ASSESSMENT OF KNOWLEDGE AND PERCEPTION OF ANTI DOPING AMONG COMMUNITY PHARMACISTS IN BENIN CITY

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF CLINICAL PHARMACY, FACULTY OF PHARMACY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DOCTOR OF PHARMACY (PHARM. D) OF THE UNIVERSITY OF BENIN, BENIN CITY, EDO STATE, NIGERIA.

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CERTIFICATION

This is to certify that this project work was carried out by **OSAIVBIE PRIYE ISAIAH** with Matriculation Number **PHA1908527** in the Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin City, in partial fulfilment of the requirements for the award of Doctor of Pharmacy (Pharm. D) degree.

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DEDICATION

This project is dedicated to the memory of my beloved father, whose sudden passing just days before my sign-out left a void words cannot describe.

I also dedicate this work to my family and Mr. Samson for their endless support, strength, and prayers through this difficult time.

Above all I dedicate this work to God Almighty.

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First and foremost, I give all glory to God Almighty for His love, favour, grace, strength, and wisdom that carried me through every step of this journey. Without His guidance and mercy, this accomplishment would not have been possible.

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My heartfelt appreciation goes to my mom, siblings (Mrs. Merit, Mrs. Blessing, and Mr. God'spower, Aunty Irene, and Mr. Samson, for your love, prayers, and unwavering support throughout my journey in school. I am forever grateful.

Lastly, I honour the memory of my late father, whose love and sacrifices continue to guide and inspire me everyday. This success is as much yours as it is mine.

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ABSTRACT

Background: Doping, or the use of performance-enhancing substances, threatens fairness and athlete health worldwide. Pharmacists, as medication experts, are well-positioned to prevent both intentional and inadvertent doping by guiding athletes on safe drug, supplement, and herbal use. However, in Nigeria, pharmacists' involvement remains limited, with gaps in knowledge, training, and policy integration. Understanding their awareness and perceptions can inform strategies to strengthen their role in promoting clean and ethical sports.

Objective: This study evaluates community pharmacists' knowledge and perceptions of anti-doping practices in Benin City, identifying knowledge gaps and exploring influencing factors.

Methods: A cross-sectional study was conducted among 169 registered community pharmacists in Benin City, Nigeria, using convenience sampling. Data were collected via a structured self-administered questionnaire covering demographics, knowledge, perceptions, information sources, and barriers related to anti-doping. Responses were analyzed using descriptive statistics and regression to explore associations and significance.

Results: All 169 community pharmacists invited participated in the study. Most were male (65.7%), aged between 26 and 35 years (66.9%), held a BPharm degree (67.5%), and had 1–5 years of work experience (53.3%). The majority occupied senior roles (92.3%). Their anti-doping knowledge was generally fair (53.3%) or poor (42.6%), with noticeable gaps related to beta-blockers, CPD content, and legal aspects. Overall perceptions of their anti-doping role were strongly positive (75.1%). Longer professional experience and higher qualifications were linked to greater role awareness, though knowledge had only a weak influence on perceptions ($p = 0.028$, $R^2 = 0.028$).

Conclusion: Community pharmacists demonstrated fair to poor knowledge of anti-doping, yet they held strongly positive attitudes toward their role in prevention. Significant gaps remain in training, access to resources, and procedural awareness. While more experienced and highly qualified pharmacists recognized their responsibilities better, knowledge had minimal impact on attitudes. Focused CPD, integration of WADA resources, and clear professional guidelines are crucial to fully equip pharmacists for doping prevention.

CHAPTER ONE

LITERATURE REVIEW

1.1 Background of the Study

The use of performance-enhancing substances, often referred to as doping, has become one of the most critical ethical and medical challenges confronting the global sporting community. Doping represents a deliberate or inadvertent act of consuming substances or employing methods that enhance athletic performance in ways prohibited by the World Anti-Doping Agency (WADA). The phenomenon continues to threaten the integrity of sports, distort fair competition, and expose athletes to severe health risks such as hormonal imbalances, cardiovascular complications, psychological disorders, and in some cases, death (Birzniece, 2015).

To address the growing menace of doping, the World Anti-Doping Agency (WADA) was established in 1999, following a global consensus to harmonize anti-doping policies and restore trust in sports. The World Anti-Doping Agency's central mandate revolves around the creation, revision, and enforcement of the World Anti-Doping Code — a comprehensive framework outlining standards for testing, prohibited substances, sanctions, and education (David, 2017). Despite these measures, doping remains pervasive across both elite and amateur sports, with reports of new substances and masking agents constantly emerging. The persistence of this issue reflects not only intentional violations but also cases of inadvertent doping — where athletes unknowingly consume banned substances contained in prescribed or over-the-counter medications (Greenbaum *et al.*, 2023).

Pharmacists, as experts in drug safety and therapeutic optimization, play an indispensable role in mitigating such risks. Their professional responsibilities encompass identifying potential drug–substance interactions, providing patient counseling, and promoting the rational use of medicines. Within the sports context, pharmacists can function as critical

Athlete Support Personnel by guiding athletes on the appropriate use of therapeutic drugs, supplements, and herbal remedies (Hooper *et al.*, 2019). This expanding role has been formally recognized by the International Pharmaceutical Federation (FIP), which advocates for the integration of pharmacists into national anti-doping frameworks and public health strategies (Greenbaum *et al.*, 2022).

