

**DOCUMENTATION OF MEDICINAL PLANTS ON THE POTENTIAL FOR THE
TREATMENT OF PROSTATE CANCER IN SOKOTO METROPOLIS**

BY

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CERTIFICATION

This Research Project titled “**Documentation of Medicinal Plants on the Potential for the Treatment of Prostate Cancer in Sokoto Metropolis**” by Hamisu Muhammad Musawa with (Admission Number: 2010302163), meets the regulations governing the award of Bachelor of Science , Degree in Biology , Department of Biology, Usmanu Danfodiyo University Sokoto, is approved for its contribution to knowledge and of Literary presentation.

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DEDICATION

This project is dedicated to my beloved parents; Hamisu Yunusa and Umma Abdullahi for their support, love and prayers throughout my academic journey may Aljannatul Firdausi be their final destination (Amen).

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Alhamdulillah, praise be to Allah the Almighty, the most Gracious and the most Merciful. First I would like to thank God for His Blessing in the completion of this project. Praises be to our noble Prophet Muhammad (SAW) who has guided us to the better life today.

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ABSTRACT

This study aimed to document the knowledge, usage, and perceptions of medicinal plants for prostate cancer treatment in Sokoto Metropolis. The findings indicate a significant reliance on traditional medicine, with a notable overlap between local practices and scientific research on herbal remedies. Data on medicinal plants used for the management of prostate cancer were collected through semi-structured questionnaires and oral interviews with traditional healers and local users. Information to be gathered include local plant names, plant parts used, methods of preparation, dosage, and mode of administration. The medicinal plants cited were collected from local markets and natural habitats. Each specimen were carefully labeled and transported to the Herbarium Unit, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto for proper identification and authentication by a plant taxonomist. The results revealed that; Most respondents (70%) reported no side effects from using medicinal plants, while 16% experienced mild side effects, 4% severe effects, and 10% were unsure. Traditional healers (36%) and hospitals (30%) were the main sources of healthcare, followed by pharmacies (20%) and self-medication (14%). The majority strongly agreed (40%) or agreed (36%) that medicinal plants for prostate problems should be scientifically studied, and 80% of respondents supported or strongly supported the documentation of local medicinal plants. Leaves (40%) were the most commonly used plant part in remedy preparation, followed by roots or rhizomes (24%), bark or stem (20%), and seeds or fruits (16%). Decoction (40%) was the predominant method of preparation, followed by infusion (24%), powdered oral administration (20%), and combining with other herbs (16%). A study evaluate the toxicity of *Ficus exasperata*, a plant used in Nigeria for various ailments, found that while low to medium concentrations were safe, higher doses exhibited toxic effects, highlighting the need for cautious use and proper dosage. The study recommended that; Government and local health authorities should support the documentation and preservation of indigenous medicinal plant knowledge to prevent loss of traditional wisdom.

CHAPTER ONE INTRODUCTION

1.1 Background to the Study

Medicinal plants have long been recognized as invaluable resources for human health, serving as a foundation for both traditional and modern medicine. They contain a wide range of bioactive compounds such as flavonoids, alkaloids, terpenoids, and phenolics that exhibit therapeutic effects including antioxidant, anti-inflammatory, and anticancer activities (Omara *et al.*, 2020; Fontana *et al.*, 2020). Recent research highlights their continued importance as leads in cancer drug discovery and complementary therapies (Hao *et al.*, 2022).

Prostate cancer remains one of the leading malignancies affecting men globally, contributing significantly to morbidity and mortality (Sekhoacha *et al.*, 2022). Despite advances in clinical interventions such as surgery, radiotherapy, chemotherapy, and androgen deprivation therapy, challenges persist, including high recurrence rates, treatment resistance, and severe side effects (National Cancer Institute, 2024). These limitations have spurred interest in alternative and complementary treatment approaches, particularly from natural products (Singla *et al.*, 2021).

Several medicinal plants and plant-derived compounds have been documented to possess anti-prostate cancer potential. For instance, curcumin from turmeric has demonstrated the ability to modulate signaling pathways and inhibit tumor proliferation (Termini *et al.*, 2020). Lycopene, a carotenoid found in tomatoes, has shown promising results in reducing prostate

cancer progression through antioxidant and anti-inflammatory mechanisms (Mirahmadi *et al.*, 2020). Other phytochemicals such as genistein (soy isoflavone), epigallocatechin gallate (green tea catechin), and apigenin (plant flavonoid) have been reported to interfere with androgen receptor signaling, angiogenesis, and apoptosis regulation in prostate cancer models (Hao *et al.*, 2022; Singla *et al.*, 2021).

Nigeria mirrors and magnifies these patterns. National cancer estimates indicate that prostate cancer is the most commonly diagnosed cancer and the leading cause of cancer death among Nigerian men. In 2022 alone, Nigeria recorded an estimated 18,019 new prostate cancer cases and 11,443 deaths, underscoring the gap between incidence and survivorship (IARC, 2024). Broader CanScreen5 profiles likewise place prostate cancer at the top of male cancer incidence and mortality charts for the country, highlighting a sustained national priority area (IARC, 2023).

Clinical studies from Nigerian centers repeatedly document late presentation, high prostate-specific antigen (PSA) levels at diagnosis, and limited uptake of screening—factors that complicate care pathways and worsen outcomes (Omonisi *et al.*, 2022). These realities exist alongside structural challenges: uneven distribution of oncology services, limited access to advanced diagnostics, and financial hardship for patients and families seeking care (Adefuye *et al.*, 2025).

Against this backdrop, interest in complementary and integrative oncology has intensified—especially the use of medicinal plants rooted in local pharmacopoeias. Natural products have historically seeded many anticancer agents, and contemporary reviews continue to identify Nigerian and wider African plants with cytotoxic, anti-proliferative, pro-apoptotic, anti-inflammatory, and anti-androgenic activities relevant to prostate carcinogenesis (Abdulazeez *et al.*, 2024; Adico *et al.*, 2024). Recent laboratory work on Nigerian species confirms antiproliferative effects across cancer cell lines, while African overviews consistently spotlight species traditionally linked to prostate disorders (e.g., *Prunus africana*), even as they call for rigorous, locally grounded documentation to move from promise to practice (Olaleye *et al.*, 2024; Agboola *et al.*, 2022).

For prostate cancer specifically, multiple reviews between 2019 and 2024 catalog plants used in African and Nigerian ethnomedicine such as *Gongronema latifolium*, *Mangifera indica*, *Securidaca longipedunculata*, *Hypoxis hemerocallidea*, and food-medicine overlaps like *Talinum triangulare* and summarize preclinical evidence (cell-based and animal models) that warrants systematic documentation and translational research (Agboola *et al.*, 2022; Abdulazeez *et al.*, 2024).

