team discussion. Quantitative and qualitative findings were integrated through triangulation to strengthen the overall interpretation of study results.

3.8 Ethical Considerations

Ethical approval was granted by the Masinde Muliro University of Science and Technology Institutional Scientific Ethics Review Committee (MMUST ISERC) (Approval No.: MMUST/ISERC/044/2025). Administrative permission was granted by KCGTRH, and a research permit was issued by the National Commission for Science, Technology and Innovation (NACOSTI) (Permit No.: NACOSTI/P/25/4172709). All healthcare provider participants provided written informed consent prior to interviews, and participation was entirely voluntary; participants were explicitly informed of their right to withdraw at any time without consequence. Patient records used for data abstraction were de-identified through unique study codes; no personal identifiers were collected or retained. All study data were stored securely with access restricted to the research team, in accordance with the Declaration of Helsinki and applicable national and institutional research governance guidelines.

IV. FINDINGS AND DISCUSSION

4.1 Patient Characteristics (n = 375)

The 375 participants had a mean age of 68.4 ± 9.2 years and were drawn predominantly from the rural sub-counties served by KCGTRH. Table 1 summarises the sociodemographic, clinical, and disease-related profile of the full cohort.

Table 1

Sociodemographic and clinical characteristics of participants

Variable	n (%) or Mean ± SD
Age (years)	68.4 ± 9.2
Rural residence	312 (83.2%)
ECOG ≥2 at baseline	198 (52.8%)
Stage at diagnosis: I–II (localized)	41 (10.9%)
Stage at diagnosis: III (locally advanced)	89 (23.7%)
Stage at diagnosis: IV (metastatic)	245 (65.3%)
Median baseline PSA (ng/mL)	186.5 (IQR: 94–312)
Gleason score ≥8	217 (57.9%)
Comorbidities (≥1)	289 (77.1%)

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A mean age of 68.4 years aligns with the typical age of prostate cancer presentation among East African men. The high proportion of rural residents (83.2%) reflects the predominantly agricultural hinterland that KCGTRH serves. Over half the cohort presented with an ECOG performance status ≥2 — meaning significant functional impairment was already established at the point of entry into the hospital's oncology pathway. This baseline functional profile narrows the range of systemic therapies that can be safely administered and signals a patient population that has lived with symptomatic disease for a considerable time before reaching specialist care.

4.2 Treatment Patterns

Androgen deprivation therapy was by far the most frequently used treatment modality, received by 358 of 375 patients (95.5%). Table 2 sets out the full distribution of treatment approaches.

Table 2

Treatment patterns among prostate cancer patients

Treatment Modality	n (%)
Androgen-deprivation therapy (ADT)	358 (95.5%)
Bilateral surgical orchiectomy	212 (56.5%)
GnRH agonists	146 (38.9%)
Docetaxel chemotherapy	124 (33.1%)
Palliative radiotherapy through external referral	28 (7.5%)
Radical prostatectomy	0 (0.0%)
Combination therapy: ADT plus chemotherapy	118 (31.5%)

ADT was nearly universal (95.5%), while radical prostatectomy was entirely absent from the treatment record. Bilateral surgical orchiectomy predominated over GnRH agonists as the ADT delivery mechanism (56.5% vs. 38.9%), almost certainly reflecting its lower cost and the logistical simplicity of a one-time procedure compared to repeated injections requiring cold-chain storage. The low rate of palliative EBRT (7.5%) reflects not clinical disinterest but the structural barrier imposed by the absence of on-site radiotherapy and the formidable challenges of referral to Nairobi or Eldoret for patients with limited resources and deteriorating functional status.