Globally, countries such as Japan, Australia, and Finland have demonstrated progressive inclusion of pharmacists in anti-doping activities. In these regions, pharmacists conduct medication reviews, provide Therapeutic Use Exemption (TUE) guidance, and deliver educational programs to athletes, coaches, and healthcare teams. However, even in countries with advanced anti-doping infrastructure, gaps persist in pharmacists' knowledge and confidence. For example, Greenbaum *et al.* (2023) reported that only about 11% of Australian pharmacists could provide comprehensive anti-doping advice despite acknowledging their professional responsibility in this area. Similarly, Lee *et al.* (2023) found that while a majority of Taiwanese pharmacists expressed willingness to counsel athletes, many lacked adequate knowledge of the World Anti-Doping Agency's prohibited list and procedures for Therapeutic Use Exemptions (TUEs).

The situation in Africa is more concerning. Pharmacists' involvement in anti-doping remains limited and largely unrecognized within the broader healthcare system. Multiple studies attribute this to poor integration of anti-doping education in pharmacy curricula, insufficient Continuing Professional Development (CPD) opportunities, and weak collaboration between national anti-doping organizations and pharmacy associations (Ndasauka *et al.*, 2023). For example, Muwonge *et al.* (2015) and Kedir *et al.* (2023) found that in several East African countries, healthcare professionals—including pharmacists—demonstrated low awareness of anti-doping guidelines and were unable to identify common banned substances. This

educational gap not only limits pharmacists' ability to provide accurate counseling but also increases the likelihood of inadvertent doping among athletes.

In Nigeria, the challenge is even more pronounced given the country's rising prominence in global sports and the frequent controversies surrounding doping among athletes. Although several anti-doping initiatives have been introduced, their implementation has been inconsistent, and the involvement of pharmacists remains minimal (Akintayo *et al.*, 2017). Akindutire *et al.* (2012) also noted that limited awareness of doping control regulations and poor access to relevant training resources continue to undermine effective anti-doping efforts in Nigeria. This has led to situations where athletes rely on self-medication or advice from non-professional sources, increasing the risk of sanctions and health complications.

Consequently, there is an urgent need to assess pharmacists' knowledge, attitudes, and perceptions toward anti-doping practices within the Nigerian context. Understanding the level of awareness among community pharmacists—who often serve as the first point of contact for drug information—can provide valuable insight into the current state of anti-doping readiness in the healthcare system. The findings from such studies can guide curriculum reform, inform professional training, and strengthen policy formulation aimed at integrating pharmacists into the national anti-doping agenda.

Therefore, this study seeks to evaluate community pharmacists' knowledge and perception of anti-doping in Benin City, Nigeria. It aims to highlight existing knowledge gaps, explore factors influencing perceptions, and propose strategies for enhancing pharmacists' participation in promoting clean and ethical sports.

1.2 Conceptualization

According to the World Anti-Doping Agency (WADA), doping encompasses the occurrence of one or more violations outlined in Articles 2.1–2.11 of the World Anti-Doping Code—

including the presence or use of prohibited substances, trafficking, complicity, and tampering (David, 2017). The Prohibited List, updated annually, covers anabolic agents, stimulants, narcotics, beta-2 agonists, diuretics, and even gene doping. Because many of these substances overlap with therapeutic agents used in clinical care, pharmacists are crucial in preventing inadvertent violations by verifying medications, providing Therapeutic Use Exemption (TUE) guidance, and counseling athletes (Hooper *et al.*, 2019).

Anti-doping involves coordinated policies, testing, education, and enforcement mechanisms designed to promote fair play and athlete safety. The World Anti-Doping Agency (WADA) and its national affiliates, such as National Anti-Doping Organizations (NADOs), oversee these activities. Beyond regulation, anti-doping also serves a public health function by addressing the medical and psychological harms linked to substance misuse (Birzniece, 2015). Pharmacists play a key role in these efforts through education and surveillance, helping reduce unintentional doping incidents (Greenbaum *et al.*, 2022).

Community pharmacists—often the most accessible healthcare professionals—have three main responsibilities in anti-doping (Hooper *et al.*, 2019):

1. Medication Verification and Review – ensuring that prescriptions and over-the-counter (OTC) medicines do not contain prohibited substances, and advising on appropriate alternatives where necessary.

2. Athlete Counselling and Therapeutic Use Exemption (TUE) Guidance – providing targeted education on the safe use of supplements, clarifying anti-doping risks, and guiding athletes through Therapeutic Use Exemption procedures.

3. Public and Community Education – leading awareness campaigns in schools, gyms, and communities to combat misinformation about performance-enhancing drugs and supplements (Greenbaum *et al.*, 2022).

Although global surveys affirm pharmacists' willingness to participate, most feel inadequately trained or informed about the World Anti-Doping Agency (WADA) Code (Greenbaum *et al.*, 2023; Lee *et al.*, 2023). This highlights an urgent need for structured anti-doping education at both undergraduate and professional levels (Kawaguchi-Suzuki *et al.*, 2021).