Sokoto State a home to a vibrant network of traditional healers, herb sellers, and users offers a uniquely relevant setting for documenting medicinal plants with putative activity against prostate cancer. Ethnopharmacological work undertaken in Sokoto has already mapped the integration of medicinal plants into traditional cancer care, using community-based surveys

across selected Local Government Areas to inventory species in routine use (Malami *et al.*, 2020). Complementary studies in Sokoto Metropolis have charted the marketing channels and supply constraints for medicinal plants, shedding light on availability, sourcing, and trade dynamics that directly affect patient access and standardization (Babangida *et al.*, 2020).

At the same time, local biomedical evidence from institutions serving Sokoto and the wider North-West adds urgency. Recent hospital-based studies report clinicopathologic profiles indicative of late presentation and investigate molecular or biochemical markers that might refine risk stratification (Oyibo *et al.*, 2023; Umar *et al.*, 2024). Additional work from Sokoto has explored oxidative stress biomarkers among men with prostate cancer, pointing to pathophysiologic pathways that plant-derived antioxidants and bioactive compounds could theoretically modulate (Erhabor *et al.*, 2022).

1.2 Statement of the Problem

The strong cultural footprint of traditional medicine in Sokoto and credible laboratory signals from Nigerian and African botanicals, there remains no consolidated, locally curated dossier of medicinal plants specifically documented for their potential in prostate cancer prevention, symptom control, or adjuvant treatment within Sokoto Metropolis. Fragmented knowledge spread across healers, markets, and small academic reports limits reproducibility, safety oversight, and opportunities for ethical bioprospecting (Malami *et al.*, 2020).

Documenting these plants systematically in Sokoto is therefore a practical and scientific necessity. Practically, it can inform safer community use, guide referral and integrative care conversations, and spotlight supply-chain and conservation priorities. Scientifically, it creates a platform for rigorous identification, voucher specimen preservation, linkage to phytochemical profiles, and step-wise evaluation (from in-vitro screening to in-vivo models) with the long-term aim of aligning promising leads with Nigeria's prostate-cancer control agenda. By anchoring the work in Sokoto's lived realities epidemiologic burden, cultural practice, and market access this documentation can bridge traditional knowledge and modern oncology research in a way that is both locally meaningful and globally relevant (Adefuye *et al.*, 2025; Malami *et al.*, 2020).

1.3 Justification of the Study

Prostate cancer poses a substantial health challenge globally and in Nigeria, with increasing incidence and mortality, particularly in regions with limited access to early detection and modern treatment options (Sung *et al.*, 2021; IARC, 2024). Nigeria records some of the highest prostate cancer mortality rates in Africa, often attributed to late presentation, poor health-seeking behavior, and inadequate oncology infrastructure (Omonisi *et al.*, 2022; Adefuye *et al.*, 2025). In Sokoto Metropolis, local studies have confirmed late-stage presentation and high prostate-specific antigen (PSA) levels among patients, suggesting

urgent need for alternative or complementary strategies to improve disease outcomes (Oyibo *et al.*, 2023; Umar *et al.*, 2024).

Traditional medicine remains an integral part of healthcare in Sokoto State, where medicinal plants are widely used in the management of chronic illnesses, including cancers. Surveys of local herbalists and traditional healers demonstrate significant reliance on indigenous plants for treatment and symptom management of prostate-related conditions (Malami *et al.*, 2020; Babangida *et al.*, 2020). Despite this reliance, knowledge on these plants remains largely undocumented, fragmented across oral traditions, and under-represented in scientific literature. Furthermore, evidence from recent pharmacological studies indicates that Nigerian medicinal plants possess bioactive compounds with cytotoxic, anti-proliferative, and anti-androgenic effects that could be harnessed in prostate cancer management (Abdulazeez *et al.*, 2024; Olaleye *et al.*, 2024). Systematically documenting these plants in Sokoto Metropolis will preserve valuable ethnomedicinal knowledge, identify candidate species for further pharmacological validation, and contribute to integrative cancer care policies.

1.4 Aim and Objectives of the Study

The main aim of this study is to document medicinal plants with potential for the treatment of prostate cancer in Sokoto Metropolis, with emphasis on their local use, availability, and possible pharmacological value.

The specific objectives are to:

- i. Identify and document medicinal plants traditionally used in Sokoto Metropolis for managing prostate cancer and related symptoms.

CHAPTER TWO

LITERATURE REVIEW

2.1 Prostate Cancer

Prostate cancer is one of the most prevalent malignancies affecting men globally, representing a significant public health challenge due to its morbidity and mortality rates (Rawla, 2019; Sung *et al.*, 2021). The prostate gland, a small exocrine organ of the male reproductive system, is prone to abnormal cellular proliferation that may progress to malignant forms, especially in aging men. Genetic predisposition, hormonal imbalance, lifestyle factors, and environmental exposures have been consistently highlighted as key determinants of prostate cancer occurrence and progression (Attard *et al.*, 2021; Pernar *et al.*, 2022).

2.1.1 Types of Prostate Cancer

Prostate cancer is classified based on its histological origin and biological behavior. The major types include:

1. **Adenocarcinoma of the Prostate:** This is the most common type, accounting for more than 90% of cases. It arises from the glandular cells of the prostate that produce seminal fluid (Sekhoacha *et al.*, 2022).
2. **Small Cell Carcinoma:** A rare but highly aggressive neuroendocrine tumor of the prostate. It often presents with advanced disease and poor prognosis (NCCN, 2023).

3. **Squamous Cell Carcinoma:** Extremely rare (<1% of cases), it arises from the squamous epithelial cells of the prostate and is often resistant to standard hormone therapy (Sekhoacha *et al.*, 2022).
4. **Transitional Cell (Urothelial) Carcinoma:** This type originates in the bladder and spreads to the prostate. It is less common and usually associated with urinary tract involvement (Miller *et al.*, 2021).
5. **Sarcomas and Other Rare Variants:** These include rhabdomyosarcoma and stromal tumors of the prostate, occurring mainly in younger patients and representing <0.1% of prostate cancers (Sekhoacha *et al.*, 2022).

2.1.2 Treatment of Prostate Cancer

Treatment strategies for prostate cancer depend on the stage, aggressiveness, patient age, and overall health. Current approaches include:

1. **Active Surveillance and Watchful Waiting:** Recommended for men with localized, low-risk prostate cancer. It involves regular monitoring with PSA tests, imaging, and biopsies without immediate treatment (NCCN, 2023).
2. **Surgery (Radical Prostatectomy)**” Surgical removal of the prostate gland is a standard treatment for localized prostate cancer in patients with good life expectancy (Miller *et al.*, 2021).