4.3 Clinical Outcomes

Table 3

Clinical outcomes and treatment-related complications

Outcome	n (%) or Mean ± SD
PSA response (≥50% decline at 6 months)	203 (54.1%)
Symptom improvement (pain/fatigue/urinary)	287 (76.5%)
Disease stabilization (no progression at 12 months)	194 (51.7%)
Complete remission (PSA <0.2 + imaging negative)	9 (2.4%)
Pathological fractures	67 (17.9%)
Spinal cord compression	23 (6.1%)
Severe anemia (Hb < 8 g/dL)	89 (23.7%)
Median event-free survival	18.2 months (95% CI: 15.6–20.8)

A PSA response rate of 54.1% — defined as a decline of ≥50% by six months — confirms that hormonal therapy produced meaningful biochemical control in the majority of patients who received it. The symptom improvement rate of 76.5% is particularly important in this clinical context: three-quarters of patients experienced meaningful relief of pain, fatigue, or urinary symptoms despite the predominantly incurable nature of their disease. Complete remission, at 2.4%, was exceptional — reflecting a cohort in which curative-intent multimodal therapy was essentially unavailable. The median event-free survival of 18.2 months (95% CI: 15.6–20.8) contextualizes the human cost of late presentation and limited treatment options.

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4.4 Predictors of Outcomes (Multivariable Analysis)

Table 4

Multivariable predictors of clinical outcomes

Factor	Adjusted OR/HR (95% CI)	p-value
Stage IV vs. I–II (for poor EFS)	HR = 2.31 (1.74–3.06)	<0.001
Metastasis present	HR = 1.89 (1.42–2.51)	<0.001
PSA response (≥50%)	HR = 0.54 (0.39–0.75)	0.001
Combination therapy (symptom control)	OR = 2.17 (1.34–3.52)	0.012
Adherence to ADT (stabilization)	OR = 1.93 (1.21–3.08)	0.006
Age, residence, education	NS	>0.05

Stage IV disease carried a hazard ratio of 2.31 for poor event-free survival relative to localized disease; metastatic spread independently nearly doubled the risk of an early adverse event. PSA response of ≥50% was strongly protective (HR = 0.54), consistent with established evidence that early biochemical response is a valid surrogate for treatment benefit in hormone-sensitive disease. Combination therapy with docetaxel was significantly associated with better symptom control (OR = 2.17, p = 0.012), reinforcing the clinical relevance of the STAMPEDE trial's findings for this population. Age, rural residence, and education level did not independently predict outcomes — a finding that shifts prognostic attribution from patient characteristics to health system and disease-level factors.

4.5 Qualitative Themes

Four major themes emerged from key informant interviews with healthcare providers at KCGTRH.

Theme 1: "We treat what we can, not what we should."

Providers consistently described ADT as the default treatment not by clinical preference but by necessity. One oncologist captured the structural bind directly: "A patient with T3N1M0 could benefit from EBRT combined with ADT — but the waiting time for Nairobi is 6 to 9 months. By then, the disease has progressed significantly." This narrative illustrates how structural deficits translate into clinical compromises — precisely the causal chain that the Donabedian SPO framework predicts.

Theme 2: Palliative care as core, not adjunct.

Nursing staff emphasized the centrality of palliative care from the earliest point of contact. "Palliation begins at diagnosis here — not at the end. If we wait until a man cannot walk to start morphine and emotional support, we have already failed him," stated one palliative care nurse. This represents a de facto early palliative care model driven by clinical necessity rather than formal protocol — one that aligns with emerging global evidence on the survival and quality-of-life benefits of early integration (Bosland et al., 2023).

Theme 3: Delays from primary facilities.

Clinical officers highlighted severe deficiencies in prostate cancer recognition at lower levels of care. "Men arrive with persistent back pain or urinary retention — already with vertebral fractures from metastatic disease. They have been treated for back pain at the dispensary for six months before anyone thinks of prostate cancer," explained one clinical officer. Absent PSA testing capacity and limited clinical training in prostate cancer recognition at dispensary and health centre level perpetuate the late-presentation pattern.

Theme 4: Finding meaning in limited victories.