Globally, pharmacists' knowledge of anti-doping is uneven. Studies reveal that while pharmacists recognize their role, many lack formal training or awareness of World Anti-Doping Agency updates (Hooper *et al.*, 2019; Greenbaum *et al.*, 2022). In Taiwan, for instance, Lee *et al.* (2023) found moderate awareness but low confidence, while Australian data showed only a minority of pharmacists could accurately identify banned substances (Greenbaum *et al.*, 2023). Similar patterns exist across Europe and Asia. In contrast, Japan has introduced formal anti-doping training programs for pharmacists, resulting in higher awareness and confidence levels (Nakajima *et al.*, 2021). These findings emphasize the need for standardized, global anti-doping education within pharmacy curricula.

Africa's anti-doping system has improved through the establishment of Regional Anti-Doping Organizations (RADOs) under the World Anti-Doping Agency (WADA). However, implementation challenges remain. Studies in Uganda, Kenya, and Ethiopia report low awareness among healthcare professionals, including pharmacists (Muwonge *et al.*, 2015; Kedir *et al.*, 2023). Many pharmacy programs across the continent still lack anti-doping content, leading to limited professional preparedness (Ruwuya *et al.*, 2022). Pharmacists in Africa thus remain an underutilized resource in anti-doping efforts despite their accessibility and expertise (Ndasauka *et al.*, 2023).

Research in West Africa is limited, and no systematic assessment of Nigerian pharmacists' anti-doping knowledge exists. Nonetheless, parallels can be drawn from studies on

pharmaceutical regulation showing similar knowledge and practice gaps (Adigwe *et al.*, 2022). The absence of structured anti-doping education in Nigerian pharmacy curricula and continuing education programs further exacerbates this gap (Akintayo *et al.*, 2017). This underscores the necessity of localized studies—such as this one—to inform future policy, education, and capacity building.

Taken together, the evidence highlights a disconnect between pharmacists' potential and actual contribution to anti-doping efforts. While the World Anti-Doping Agency (WADA) defines the legal and regulatory framework, pharmacists' knowledge and perception shape their ability to act as effective intermediaries. Globally and in Africa, gaps persist in both factual knowledge and practical engagement. In Nigeria, the absence of research makes it difficult to tailor policies or curricula.

This study therefore focuses on assessing community pharmacists' knowledge and perception of anti-doping in Benin City, Nigeria. Findings will provide evidence to support curriculum reforms, professional training, and policy advocacy aimed at positioning pharmacists as integral partners in safeguarding athlete health and clean sport.

1.3 Knowledge of Anti-Doping

Knowledge was assessed through items that examined pharmacists' awareness of anti-doping agencies, recognition of banned substances, awareness of therapeutic use exemptions and ability to identify safe versus unsafe medications and supplements (Section B of the questionnaire). Questions such as "Are you aware of any Anti-Doping Agency?", "Do you know that certain over-the-counter (OTC) medications can contain substances banned in sports?", and "Do you know where to find the current list of prohibited substances published by World Anti-Doping Agency (WADA)?" operationalize knowledge as both factual recall and applied awareness. This aligns with the attention and retention components of Social

Learning Theory (SLT) (Bandura, 1986), whereby individuals acquire information through direct exposure and observation. Furthermore, the Health Belief Model (HBM) dimensions of perceived susceptibility (e.g., accidental doping from over-the-counter drugs) and perceived severity (legal consequences of dispensing banned substances) are directly embedded in these knowledge items.

1.4 Perception of Anti-Doping

Perception was measured through Likert-scale items in Section C, addressing pharmacists' confidence, attitudes, and willingness to engage in anti-doping roles. Statements such as "Providing anti-doping advice should be part of a community pharmacist's professional responsibility" and "Pharmacists should collaborate with sports authorities to promote clean sport and prevent doping" capture constructs of perceived benefits and cues to action from the Health Belief Model (HBM). Similarly, "I regularly update myself with current anti-doping guidelines" reflects self-efficacy, another Health Belief Model (HBM) dimension that is crucial in sustaining preventive health behaviours. The perception domain also draws on Social Learning Theory (SLT)'s principle of modelling, since pharmacists' confidence and attitudes are influenced by training, role models, and professional expectations in their environment.

Framework Relationship

In summary, the conceptual framework posits that pharmacists' knowledge of anti-doping directly influences their perception toward anti-doping responsibilities. Knowledge domains such as awareness of agencies, recognition of prohibited substances, and understanding of legal consequences are hypothesized to shape perceptions of professional responsibility, confidence, and readiness to participate in anti-doping advocacy. Moderating variables

(demographics, information access, and barriers) may strengthen or weaken this relationship. This integrated framework thus provides a structured basis for analysing the empirical data collected, bridging the theories (Social Learning Theory (SLT) and Health Belief Model (HBM)), the questionnaire items, and the overarching aim of assessing community pharmacists' knowledge and perception of anti-doping.