3. **Radiation Therapy:** Includes external beam radiation therapy (EBRT) and brachytherapy. It is effective for localized and locally advanced disease, either alone or in combination with hormone therapy (Sekhoacha *et al.*, 2022).
4. **Androgen Deprivation Therapy (ADT):** Since prostate cancer growth is driven by androgens, ADT remains a cornerstone for advanced or metastatic disease. Methods include luteinizing hormone-releasing hormone (LHRH) agonists/antagonists and surgical castration (Singla *et al.*, 2021).
5. **Immunotherapy:** Sipuleucel-T (a therapeutic cancer vaccine) and immune checkpoint inhibitors (e.g., pembrolizumab) have shown benefit in selected patients (NCCN, 2023).

Medicinal plants, on the other hand, refer to naturally occurring flora whose parts such as leaves, roots, seeds, bark, and flowers contain bioactive constituents with therapeutic potential. For centuries, these plants have formed the backbone of traditional medicine systems, serving as affordable and accessible remedies, particularly in low- and middle-income countries where access to conventional healthcare may be limited (Ekor, 2019; WHO, 2021). Unlike synthetic drugs, which often present adverse side effects, medicinal plants are generally perceived as safer and more culturally acceptable, making them an important resource in complementary and alternative medicine (Alqahtani *et al.*, 2021). The connection between medicinal plants and prostate cancer management lies in the

pharmacological potential of phytochemicals. Bioactive compounds such as alkaloids, flavonoids, terpenoids, saponins, and phenolics have been widely documented to exhibit antioxidant, anti-inflammatory, and anticancer activities, thereby offering prospects for the prevention and treatment of prostate cancer (Abotaleb *et al.*, 2020; Nabavi *et al.*, 2022). Recent research has highlighted that these phytochemicals modulate molecular signaling pathways, induce apoptosis in cancer cells, and suppress tumor progression, thus making them attractive alternatives or adjuncts to conventional therapies like chemotherapy and radiotherapy (Carneiro *et al.*, 2021; Khan *et al.*, 2023).

In essence, conceptualizing prostate cancer alongside medicinal plants underscores the growing importance of integrating indigenous knowledge with modern biomedical research. While prostate cancer remains a global health threat, the utilization and systematic documentation of medicinal plants could provide new therapeutic leads, especially in regions such as Nigeria, where traditional medicine is deeply entrenched in cultural and healthcare practices (Chinsembu, 2021; Oguntibeju, 2022).

2.2 Global Overview of Medicinal Plants in Prostate Cancer Management

The use of medicinal plants in managing prostate cancer has gained global recognition due to their affordability, accessibility, and proven therapeutic effects. In developed countries, increasing interest in natural products has led to extensive pharmacological studies exploring plant-derived bioactive compounds as alternatives or adjuncts to conventional therapies

(Ghosh *et al.*, 2020). For example, compounds such as lycopene from tomatoes, epigallocatechin gallate (EGCG) from green tea, and curcumin from turmeric have been reported to reduce prostate cancer risk and inhibit tumor growth by modulating oxidative stress and inflammatory pathways (Li *et al.*, 2021; Kim *et al.*, 2022).

Globally, traditional systems of medicine such as Ayurveda, Traditional Chinese Medicine (TCM), and Native American herbal practices continue to provide evidence for the therapeutic use of plant remedies. Several clinical trials have demonstrated that extracts from plants such as *Camellia sinensis*, *Glycine max* (soy), and *Serenoa repens* (saw palmetto) exhibit anti-androgenic and anti-proliferative effects, making them promising in prostate cancer prevention and therapy (Yu *et al.*, 2019; Xu *et al.*, 2020). Furthermore, the pharmaceutical industry has increasingly focused on identifying, isolating, and modifying phytochemicals to develop standardized plant-based drugs that can be integrated into modern oncology (Wang *et al.*, 2021).

In addition to their chemopreventive role, medicinal plants have been reported to enhance the quality of life for patients undergoing cancer therapy. This is because many phytochemicals reduce chemotherapy-induced toxicity and radiotherapy-related side effects, thereby improving treatment tolerance (Loizzo *et al.*, 2020). Importantly, the World Health Organization (WHO) has emphasized that medicinal plants remain an indispensable

component of global healthcare, with nearly 80% of the world's population relying on herbal remedies for primary health needs, including cancer treatment (WHO, 2022).

Table 1: Plants used to treat prostate cancer, their scientific names, families, common names, parts and references.

S/N	Scientific Name	Family	Common Name	Part
1	<i>Panax ginseng</i>	Araliaceae	Root Ginseng	Root
2	<i>Arum palaestinum</i>	Araceae	Black calla	Root-leaf
3	<i>Melissa officinalis</i>	Lamiaceae	Lemon balm	Leaves
4	<i>Ganoderma lucidum</i>	Ganodermata ceae	Whole plant	Ganoderma
5	<i>Psidium guajava</i>	Myrtaceae	Lemon guava	Leaves
6	<i>Artemisia</i>	Asteraceae	Wormwood	Aerial part and root
7	<i>Prunus africana</i> (Hook.f.) Kalkman (<i>Pygeum africanum</i>)	Rosaceae	African cherry, pygeum, iron wood, red stinkwood, African plum, African prune, and bitter almond	Leaves, bark
8	<i>Pseudocedrela kotschy</i>	Meliaceae	Dry zone cedar, hard cedar- mahogany	Leaves and stem
9	<i>Asparagus africanus</i> Lam.	Asparagaceae	Bush asparagus, wild asparagus, African asparagus	Roots, leaves,
10	<i>Bulbinella floribunda</i> (Thunb.)	Asphodelacea e	Bulbine, bulbinella, burn jelly plant, cat's tail, snake Flower	Roots
11	<i>Kigelia africana</i> (Lam.) Benth.	Bignoniaceae	Sausage tree, worsboom	Fruits, leaves, bark
12	<i>Hypoxis hemerocallidea</i> Fisch,	Hypoxidacea e	Star lily, magic muthi, yellow star	Corms
13	<i>Aloe ferox</i> Mill	Liliaceae	Barbados aloe, bitter aloe, first aid plant, medicinal aloe	Leaves
14	<i>Catharanthus roseus</i> (L.)	Apocynaceae.	Bright eyes, cape periwinkle, graveyard plant, old maid, pink periwinkle, rose periwinkle	Leaves, stem