Despite the systemic constraints, providers described genuine clinical satisfaction in achieving symptom relief and functional restoration. "When a man walks again after morphine and ADT — that is success for us. We celebrate small victories every day," reflected one clinician. This adaptation of clinical success metrics — from disease-free survival to quality-of-life improvement — represents the pragmatic professional response to an environment where cure is rarely achievable.

4.6 Discussion

4.6.1 Disease Burden and Stage at Presentation

Across the 375 participants, 334 (89.1%) had stage III or IV disease at diagnosis. Stage IV alone accounted for 65.3% of cases, 57.9% of patients had a Gleason score of ≥8, and the median baseline PSA of 186.5 ng/mL was profoundly elevated — together constituting a clinical picture of advanced, aggressive, often metastatic disease as the dominant reality in this cohort.

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The literature from comparable sub-Saharan settings maps the same reality. Seraphin et al. (2021) drew on multicountry cancer registry data to show that advanced-stage disease predominates across the region, with very few patients presenting with localised, curable disease; advanced-stage presentation was the primary driver of poor survival in their analysis. Degu et al. (2022) reached consistent conclusions from a systematic review: advanced disease at presentation is not an outlier in African prostate cancer care — it is the norm, foreclosing curative treatment before any therapeutic choice is made. At KCGTRH, the structural backdrop explains much of this. The Donabedian SPO framework makes the mechanism visible: no on-site radiotherapy, limited surgical oncology, absent community screening — structural gaps that determine what processes of care are possible, and therefore what outcomes are achievable.

4.6.2 Treatment Patterns and Clinical Efficacy

The dominant role of hormonal therapy — particularly bilateral surgical orchiectomy — reflects resource constraints as much as clinical reasoning. Advanced disease that precludes curative surgery combined with the unavailability of on-site radiotherapy leaves ADT as the primary accessible treatment for the majority of patients, a pattern consistent with findings across sub-Saharan Africa (Degu et al., 2022; Kania et al., 2023). The PSA response rate of 54% and symptom improvement rate of 76% are meaningful outcomes within this context: they demonstrate that hormonal therapy delivers real clinical benefit for most patients and justify continued investment in ADT access and adherence support. For oncology planning in LMICs, this finding carries a direct implication — substantial clinical value is attainable with existing resources.

The ADT plus docetaxel subgroup showed significantly superior symptom control (OR = 2.17, p = 0.012), mirroring the STAMPEDE trial results (James et al., 2016). This reinforces the feasibility and clinical case for implementing ADT–docetaxel combination protocols at county hospital level where chemotherapy administration infrastructure and safety monitoring are in place. The complete remission rate of just 2.4% and median event-free survival of 18.2 months, however, mark the ceiling imposed by predominantly metastatic disease managed without curative-intent multimodal therapy. Roldán et al. (2024) reported substantially better long-term oncological outcomes in settings where multimodal therapy was delivered with adequate infrastructure support, quantifying the opportunity cost of the treatment gaps at KCGTRH.

4.6.3 Predictors of Clinical Outcomes

Disease stage and metastatic status dominated the multivariable analysis as predictors of event-free survival, consistent with the international literature identifying stage at diagnosis as the primary determinant of prostate cancer outcomes globally. The non-significance of age, rural residence, and educational attainment as outcome predictors is notable: it suggests that individual patient characteristics matter far less than system-level factors — late presentation driven by inadequate screening, limited primary care capacity, and restricted access to specialist services. Addressing those system-level determinants therefore offers greater population benefit than any intervention targeted at individual patient behaviour alone.

Treatment adherence to ADT emerged as a significant predictor of disease stabilization (OR = 1.93, p = 0.006). In environments where patients contend with financial hardship, long travel distances to facilities, and social stigma, maintaining long-term adherence to hormonal therapy requires active, structured support. Community-based outreach, patient education programs, mobile appointment reminders, and adherence counselling are practical components of such support (Bosland et al., 2023) that can be implemented at county hospital level without requiring major capital investment.