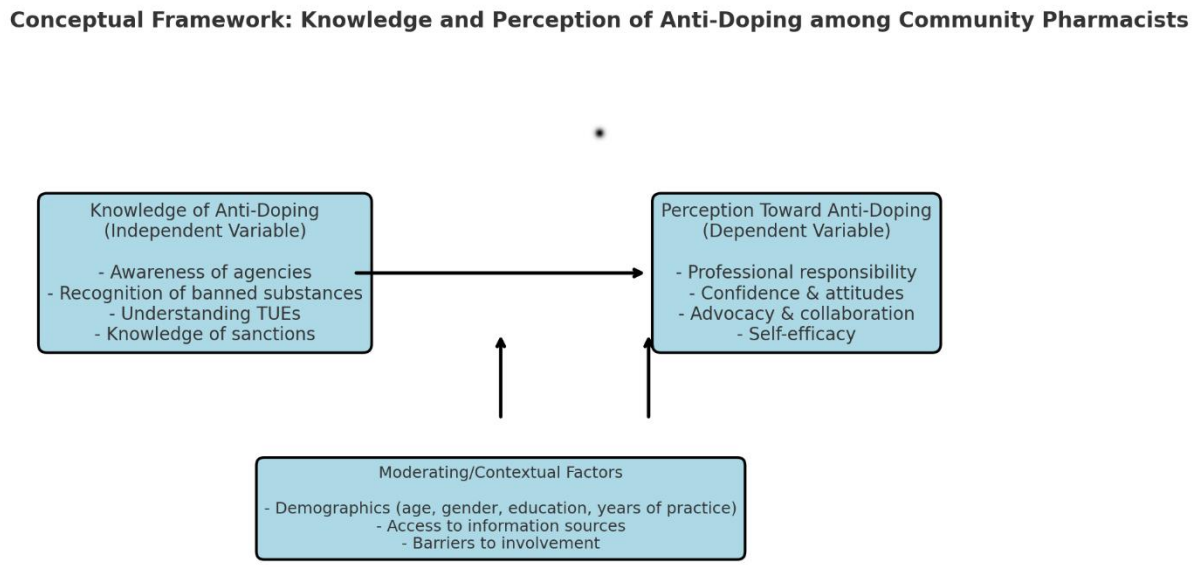

Figure 1.1: Conceptual Framework

1.5 Empirical Review

Empirical work examining pharmacists' knowledge, attitudes and practices (Knowledge, Attitude, and Practice [KAP]) toward anti-doping has increased in recent years, but findings are uneven across regions and professional groups. Across the literature there is a consistent pattern: pharmacists are widely recognized as strategically placed to prevent inadvertent doping because of their medication expertise and accessibility; nonetheless, their factual knowledge of World Anti-Doping Agency (WADA) rules, the Prohibited List and Therapeutic Use Exemption (TUE) procedures is often incomplete, and important practical barriers (limited training, scarce workplace decision tools, unclear role definitions) constrain

translation of knowledge into practice (Greenbaum *et al.*, 2022; Hooper *et al.*, 2019). The studies below synthesize these empirical findings and draw out the implications most relevant to Nigeria and Benin City.

Systematic and scoping reviews conclude that pharmacists possess the clinical capabilities needed to identify and prevent inadvertent doping, but are frequently under-utilized (Greenbaum *et al.*, 2022; Hooper *et al.*, 2019). Where empirical studies have probed practice, two recurring weaknesses appear. First, baseline awareness that medications, over-the-counter (OTC) products and supplements can contain prohibited substances is often present, yet applied knowledge (ability to identify specific banned agents, use decision tools, or navigate TUE procedures) is limited (Lee *et al.*, 2023; Greenbaum *et al.*, 2023). Second, even when pharmacists hold relevant knowledge, self-reported confidence and concrete counselling actions are low because of workplace constraints: lack of access to up-to-date prohibited lists, time pressures in community settings, and absence of formal protocols that incorporate pharmacists into Athlete Support Teams (Greenbaum *et al.*, 2023; Nakajima *et al.*, 2021). These dual shortfalls, knowledge depth and system support frame the central empirical challenge.

Empirical surveys from a number of middle-income countries mirror the pattern seen above but foreground resource and system constraints. For example, a national assessment in Taiwan reported that pharmacists understood the general risk posed by medications and supplements but struggled to identify specific prohibited substances and to use practical decision aids; respondents emphasized the need for structured educational interventions and ready workplace supports (Lee *et al.*, 2023). Similar studies from Malaysia and other settings show reasonable recognition of major classes (anabolic agents, stimulants) but poor performance in nuanced or scenario-based questions that reflect real counselling encounters

(Voravuth *et al.*, 2022). These studies collectively suggest that knowledge gaps are not merely academic but affect real-world decision making and therefore athlete safety (Voravuth *et al.*, 2022; Lee *et al.*, 2023).

Studies conducted in countries with more developed anti-doping structures reveal a different emphasis: the problem is often not absolute lack of knowledge but insufficient confidence, lack of workplace decision tools, and limited routine integration of anti-doping tasks into pharmacists' workflow. Greenbaum *et al.* (2023) used simulated patient encounters in Australia to show that while many pharmacists could deliver either clinical or anti-doping advice, only a small minority (≈11%) provided both thorough clinical care and explicit anti-doping counselling in the same interaction — evidence that pharmacists struggle to combine competing demands in time-constrained settings. The Australian and Japanese literature also highlights logistical and institutional barriers (access to resources, time, clarity of role) that reduce the frequency of proactive counselling despite expressed willingness (Nakajima *et al.*, 2021; Greenbaum *et al.*, 2023). These findings argue for pragmatic workplace solutions—concise decision supports, integrated digital references, and clear role descriptions—alongside education.