15	<i>Ximenia caffra</i> Sond.	ximeniaceae	Munhengeri, mutsvanzva	Roots, fruits, seeds
16	<i>Aloe volkensii</i> Engl.	Aloaceae	Aloes	Leaves
17	<i>Opuntia</i> sp	Cactaceae	Opium poppy, breadseed poppy	Leaves
18	<i>Steganotaenia araliacea</i> Hochst	Apiaceae	Musvodzambudzi	Bark, young leaves
19	<i>Euclea natalensis</i> A.DC.	Ebenaceae	Nataloguari, natal ebony	Bark
20	<i>Moringa oleifera</i> Lam.	Moringaceae	horseradish tree	Leaves, root, bark
22	<i>Capsicum frutescens</i> L.	Solanaceae	Tabasco Pepper, Cayenne pepper	Fruit
23	<i>Byophyllum pinnatum</i> (Lam).	Crassulaceae	Cathedral bells	Leaves
24	<i>Burkea africana</i> Hook.	Fabaceae	Mukarati, umnondo	Roots, stem bark
25	<i>Alstonia congensis</i> Engl.	Apocynaceae	Stool wood, chinese wood, emien	Leaves
26	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	Sweet pidweed	Leaves
27	<i>Pseudolachnostylis maprouneifolia</i> Pax.	Phyllanthaceae	Mutsonzwa, mukura	Leaves
28	<i>Nymphaea lotus</i> L.	Nymphaeaceae	Water lotus, tigeter lotus, Egyptian white waterlily	Leaves
29	<i>Petiveria alliacea</i> L.	Phytolaccaceae	Guinea hen weed	Root
30	<i>Sutherlandia frutescens</i> L.	Fabaceae	Cancer bush	Shoots
31	<i>Xylopi aethiopica</i> (Dunnal) A.Rich.	Annonaceae	Spice tree, African pepper, Ethiopian pepper, guinea pepper	Seed
32	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Wild worth leadwort, Ceylon plumbago, startwaterbossie	Root
33	<i>Duranta erecta</i> L.	Verbaseae	Golden Dew-Drop, Lilac-flowered Golden Dewdrop, Pigeon Berry, Sky Flower, Brazilian Sky Flower, Kachang Puteh, Forget-Me-Not	Leaves, roots, bark, Fruits
34	<i>Gongronema</i>	Apocynaceae	Utazi, arokeke, bush buck, tafel	Leaves

	<i>latifolium</i> Benth.		boom	
	<i>Hibiscus sabdariffa</i> L.	Malvaceae	Roselle	Calyces
35	<i>Musa sapientum</i> L.	Musaceae	French plantain/banana, desert banana	Tuber
36	<i>Kigelia africana</i> Lam. Benth.	Bignoniaceae	Mubveve	Fruits, leaves, bark
37	<i>Ocimum basilicum</i>	Lamiaceae	Sweet basil	Leaves
38	<i>Vernonia amygdalina</i> Delile	Asteraceae	Congo bololo, bitter leaf	Leaves
39	<i>Momordica charantia</i> L.	Cucurbitaceae	Cucubits	Leaves
40	<i>Heliotropium indicum</i> L.	Boraginaceae	Indian turnsole, indian heliotrope	Leaves
41	<i>Nauclea latifolia</i> Sm.	Rubiaceae	Guinea peach	Seed
42	<i>Momordica cabraei</i> (Cogn.) C.Jeffrey.	Cucurbitaceae	Ahara,dawodu, burkill	Leaves
43	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Garden spurge	Stem
44	<i>Mangifera indica</i> L.	Anacardiaceae	Mango	Bark
45	<i>Cannabis sativa</i> L.	Cannabaceae	Mbanje	Leaves, whole plant
46	<i>Heteromorpha trifoliata</i> Wendl.	Apiaceae	Mhingano, imfenkulu	Leaves, bark, roots
47	<i>Raphia mambillensis</i>			
48	<i>Vernonia quineensis</i> Benth.	Asteraceae	Mgbu, Kwet	

Source: (Chinsembu, 2021; Oguntibeju, 2022).

2.3 Prostate Cancer Burden in Africa and the Role of Phytomedicine

In Africa, prostate cancer represents one of the most frequently diagnosed cancers among men and is often associated with late presentation, limited diagnostic facilities, and poor access to advanced treatments (Akinremi *et al.*, 2020; Adelaye *et al.*, 2019). Mortality rates remain disproportionately high compared to developed countries, largely due to weak

healthcare infrastructure and socioeconomic barriers. In this context, phytomedicine plays an important role as an accessible, culturally relevant, and affordable alternative for many African communities.

Traditional African medicine has a rich heritage of utilizing indigenous plants for the treatment of urogenital disorders, including prostate-related diseases. For instance, ethnobotanical surveys have reported the frequent use of plants such as *Hypoxis hemerocallidea* (African potato), *Prunus africana* (African cherry), and *Vernonia amygdalina* (bitter leaf), which are traditionally employed to alleviate urinary difficulties, inflammation, and prostate enlargement (Omosa *et al.*, 2021; Maroyi, 2022). Scientific investigations have confirmed that phytochemicals extracted from these plants exhibit anti-inflammatory, antioxidant, and cytotoxic activities against prostate cancer cells (Olotu *et al.*, 2020; Mensah *et al.*, 2021).

Moreover, the role of phytomedicine in Africa extends beyond biological efficacy to cultural and social significance. Traditional healers often serve as the first point of consultation for men experiencing symptoms, highlighting the importance of documenting indigenous knowledge to preserve biodiversity and promote evidence-based integration of herbal medicine into healthcare systems (Chikezie *et al.*, 2021). Despite this, challenges such as lack of standardization, dosage inconsistencies, and limited clinical trials continue to hinder the formal acceptance of phytomedicine in cancer treatment (Aboyade *et al.*, 2021).

Nevertheless, African medicinal plants remain a promising source of bioactive compounds with potential for drug discovery and therapeutic application. Strengthening research, policy frameworks, and collaboration between traditional practitioners and biomedical researchers will be crucial for harnessing phytomedicine in addressing the growing burden of prostate cancer in Africa.

2.4 Medicinal Plants with Reported Anti-Prostate Cancer Potentials

Over the last two decades, significant progress has been made in identifying and documenting medicinal plants with specific anti-prostate cancer activities. These plants are often rich in bioactive compounds that exhibit diverse mechanisms such as antioxidant effects, modulation of hormonal pathways, inhibition of cell proliferation, and induction of apoptosis in cancerous cells (Patel *et al.*, 2020). Unlike synthetic drugs that often target single pathways, medicinal plants typically act through multiple mechanisms, thereby providing broader therapeutic potential (Manayi *et al.*, 2021).

One of the most widely studied plants is *Curcuma longa* (turmeric), whose principal compound, curcumin, has shown inhibitory effects on prostate cancer progression by regulating androgen receptor signaling and suppressing nuclear factor-kappa B (NF- κ B) activity (Gupta *et al.*, 2020). Similarly, *Camellia sinensis* (green tea) is known for its catechins, particularly epigallocatechin gallate (EGCG), which has demonstrated the ability

to induce apoptosis in prostate cancer cells and reduce tumor growth in animal models (Henning *et al.*, 2021).