4.6.4 Systemic Drivers of Late Presentation

The qualitative findings provide essential interpretive context for the quantitative results. Provider narratives documented a consistent set of structural failures: absent PSA testing at primary care facilities; no standardized prostate cancer referral pathway from dispensaries to KCGTRH; lack of on-site radiotherapy; and intermittent chemotherapy supply. Kenya has fewer than five operational radiotherapy machines nationally for a population exceeding 55 million, making timely radiation access a logistical impossibility for most patients outside Nairobi. These structural realities are the upstream causes of the clinical outcomes documented at KCGTRH — and they will not shift without targeted health system investment.

4.6.5 Strengths and Limitations

The study's strengths include its focus on county-level clinical reality, its mixed-methods triangulation approach, and the use of a census sample that minimizes selection bias and maximizes the representativeness of the findings within the study setting. The census approach also enhances statistical power for subgroup analyses that would otherwise be underpowered.

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Limitations are also important to acknowledge. Single-centre design restricts generalizability beyond KCGTRH to other county hospitals in Kenya or the broader region. Retrospective data extraction from clinical records introduces documentation bias, particularly in QoL assessments that were not consistently completed across all records. Survival estimates based on clinic records may underestimate mortality if deaths occurring outside the hospital went uncaptured. Prospective multi-site designs with systematic data capture systems would address these limitations and provide more robust, generalizable evidence for cancer care planning across Western Kenya and the wider East African region.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The findings here are hard to read as anything other than documentation of a failing system upstream of the hospital. At KCGTRH, 89.1% of patients presented with stage III or IV prostate cancer. Radical prostatectomy was absent from the treatment record entirely. Fewer than one in twelve patients accessed radiotherapy, and only through external referral. These are not outcomes shaped by clinical choice — they are outcomes shaped by what was structurally available. Yet within those constraints, 76.5% of patients achieved meaningful symptom improvement, and combination therapy produced significantly better outcomes than monotherapy. That finding matters: clinical benefit is attainable at this level of the health system without waiting for infrastructure transformation, and it makes a direct case for investment in medication access and combination protocols now rather than only in oncology infrastructure expansion.

The predictors of outcome in this cohort are revealing. Stage at diagnosis and metastatic status dominated the multivariable analysis; individual sociodemographic factors did not significantly alter outcomes. This pattern reflects a system-level failure — delayed presentation driven by weak primary care capacity, absent community screening, and structural oncology gaps — rather than a patient-level failure. Any strategy targeting improved prostate cancer outcomes in this setting must therefore begin upstream of the clinic, in the communities and primary health facilities where men's cancer risk goes unrecognized for years.

What this study demonstrates, specifically and with verifiable evidence, is that even within a resource-constrained county hospital setting, meaningful clinical benefit is achievable through hormonal therapy, adherence support, and systematic palliative care. The 2.4% complete remission rate and 18.2-month median event-free survival simultaneously document the ceiling imposed by late presentation and the distance that remains between current outcomes and what is achievable with earlier detection and multimodal treatment. This is not a counsel of despair — it is a precise map of where system investment will yield clinical returns.

5.2 Recommendations

The following three-tiered framework addresses the evidence-identified gaps at policy, system, and practice levels. There is need for health system strengthening within 12 months. In this regard, there should be deployment of mobile PSA testing and digital rectal examination screening in high-burden sub-counties within Kakamega and neighboring counties, with fast-track referral links to KCGTRH for screen-positive patients. Likewise, there ought to be development of a standardized prostate cancer referral protocol for lower-level health facilities, including training of community health volunteers and clinical officers in prostate cancer symptom recognition and PSA test referral criteria.

In the medium-term (1–3 years), it is important to establish a Western Kenya Prostate Cancer Network connecting KCGTRH with at least four county hospitals through shared chemotherapy protocols, tele-oncology consultations, and pooled drug procurement. For the long-term (3–5 years), there should be prioritization of installation of a radiotherapy unit at KCGTRH in partnership with the national government and international oncology organizations, eliminating the referral barrier to EBRT for patients in Western Kenya.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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