Africa presents a heterogeneous empirical picture. Southern Africa (notably South Africa) has comparatively more mature anti-doping institutions that have engaged healthcare professionals in training and pilot athlete-support initiatives (Starzak *et al.*, 2016). Elsewhere on the continent, including East and parts of West Africa, empirical studies consistently report limited technical knowledge among pharmacists and other healthcare workers about the Prohibited List and Therapeutic Use Exemption procedures (Gebregergs Hailu *et al.*, 2021; Kedir *et al.*, 2023; Rotich *et al.*, 2023). These studies also point to broader systemic constraints—weak incorporation of anti-doping into professional curricula, irregular and

short capacity-building events, and low prioritization of pharmacists in national anti-doping plans (Ruwuya *et al.* 2022; Ndasauka *et al.* 2023).

A particularly salient empirical concern in African research is the widespread use of herbal and traditional medicines, which may be contaminated or contain stimulating compounds not declared on labels; several African studies flag this as a unique source of inadvertent doping risk that pharmacists must be trained to assess (Imorou, 2020). Linked to this is the practical reality that in many African communities athletes obtain medications and supplements through informal channels or local vendors, which complicates the pharmacist's gatekeeper role unless pharmacists are proactively integrated into athlete education efforts (Ruwuya *et al.*, 2022).

Direct evidence in Nigeria and West Africa is sparse but signals are concerning. Empirical work specifically measuring Nigerian community pharmacists' anti-doping Knowledge, Attitude, and Practice (KAP) is scarce; most available Nigerian studies investigate athletes' substance use patterns and the broader pharmaceutical landscape rather than pharmacists' anti-doping competence (Akindutire *et al.*, 2012; Akintayo *et al.*, 2017). Studies of Nigerian athletes and professional players reveal prevalent substance use patterns and determinants that create demand for reliable, accessible medication counselling (Akintayo *et al.*, 2017; Akindutire *et al.*, 2012). Parallel research into Nigeria's pharmaceutical system indicates challenges—limited Continuing Professional Development (CPD) coverage for niche public health topics, problems with regulatory enforcement, and constrained collaboration between professional bodies and regulators—which together plausibly reduce pharmacists' access to specialist anti-doping information and the capacity to provide extended athlete counselling (Adigwe *et al.* 2022). Taken together, these strands imply that community pharmacists in Nigeria are likely to face the combined problems of limited formal training, weak

institutional supports, and high local risk (over-the-counter [OTC] and herbal exposures)—a combination that makes targeted empirical study in Benin City both necessary and timely.

Across regions, most empirical studies use cross-sectional surveys (often convenience samples), simulated patient designs, or mixed methods combining surveys with qualitative interviews (Greenbaum *et al.*, 2023; Voravuth *et al.*, 2022; Lee *et al.*, 2023). While these designs yield useful descriptive and exploratory data, they have limitations: cross-sectional Knowledge, Attitude, and Practice (KAP) surveys are prone to social desirability bias (respondents over-reporting willingness or competence), simulated patient studies capture practice under artificial conditions that may not generalize, and few studies have longitudinally evaluated whether Continuing Professional Development (CPD) or curriculum changes produce sustained practice change (Kawaguchi-Suzuki *et al.*, 2021; Greenbaum *et al.*, 2022). Moreover, there is limited harmonization of measurement instruments—different studies use different knowledge items, scenario complexity, and outcome definitions—making direct cross-study comparison challenging. These methodological gaps underline the value of rigorously designed, context-sensitive instruments in the Benin City study that combine factual knowledge items with scenario-based assessments and measures of workplace supports and barriers.

The empirical corpus converges on several actionable conclusions that directly inform the rationale for this study:

1. Pharmacists are well placed to reduce inadvertent doping, but their practical readiness is often undermined by deficits in applied knowledge (specific banned agents, Therapeutic Use Exemption [TUE] navigation) and by workplace constraints (lack of decision tools, time pressures). This is supported by studies from Australia, Taiwan,

Malaysia and various African countries (Greenbaum *et al.*, 2023; Lee *et al.*, 2023; Voravuth *et al.*, 2022; Kedir *et al.*, 2023).

2. Educational interventions matter, but they must be combined with institutional supports. Training alone produces awareness; sustained practice change requires workplace decision aids (quick reference tools), integration into athlete support teams, and clear role mandates—lessons drawn from both high-income and Low- and Middle-Income Country (LMIC) studies (Barkoukis *et al.*, 2022; Kawaguchi-Suzuki *et al.*, 2021; Greenbaum *et al.*, 2022).
3. Regional specificities require local evidence. In West Africa and Nigeria, over-the-counter (OTC) access, herbal medicine use, and informal supply chains create particular risks for inadvertent doping that are not fully captured by studies from other regions (Imorou, 2020; NIGAN *et al.*, 2019). Therefore, local empirical data—like that planned in Benin City—are essential to design feasible, culturally appropriate interventions.
4. Research design should be robust and multifaceted. The literature shows a need for scenario-based knowledge testing, measures of self-efficacy and barriers (to align with theoretical frameworks such as the Health Belief Model [HBM] and Social Learning Theory [SLT]), and attention to measurement reliability—features that should be incorporated into the Benin City survey instrument (Greenbaum *et al.*, 2023; Lee *et al.*, 2023; Bandura, 1977).