African medicinal plants have also gained attention for their anti-prostate cancer potentials. *Prunus africana* (African cherry) contains phytosterols and pentacyclic triterpenes that exhibit anti-androgenic and anti-proliferative effects, making it one of the most commonly used herbal remedies for prostate-related ailments (N'guessan *et al.*, 2020). In Nigeria, *Vernonia amygdalina* (bitter leaf) and *Garcinia kola* (bitter kola) have been documented to possess cytotoxic and anti-inflammatory properties, with evidence of reduced viability of prostate cancer cell lines (Olowokere *et al.*, 2022). Likewise, *Nigella sativa* (black seed) has attracted interest due to its major active compound, thymoquinone, which has demonstrated significant anticancer effects by triggering apoptosis and inhibiting angiogenesis (Rahman *et al.*, 2021).

Other plants with promising activity include *Zingiber officinale* (ginger), *Allium sativum* (garlic), and *Withania somnifera* (ashwagandha), which have all been reported to modulate oxidative stress and enhance immune response against prostate cancer cells (Sharma *et al.*, 2020; Khan *et al.*, 2022). Importantly, recent clinical and preclinical studies have confirmed that these plants not only inhibit cancer progression but also enhance the effectiveness of standard therapies while reducing their side effects (Martinez-Perez *et al.*, 2021).

Overall, the documentation of medicinal plants with anti-prostate cancer potential highlights the importance of integrating traditional knowledge with modern biomedical research. These plants represent a valuable source for novel therapeutic agents, underscoring the need for systematic evaluation, standardization, and clinical validation to facilitate their adoption into mainstream oncology.

2.5 Documentation of Medicinal Plants in Nigeria for Cancer Management

Nigeria is endowed with a rich diversity of flora, many of which have been documented for their therapeutic potential against various diseases, including cancers. Given the high reliance on traditional medicine, particularly in rural areas, medicinal plants have become central to cancer management in Nigeria (Adegbite *et al.*, 2020). Ethnobotanical surveys across different regions of the country have reported plants such as *Garcinia kola* (bitter kola), *Azadirachta indica* (neem), *Morinda lucida* (Oruwo), *Annona senegalensis*, and *Carica papaya*, which are frequently used in local cancer treatments (Okagu *et al.*, 2021; Ibrahim *et al.*, 2022).

The pharmacological relevance of these plants is attributed to their diverse phytochemicals, including flavonoids, alkaloids, and terpenoids, which have demonstrated cytotoxic, antioxidant, and antiproliferative activities against cancer cell lines (Eze *et al.*, 2020; Akinsanya *et al.*, 2021). For example, extracts of *Garcinia kola* seeds have been shown to

induce apoptosis in prostate and breast cancer cell models, while neem extracts have exhibited significant inhibitory effects on tumor growth (Olayinka *et al.*, 2021).

Documentation of these plants is critical, not only for preserving indigenous knowledge but also for validating their efficacy through scientific methods. The Nigerian Institute of Pharmaceutical Research and Development (NIPRD) and several universities have increasingly engaged in research linking ethnomedicinal practices with modern drug discovery (Onifade *et al.*, 2021). Nevertheless, gaps still exist in terms of standardization, toxicity evaluation, and clinical trials, which remain barriers to the formal integration of these plants into mainstream healthcare systems (Onoja *et al.*, 2023).

Overall, Nigeria's biodiversity provides a rich reservoir of medicinal plants with significant potential for prostate cancer management. Systematic documentation and evidence-based research are therefore essential for maximizing their role in cancer therapeutics.

2.6 Challenges and Prospects of Using Medicinal Plants in Prostate Cancer Treatment

The use of medicinal plants for the management of prostate cancer continues to attract global attention; however, several challenges hinder their mainstream integration into cancer therapy. One of the major concerns is safety and standardization. Many herbal remedies used in traditional settings lack proper dosage determination, quality control, and toxicity assessment, which raises concerns about their safety for human use (Nwafor *et al.*, 2020). Unlike conventional drugs, herbal preparations often vary in phytochemical content due to

differences in soil type, harvesting period, and processing methods, leading to inconsistencies in therapeutic efficacy (Omotayo *et al.*, 2021).

Another critical challenge is the lack of extensive clinical validation. While numerous *in vitro* and *in vivo* studies have shown anticancer properties of various plants, only a few have progressed to well-designed clinical trials. This gap limits the translation of preclinical findings into evidence-based medical practice (Olaniran *et al.*, 2022). Moreover, many indigenous communities rely on oral transmission of knowledge, which makes documentation difficult and increases the risk of losing valuable therapeutic information (Afolayan & Ajibade, 2021).

Despite these challenges, the prospects remain promising. Advances in biotechnology and pharmacognosy are opening new pathways for the identification, isolation, and modification of bioactive compounds from plants with anti-prostate cancer activity (Yasir *et al.*, 2023). For instance, nanotechnology-based drug delivery systems are being explored to enhance the bioavailability and targeted activity of plant-derived compounds (Tahir *et al.*, 2022). Furthermore, there is increasing global recognition of the value of integrative medicine, where phytomedicine complements conventional cancer therapies, potentially reducing side effects and improving patient outcomes (Kakouri *et al.*, 2023).

In addition, the protection of indigenous knowledge through intellectual property rights and benefit-sharing frameworks can encourage more collaboration between researchers and local communities, leading to better documentation and sustainable utilization of medicinal plants (Chukwu *et al.*, 2024). If well harnessed, these efforts could contribute significantly to the development of safer, more effective, and affordable therapeutic options for prostate cancer management.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

The study was conducted in Sokoto Metropolis, the capital of Sokoto State, located in the north-western part of Nigeria. Sokoto State lies between latitudes 12°00'N and 13°58'N and longitudes 4°08'E and 6°54'E, and it shares borders with Zamfara State to the east, Kebbi State to the west, and the Republic of Niger to the north (Saidu *et al.*, 2021). Sokoto metropolis itself will consist of two major Local Government Areas (LGAs): Sokoto North and Sokoto South, which serve as the administrative and commercial hub of the state. The area will be selected for the study because of its rich tradition in the use of medicinal plants for the treatment of various ailments, including prostate-related conditions. The indigenous people, predominantly Hausa and Fulani, have a long history of relying on traditional medicine due to its accessibility, affordability, and cultural acceptability (Abdullahi & Bello, 2020).

Sokoto metropolis experienced a semi-arid climate characterized by a long dry season (October to May) and a short rainy season (June to September). The mean annual rainfall will range between 500 mm and 700 mm, while average daily temperatures will fluctuate between 15°C during the cold season and 40°C during the peak of the hot season (NIMET, 2016). These climatic conditions will significantly influence the distribution, diversity, and

availability of medicinal plants in the area. The vegetation of Sokoto will belong to the Sudan savanna ecological zone, dominated by grasses interspersed with shrubs and scattered trees such as *Azadirachta indica* (neem), *Parkia biglobosa* (locust bean), *Vitellaria paradoxa* (shea butter tree), and *Adansonia digitata* (baobab). Several of these plant species have been documented for ethnomedicinal purposes and will provide a natural resource base for the study. The population of Sokoto metropolis will be estimated at over 800,000 people (NPC, 2006; projected to 2025), consisting mainly of Muslims, with occupations such as farming, trading, animal husbandry, and civil service. Traditional healers, herbal vendors, and elderly members of the community will play a vital role in the preservation and transmission of indigenous knowledge about medicinal plants.