Empirical studies recommend several practical steps relevant to the Nigerian context: integrate anti-doping modules into undergraduate pharmacy curricula and Continuing Professional Development (CPD); develop concise workplace decision tools (digital or pocket guides) that allow rapid checking of medications against the World Anti-Doping Agency (WADA) Prohibited List; include pharmacists purposively in national anti-doping

capacity-building events; and design public-facing education (including using social media and online resources) that enables pharmacists to reach athletes where they obtain medications and supplements (Kawaguchi-Suzuki *et al.*, 2021; Roberts, Callahan, and O'Leary, 2017; Greenbaum *et al.*, 2022). African studies further suggest the need to tailor guidance on herbal and traditional products and to involve community pharmacists in community outreach programs that address local supply-chain realities (Ruwuya *et al.*, 2022; Ndasauka and Makwinja, 2023).

1.6 Research Gap

While the literature affirms pharmacists' strategic position in preventing inadvertent doping, three interlocking research gaps persist — and these gaps frame the need for this study in Benin City.

1. Lack of locally specific pharmacist data in Nigeria. Direct, peer-reviewed studies that assess community pharmacists' applied knowledge of World Anti-Doping Agency (WADA) rules, Therapeutic Use Exemption (TUE) procedures, counselling frequency, and workplace supports in Nigeria are scarce. Where Nigerian evidence exists, it more often addresses athlete substance use or broader pharmacy system issues, leaving the precise Knowledge, Attitude, and Practice (KAP) profile of pharmacists largely undocumented (Akindutire *et al.*, 2012; Akintayo and Sunday, 2017; Adigwe *et al.*, 2022).
2. Insufficient measurement of applied competence and behaviour. Many studies report general awareness but do not probe scenario-based decision making, self-efficacy, or actual counselling actions under time constraints — measures that better predict real-world impact (Greenbaum *et al.*, 2023; Lee *et al.*, 2023). Because knowledge alone

does not guarantee practice, instruments that capture procedural skill and workplace feasibility are needed.

3. Contextual gaps for Low- and Middle-Income Countries (LMICs) relating to informal supply chains and herbal remedies. Global tools and trainings often assume regulated pharmaceutical markets; they under-address the realities of over-the-counter (OTC) access, unlabelled herbal products, and informal vendors common in Nigeria and the subregion. Understanding how these contextual features shape pharmacists' counselling possibilities is essential for realistic intervention design.

Addressing these gaps will provide the empirical foundation for tailored education, pragmatic workplace tools, and policy advocacy to integrate pharmacists into national anti-doping architectures.

1.7 Statement of the Problem

Despite international advances in anti-doping regulation and education, pharmacists in Nigeria remain an under-examined and under-utilised resource in the prevention of inadvertent doping. The World Anti-Doping Agency (WADA) Prohibited List and Therapeutic Use Exemption (TUE) mechanisms are complex and frequently updated, demanding practical competence from healthcare providers who advise athletes (David, 2017; Vernec, 2014). Yet, in Nigeria, pharmacy training and continuing education rarely emphasise sports pharmacy or explicit anti-doping competencies; professional linkages between pharmacists and national anti-doping systems are weak; and the local medicine environment — characterised by over-the-counter (OTC) accessibility and common use of herbal products — increases the risk of athletes unintentionally ingesting prohibited substances (Akindutire *et al.*, 2012; Akintayo *et al.*, 2017; Adigwe *et al.*, 2022; Imorou, 2020).

Consequently, athletes who consult community pharmacists may receive incomplete or inconsistent advice, exposing them to sanctions, health harms, and reputational damage. The absence of reliable, local data on pharmacists' knowledge, self-efficacy, and practice behaviour hinders curriculum reform, Continuing Professional Development (CPD) targeting, and policy actions needed to integrate pharmacists into athlete support systems. This study therefore aims to fill that crucial evidence gap by empirically assessing the knowledge, perceptions, and readiness of community pharmacists in Benin City to take on active anti-doping roles — a necessary step for protecting athlete health and upholding the integrity of sport in Nigeria (Hooper *et al.*, 2019; Greenbaum *et al.*, 2022).

1.8 Scope of the Study

This study is directed at gaining insights into community pharmacists' knowledge, perceptions, and experiences related to anti-doping practices as well as their potential contribution to promoting anti-doping awareness in Nigeria. In particular, the following areas will be studied:

1. Demographic

   The study focused on community pharmacists in Nigeria, capturing details such as age, gender, years of practice, academic qualifications, and professional roles (intern, locum, superintendent, or staff pharmacist). This scope enabled an understanding of how differences in demographic background may influence pharmacists' knowledge and attitudes toward anti-doping.

2. Knowledge

   The research investigated pharmacists' awareness of anti-doping, focusing on their familiarity with the language of anti-doping, its objectives, and the core concepts underpinning drug-free sport. It assessed their knowledge of international and national

anti-doping bodies such as the World Anti-Doping Agency (WADA) and the Nigeria Anti-Doping Committee, including their understanding of the role these organizations play in regulating banned substances. Furthermore, it examined pharmacists' knowledge of prohibited substances (e.g., anabolic steroids, stimulants, masking agents), Therapeutic Use Exemptions (TUEs), and the health, social, and legal risks of doping.

3. Perception

   The research examined pharmacists' opinions regarding the seriousness and prevalence of doping in sports, as well as their perceived professional responsibility to provide anti-doping education and guidance to athletes. This scope also included pharmacists' attitudes toward whether anti-doping knowledge should be formally integrated into their practice and Continuing Professional Development (CPD).

4. Information Source

   The study explored where pharmacists acquire their anti-doping knowledge, including undergraduate education, Continuing Professional Development (CPD) programs, textbooks, online platforms, drug reference databases (e.g., Global Drug Reference Online [Global DRO]), seminars, and professional associations. This scope provided an overview of the most utilized and trusted information sources for community pharmacists.

5. Barrier

   The study identified challenges that limit pharmacists' active involvement in anti-doping initiatives. These barriers included lack of specialized training, inadequate access to current anti-doping updates, time limitations within practice, uncertainty about legal/professional responsibility, and low demand for anti-doping services.

1.9 Significance of the Study

This research carries substantial academic, professional, and societal value because it examines an under-explored but strategically vital dimension of sports integrity—the involvement of community pharmacists in anti-doping initiatives. While global sport has witnessed growing concern over inadvertent doping, empirical data from Nigeria remain sparse (Akindutire *et al.*, 2012; Akintayo *et al.*, 2017). By analysing pharmacists' knowledge, perceptions, and potential roles, the study contributes evidence necessary to guide policy, education, and professional practice in a field where pharmacists can serve as critical gatekeepers between athletes and prohibited substances.

Empirical research on pharmacists' anti-doping competence has been largely concentrated in developed countries, with limited representation from sub-Saharan Africa (Hooper *et al.*, 2019; Greenbaum *et al.*, 2022; Kedir *et al.*, 2023). This study therefore fills a key regional gap by providing baseline data on Nigerian pharmacists' understanding of banned substances, Therapeutic Use Exemptions (TUEs), and their professional readiness to counsel athletes. Previous studies among Nigerian athletes revealed poor awareness of doping control procedures and reliance on peer advice rather than qualified professionals (Akindutire *et al.*, 2012; Akintayo and Sunday, 2017). By extending inquiry to pharmacists, this study shifts the focus from athlete behaviour to healthcare-system capacity. The findings will expand scholarly understanding of the "dopogenic environment"—the social and structural conditions that normalise substance misuse in sport—identified by Backhouse *et al.* (2018) and align with calls for multi-sectoral strategies to counter it.

Pharmacists' education is central to sustainable anti-doping efforts. Evidence from Japan, Finland, and Taiwan demonstrates that structured curricular and continuing-education modules markedly improve pharmacists' confidence and competence in athlete counselling

(Shibata *et al.*, 2017; Lemettilä *et al.*, 2021; Lee *et al.*, 2023). Yet such programmes are almost nonexistent in Nigeria. By assessing the sources and adequacy of anti-doping information available to practitioners, this study identifies specific educational deficits. The results can guide faculties of pharmacy and professional bodies in embedding anti-doping content within undergraduate and Continuing Professional Development (CPD) curricula. As Hooper *et al.* (2019) argued, pharmacists' training must evolve beyond conventional therapeutics to encompass sports pharmacy, ethical decision-making, and communication skills tailored to athlete populations. Furthermore, aligning anti-doping instruction with behavioural frameworks such as Bandura's (1977, 1986) Social Learning Theory and Becker's (1974) Health Belief Model can enhance self-efficacy and motivate preventive counselling behaviours among pharmacists (Glanz *et al.*, 2015).

Community pharmacists are among the most accessible health professionals in Nigeria, often serving as first contact for athletes seeking advice or medication. However, research elsewhere shows that pharmacists possess limited applied anti-doping knowledge and infrequently provide related counselling (Greenbaum *et al.*, 2023; Voravuth *et al.*, 2022). By systematically examining Nigerian pharmacists' knowledge gaps and perceived barriers, this study offers evidence to inform professional organisations such as the Pharmaceutical Society of Nigeria (PSN) and the Pharmacists Council of Nigeria (PCN). These bodies can leverage the findings to design Continuing Professional Development (CPD) modules, mentorship programmes, and practice guidelines that clarify pharmacists' responsibilities in anti-doping control. Similar initiatives in Ethiopia and Kenya have demonstrated that targeted professional development enhances pharmacists' engagement with athletes and reduces inadvertent doping risks (Gebregergs Hailu *et al.*, 2021; Rotich *et al.*, 2023). Strengthening pharmacists' advisory role will therefore reinforce both professional relevance and public confidence in pharmacy practice.

From a governance perspective, the study's results have implications for national policy formulation and Nigeria's compliance with World Anti-Doping Agency (WADA) standards. Pharmacists remain an under-utilised component of Athlete Support Personnel, despite international recognition of their potential contribution to doping prevention (David, 2017; Vernec, 2014). Evidence from Malaysia and Japan indicates that when pharmacists are formally integrated into anti-doping frameworks, they can effectively identify high-risk products, provide Therapeutic Use Exemption (TUE) guidance, and enhance athlete literacy (Voravuth *et al.*, 2022; Nakajima *et al.*, 2021). By documenting local realities—such as unregulated supplement markets and weak coordination between pharmacy regulators and the Nigeria Anti-Doping Committee (NADC)—this study offers actionable intelligence for policymakers. Establishing pharmacist representation within NADC structures and mandating anti-doping Continuing Professional Development (CPD) accreditation could strengthen Nigeria's regulatory alignment and overall sports integrity architecture.