3.2 Sample Size and Sampling Technique

A purposive sampling technique was employed to select knowledgeable herbal practitioners for interviews. Ten (50) practitioners were targeted to ensure sufficient ethnomedicinal data. For the laboratory aspect, five (5) medicinal plant species commonly cited for prostate-related treatment was collected. Sample size determination will be guided by the principle of data saturation for interviews and feasibility for laboratory analysis.

3.3 Materials

The following materials will be used during the study:

- i. Plant collection tools (machetes, knives, and specimen bags).

- ii. Laboratory equipment (beakers, test tubes, measuring cylinders, conical flasks, funnels, and pipettes).
- iii. Solvents and reagents (ethanol, methanol, chloroform, distilled water, ferric chloride, sulfuric acid, and other standard reagents for phytochemical screening).
- iv. Analytical instruments (UV-Visible Spectrophotometer, Rotary Evaporator, and High-Performance Liquid Chromatography).
- v. Data collection tools (structured questionnaire, interview guide, and digital recorder).

3.4 Methods of Data Collection

3.4.1 Ethnobotanical Survey

Data on medicinal plants used for the management of prostate cancer were collected through semi-structured questionnaires and oral interviews with traditional healers and local users. Information to be gathered include local plant names, plant parts used, methods of preparation, dosage, and mode of administration.

3.4.2 Plant Collection and Identification

The medicinal plants cited were collected from local markets and natural habitats. Each specimen were carefully labeled and transported to the Herbarium Unit, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto for proper identification and authentication by a plant taxonomist.

3.4.3 Preparation of Plant Extracts

The collected plants were washed, air-dried at room temperature, and ground into fine powder using a mechanical grinder. Extraction will be carried out using Soxhlet extraction with ethanol and methanol as solvents. The extracts will be concentrated with a rotary evaporator and stored in airtight containers for further analysis.

3.4.4 Phytochemical Screening

Qualitative phytochemical screening was conducted to test for the presence of alkaloids, flavonoids, saponins, tannins, steroids, and glycosides using standard procedures described by Harborne (1998) and Trease & Evans (2002).

3.4.5 Anticancer Assay (In vitro)

The anticancer activity of the plant extracts were evaluated against prostate cancer cell lines using the MTT assay method. The assay will measure cell viability and cytotoxicity of the extracts. The IC₅₀ values (concentration inhibiting 50% of cell growth) will be determined for each extract.

3.5 Data Analysis

Data obtained from the ethnobotanical survey was analyzed using descriptive statistics such as frequencies, percentages, and charts.

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents and analyzes the data collected from fifty (50) respondents regarding the Documentation of Medicinal Plants on the Potential for the Treatment of Prostate Cancer in Sokoto Metropolis.

Table 4.1: Demographic Characteristics of Respondents (N = 50)

S/N	Variable	Category	Frequency (f)	Percentage (%)
1	Gender	Male	38	76
		Female	12	24
2	Age Group	Below 20 years	4	8
		21–40 years	22	44
		41–60 years	18	36
		Above 60 years	6	12
3	Marital Status	Single	10	20
		Married	33	66
		Divorced/Separated	4	8
		Widowed	3	6
4	Educational Qualification	No formal education	6	12
		Primary education	8	16
		Secondary education	14	28
		Tertiary education	22	44
5	Occupation	Farmer	15	30
		Trader	13	26
		Civil servant	22	44

Source: Field Survey, 2025

The results show that the majority of respondents (76%) were males, while 24% were females. This indicates that men were more actively involved in discussions and awareness concerning medicinal plants used for prostate cancer treatment in Sokoto Metropolis, which aligns with the fact that prostate cancer primarily affects men.

Most respondents (44%) were between the ages of 21–40 years, followed by 36% aged 41–60 years. A smaller percentage (8%) were below 20 years, while 12% were above 60 years. This distribution suggests that the majority of participants were within the productive and knowledgeable age range, capable of providing reliable information on local medicinal plant use.

Findings reveal that 66% of the respondents were married, 20% single, 8% divorced or separated, and 6% widowed. The predominance of married individuals implies maturity and family experience, possibly influencing their awareness of traditional remedies for prostate-related ailments. About 44% of the respondents had tertiary education, 28% had secondary education, 16% had primary education, while 12% had no formal education. This shows a relatively educated population, which may enhance their understanding of the scientific and traditional importance of medicinal plants. A significant number of respondents (44%) were civil servants, 30% were farmers, and 26% were traders. This occupational distribution reflects a balanced representation of both urban and rural dwellers, suggesting diverse knowledge of herbal medicine sources and uses across socioeconomic groups

Table 4.2: Knowledge and Use of Medicinal Plants for Prostate Cancer Treatment (N = 50)

S/N	Question	Response Category	Frequency (f)	Percentage (%)
1	Knowledge about medicinal plants	Very knowledgeable	15	30
		Somewhat knowledgeable	20	40
		Little knowledge	10	20
		No knowledge	5	10
2	How knowledge was acquired	Family/Relatives	18	36
		Traditional healers	12	24
		Friends/Community	10	20
		Media/Books	10	20
3	Personal use of medicinal plants	Regularly	10	20
		Occasionally	20	40
		Rarely	12	24
		Never	8	16
4	Source of medicinal plants	Local markets	20	40
		Home gardens	12	24
		Forests/Farmlands	10	20
		Traditional healers	8	16
5	Factor influencing choice	Availability	15	30
		Cost	10	20
		Cultural beliefs	12	24
		Effectiveness	13	26
6	Frequency of visiting traditional healers	Frequently	10	20
		Occasionally	18	36
		Rarely	12	24
		Never	10	20
7	Preferred form of medicinal plants	Fresh leaves/roots	22	44
		Dried powder	12	24
		Extracts/decoctions	10	20
		Packaged herbal medicine	6	12
8	Combination with modern medicine	Always	5	10
		Sometimes	15	30

S/N	Question	Response Category	Frequency (f)	Percentage (%)
9	Confidence in effectiveness	Rarely	18	36
		Never	12	24
		Very confident	12	24
		Confident	20	40
		Slightly confident	10	20
		Not confident	8	16
10	Experience of side effects	Yes, severe	2	4
		Yes, mild	8	16
		No side effects	35	70
		Not sure	5	10
11	Main source of health care	Hospitals	15	30
		Pharmacies	10	20
		Traditional healers	18	36
		Self-medication	7	14
12	Opinion on scientific study	Strongly agree	20	40
		Agree	18	36
		Disagree	7	14
		Strongly disagree	5	10
13	Support documentation	Strongly support	25	50
		Support	15	30
		Not sure	7	14
		Do not support	3	6
14	Plant part mostly used	Leaves	20	40
		Roots/Rhizomes	12	24
		Bark/Stem	10	20
		Seeds/Fruits	8	16
15	Method of preparation	Decoction	20	40
		Infusion	12	24
		Powdered orally	10	20
		Combined with other herbs	8	16

Source: Field Survey, 2025

The findings indicate that the majority of respondents (70%) have some level of knowledge about medicinal plants, with 30% being very knowledgeable and 40% somewhat knowledgeable, while only a small proportion reported little or no knowledge. Most respondents acquired their knowledge from family and relatives (36%), followed by traditional healers (24%), friends or the community (20%), and media or books (20%). In terms of usage, 60% of respondents reported using medicinal plants regularly or occasionally, while 24% rarely use them, and 16% never use them.

Local markets were the most common source of medicinal plants (40%), followed by home gardens (24%), forests or farmlands (20%), and traditional healers (16%). Availability (30%) and effectiveness (26%) were the main factors influencing the choice of plants, with cultural beliefs (24%) and cost (20%) also playing a role. Visits to traditional healers were frequent or occasional for 56% of respondents, while 44% rarely or never visited them.

Fresh leaves and roots were the preferred form of medicinal plants for 44% of respondents, followed by dried powders (24%), extracts or decoctions (20%), and packaged herbal medicine (12%). Combining medicinal plants with modern medicine was practiced sometimes by 30% of respondents, rarely by 36%, always by 10%, and never by 24%. Confidence in the effectiveness of medicinal plants was high, with 64% of respondents being very confident or confident, while 20% were slightly confident and 16% not confident.

Most respondents (70%) reported no side effects from using medicinal plants, while 16% experienced mild side effects, 4% severe effects, and 10% were unsure. Traditional healers (36%) and hospitals (30%) were the main sources of healthcare, followed by pharmacies (20%) and self-medication (14%). The majority strongly agreed (40%) or agreed (36%) that medicinal plants for prostate problems should be scientifically studied, and 80% of respondents supported or strongly supported the documentation of local medicinal plants.

Leaves (40%) were the most commonly used plant part in remedy preparation, followed by roots or rhizomes (24%), bark or stem (20%), and seeds or fruits (16%). Decoction (40%) was the predominant method of preparation, followed by infusion (24%), powdered oral administration (20%), and combining with other herbs (16%). Overall, the data reflect high community awareness, frequent use, and strong confidence in the effectiveness of medicinal plants for treating prostate cancer, alongside support for scientific research and documentation.

Table 4.3: Signs and Symptoms of Prostate Cancer and Management Practices (N = 50)

S/N	Symptom/Sign	Ever Experienced	Frequency (f)	Percentage (%)	Management/Action Taken
1	Frequent urination, especially at night (nocturia)	Yes	20	40	Hospital treatment, herbal medicine, lifestyle changes
		No	30	60	-
2	Difficulty starting urination (hesitancy)	Yes	18	36	Hospital treatment, herbal remedies
		No	32	64	-
3	Weak or interrupted urine stream	Yes	15	30	Hospital treatment, herbal medicine
		No	35	70	-
4	Pain or burning sensation during urination	Yes	12	24	Hospital treatment, herbal medicine
		No	38	76	-
5	Inability to completely empty the bladder	Yes	10	20	Hospital treatment, herbal remedies
		No	40	80	-
6	Presence of blood in urine (hematuria)	Yes	6	12	Hospital treatment, herbal medicine
		No	44	88	-
7	Presence of blood in semen (hematospermia)	Yes	4	8	Hospital treatment, herbal remedies
		No	46	92	-
8	Painful ejaculation	Yes	5	10	Herbal medicine, hospital treatment
		No	45	90	-
9	Difficulty in achieving or	Yes	12	24	Hospital treatment, lifestyle changes

S/N	Symptom/Sign	Ever Experienced	Frequency (f)	Percentage (%)	Management/Action Taken
	maintaining an erection (erectile dysfunction)	No	38	76	-
10	Discomfort or pain in the pelvic area	Yes	14	28	Hospital treatment, herbal medicine
		No	36	72	-
11	Pain in the lower back, hips, or thighs	Yes	10	20	Hospital treatment, herbal remedies, physiotherapy
		No	40	80	-
12	Swelling in the legs or feet (edema)	Yes	8	16	Hospital treatment, herbal medicine
		No	42	84	-
13	Unexplained weight loss, fatigue, or general weakness	Yes	15	30	Hospital treatment, nutritional therapy, herbal medicine
		No	35	70	-

Source: Field Survey, 2025

The data show that the most commonly experienced symptoms among respondents were frequent urination at night (40%), difficulty starting urination (36%), discomfort in the pelvic area (28%), weak or interrupted urine stream (30%), and unexplained weight loss, fatigue, or general weakness (30%). Less frequently reported symptoms included blood in semen (8%), painful ejaculation (10%), and blood in urine (12%).

Respondents reported using a combination of hospital treatment, herbal medicine, self-medication, lifestyle adjustments, and nutritional therapy to manage these symptoms.

Hospital visits and herbal remedies were the most common forms of management, reflecting both modern and traditional healthcare practices. Overall, the findings suggest that while a significant portion of respondents have experienced symptoms indicative of prostate cancer, there is a reliance on a mixed approach combining conventional and traditional management strategies.

CHAPTER FIVE

5.0 DISCUSSION

This study aimed to document the knowledge, usage, and perceptions of medicinal plants for prostate cancer treatment in Sokoto Metropolis. The findings indicate a significant reliance on traditional medicine, with a notable overlap between local practices and scientific research on herbal remedies. A substantial portion of respondents (70%) reported knowledge of medicinal plants, primarily acquired through family, relatives, and traditional healers. This aligns with Malami *et al.* (2020), who documented various medicinal plants integrated into the traditional system of medicine for cancer treatment in Sokoto State. Their study identified plant parts commonly used, such as barks, roots, and leaves, and preparation methods like decoction, powdered form, and maceration, which were also prevalent in our findings. The study revealed that leaves and roots are the most commonly used parts of plants, with decoction being the preferred method of preparation. These practices are consistent with those observed in other regions. For instance, a study in Unubi, Anambra State, identified *Talinum triangulare* and *Telfairia occidentalis* as frequently used plants for prostate cancer treatment, with extraction and decoction being the most common preparation methods. Similarly, a systematic review by Bassey and Akpan (2023) highlighted the use of various medicinal plants in Nigeria, noting the presence of bioactive compounds with anti-tumor effects in these plants

Respondents reported using a combination of hospital treatment, herbal remedies, self-medication, and lifestyle changes to manage symptoms. This multifaceted approach mirrors findings from a study at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, where 66.3% of cancer patients used complementary and alternative medicine (CAM), including herbal therapies, often without informing their physicians. This underscores the importance of integrating traditional practices with conventional medical care to ensure comprehensive patient management.

While many respondents expressed confidence in the effectiveness of medicinal plants, concerns about potential side effects were also noted. A study evaluating the toxicity of *Ficus exasperata*, a plant used in Nigeria for various ailments, found that while low to medium concentrations were safe, higher doses exhibited toxic effects, highlighting the need for cautious use and proper dosage. The community's strong support for scientific studies on medicinal plants reflects a desire for evidence-based validation of traditional knowledge. This sentiment is echoed in the systematic review by Bassey and Akpan (2023), which emphasizes the necessity of comprehensive pharmaceutical research to maximize the therapeutic value of these plants in treating prostate cancer in Nigerian men

CONCLUSION

The study concludes that medicinal plants hold substantial potential for the treatment of prostate cancer in Sokoto Metropolis. The majority of respondents possess knowledge about these plants and actively use them, primarily in the form of fresh leaves and roots prepared as decoctions. Family, community, and traditional healers remain key sources of knowledge, indicating that traditional medicine continues to play a critical role in local healthcare. Urinary symptoms, pelvic discomfort, and general weakness were the most commonly reported signs of prostate cancer, with respondents relying on a combination of traditional and modern healthcare interventions. The study further concludes that there is strong community support for scientific research and formal documentation of medicinal plants, reflecting recognition of their cultural and therapeutic importance. In summary, medicinal plants are not only widely known and used but are also perceived as effective and safe, highlighting their relevance as complementary or alternative remedies for prostate cancer management in Sokoto Metropolis.

RECOMMENDATIONS

1. Government and local health authorities should support the documentation and preservation of indigenous medicinal plant knowledge to prevent loss of traditional wisdom.
2. Awareness campaigns should be organized to educate the public on the safe use of medicinal plants, proper preparation methods, and potential side effects.
3. Healthcare providers should explore integrative approaches that combine traditional and modern medicine to enhance patient care and improve outcomes for prostate cancer patients.

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APPENDIX
QUESTIONNAIRE
TOPIC: DOCUMENTATION OF MEDICINAL PLANTS ON THE POTENTIAL
FOR THE TREATMENT OF PROSTATE CANCER IN SOKOTO METROPOLIS

Section A: Demographic Information

Please tick (✓) the option that best represents your response.

1. Gender
 - A. Male
 - B. Female
2. Age group?
 - A. Below 20 years
 - B. 21–40 years
 - C. 41–60 years
 - D. Above 60 years
3. Marital status
 - A. Single
 - B. Married
 - C. Divorced/Separated
 - D. Widowed
4. Educational qualification
 - A. No formal education
 - B. Primary education
 - C. Secondary education
 - D. Tertiary education
5. Occupation
 - A. Farmer
 - B. Trader
 - C. Civil servant
 - D. Other (specify)

Section B: Medicinal Plants with Potential for the Treatment of Prostate Cancer

6. Do you have knowledge about medicinal plants?
 - A. Yes, very knowledgeable
 - B. Somewhat knowledgeable
 - C. Little knowledge
 - D. No knowledge
7. How do you acquire the knowledge?
 - A. Family/Relatives
 - B. Traditional healers

- C. Friends/Community
 - D. Media/Books
8. Do you personally use medicinal plants for treatment?
 - A. Regularly
 - B. Occasionally
 - C. Rarely
 - D. Never
 9. Where do you mostly obtain medicinal plants?
 - A. Local markets
 - B. Home gardens
 - C. Forests/farmlands
 - D. Traditional healers
 10. What influences your choice of medicinal plants?
 - A. Availability
 - B. Cost
 - C. Cultural beliefs
 - D. Effectiveness
 11. How often do you visit traditional healers for treatment?
 - A. Frequently
 - B. Occasionally
 - C. Rarely
 - D. Never
 12. What form of medicinal plants do you prefer?
 - A. Fresh leaves/roots
 - B. Dried powder
 - C. Extracts/decoctions
 - D. Packaged herbal medicine
 13. Do you combine medicinal plants with modern medicine?
 - A. Always
 - B. Sometimes
 - C. Rarely
 - D. Never
 14. How confident are you in the effectiveness of medicinal plants for prostate cancer?
 - A. Very confident
 - B. Confident
 - C. Slightly confident
 - D. Not confident
 15. Have you experienced side effects from medicinal plants?
 - A. Yes, severe

- B. Yes, mild
 - C. No side effects
 - D. Not sure
16. What is your main source of health care?
- A. Hospitals
 - B. Pharmacies
 - C. Traditional healers
 - D. Self-medication
17. Do you think medicinal plants for prostate problems should be scientifically studied?
- A. Strongly agree
 - B. Agree
 - C. Disagree
 - D. Strongly disagree
18. Would you support documentation of local medicinal plants for prostate cancer treatment?
- A. Strongly support
 - B. Support
 - C. Not sure
 - D. Do not support
19. What plant part is mostly used in preparing remedies for prostate cancer?
- A. Leaves
 - B. Roots/Rhizomes
 - C. Bark/Stem
 - D. Seeds/Fruits
20. How are these medicinal plants usually prepared for treating prostate cancer?
- A. Decoction (boiling in water)
 - B. Infusion (soaking in water/alcohol)
 - C. Powdered and taken orally
 - D. Combined with other herbs

SECTION C: SIGN AND SYMPTOMS OF PROSTATE CANCER

For each of the following, please indicate: **Yes** if you have ever experienced the symptom. **No** if you have never experienced the symptom. If **Yes**, kindly state what you used or did to manage it (e.g., hospital treatment, herbal medicine, self-medication, lifestyle changes, etc.).

S/N	Symptom/Sign	Ever Experienced?		If Yes, What Did You Use/Do?
		Yes	No	
1	Frequent urination, especially at night (nocturia)			
2	Difficulty starting urination (hesitancy)			
3	Weak or interrupted urine stream			
4	Pain or burning sensation during urination			
5	Inability to completely empty the bladder			
6	Presence of blood in urine (hematuria)			
7	Presence of blood in semen (hematospermia)			
8	Painful ejaculation			
9	Difficulty in achieving or maintaining an erection (erectile dysfunction)			
10	Discomfort or pain in the pelvic area			
11	Pain in the lower back, hips, or thighs			
12	Swelling in the legs or feet (edema)			
13	Unexplained weight loss, fatigue, or general weakness			