Beyond sport, the misuse of performance-enhancing substances constitutes a pressing public-health concern. Doping agents, including anabolic steroids and stimulants, are associated with cardiovascular, hepatic, and psychological complications (Birzniece, 2015). Pharmacists, equipped with accurate information, can mitigate these risks through targeted education and community outreach. According to Rosenstock's (1974) Health Belief Model, health professionals influence behaviour by shaping individuals' perceived susceptibility, severity, benefits, and barriers. Thus, knowledgeable pharmacists can act as credible communicators, promoting informed decision-making among athletes and the public. This contribution extends the pharmacist's role from medication dispenser to health advocate, thereby strengthening social trust in both pharmacy and sport. Moreover, effective pharmacist-led education aligns with global calls to address the dopogenic environment through proactive, preventive engagement (Backhouse *et al.*, 2018).

The study also yields demographic insights that can sharpen intervention design. Variables such as age, gender, years of experience, practice setting, and educational background influence pharmacists' readiness to participate in anti-doping activities (Salih and Abd, 2021; Greenbaum *et al.*, 2023). Analysing these dimensions enables identification of sub-groups requiring tailored educational or policy interventions. For instance, younger or less experienced pharmacists may benefit from mentorship and simulation-based training, while senior pharmacists might serve as anti-doping champions within professional networks. Such targeted strategies will enhance knowledge transfer, ensure equitable capacity building, and optimise resource allocation within the Nigerian pharmacy workforce.

1.10 Aim and Objectives

This study aims to evaluate the knowledge and perception of community pharmacists regarding anti-doping practices in sports, identify gaps in their understanding, and explore opportunities to strengthen their role in doping prevention and athlete support.

1.10.1 Specific Objectives

The specific objectives of this study are to:

1. Assess community pharmacists' knowledge of anti-doping practices, prohibited substances, and relevant anti-doping agencies.
2. Evaluate pharmacists' perceptions of their professional role in promoting anti-doping awareness among athletes.
3. Identify the primary sources from which pharmacists obtain anti-doping information and highlight gaps in continuing education.
4. Explore barriers that limit pharmacists' involvement in anti-doping activities.
5. Determine factors associated with variations in knowledge and perception among community pharmacists regarding anti-doping practices.

CHAPTER TWO

METHODS

2.1 Study Design

The study adopted a cross-sectional prospective design to assess the knowledge and perception of anti-doping among community pharmacists in Benin City, Edo State, Nigeria. This design enabled the collection of data at a single point in time, providing a snapshot of pharmacists' awareness, attitudes, and experiences related to anti-doping. The prospective approach allowed for real-time data collection from participants who met the inclusion criteria, ensuring accuracy and relevance.

2.2 Study Setting

The study was conducted in community pharmacies within Benin City, the capital and largest metropolitan area of Edo State, located in southern Nigeria. Benin City is a significant urban center with an estimated population density of approximately 122.025 people per square kilometer. It serves as a hub for healthcare delivery in the region, attracting pharmaceutical professionals from diverse backgrounds.

Benin City was an ideal setting for the research due to several factors:

- High density of pharmacists, ensuring an adequate pool of participants.
- Access to professional networks and resources, which facilitated engagement and data collection.
- Presence of experienced pharmaceutical professionals, providing a realistic context for assessing knowledge and perceptions.
- Proximity to healthcare facilities and community pharmacies, which was relevant for understanding real-world practice and exposure to anti-doping issues.

The community pharmacy environment in Benin City encompassed retail pharmacies, hospital-based community services, and independent pharmaceutical outlets. Pharmacists in these settings frequently interacted with patients and athletes, making their knowledge of anti-doping regulations critical for promoting safe and ethical medication use.

2.3 Study Population

The target population comprised all registered community pharmacists currently practicing in Benin City. This population included pharmacists working in retail pharmacies who had direct interaction with clients and potential athlete-patients.

2.4 Inclusion and Exclusion Criteria

2.4.1 Inclusion Criteria

- Registered community pharmacists actively practicing in retail pharmacies within Benin City.
- Pharmacists who were willing to participate and provided informed consent.

2.4.2 Exclusion Criteria

- Pharmacy students and pharmacy assistants/technicians.
- Pharmacists exclusively involved in wholesale or administrative roles with no patient interaction.

2.5 Sampling Technique

Convenience sampling was employed due to its practicality and ease of access to participants. Pharmacists who were readily available and willing to participate were selected.

2.6 Sample Size Determination

The Cochran formula for an unknown population was used to calculate the sample size:

$$n_0 = \frac{Z^2 \times P\,(1 - P)}{E^2}$$

Where:

- Z = Z-score at 95% confidence level = 1.96
- P = estimated population proportion = 0.5
- E = margin of error = 0.05

$$n_0 = \frac{(1.96)^2 \times 0.5(1 - 0.5)}{(0.05)^2} = 384.16$$

For a finite population (N = 300 registered community pharmacies in Benin City), the sample size was adjusted:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} = \frac{384.16}{1 + \frac{384.16 - 1}{300}} = 169$$

Thus, the final sample size targeted 169 community pharmacists, ensuring statistical precision and representativeness.

2.7 Data Collection

Data were collected using a self-administered, structured questionnaire, developed from a review of relevant literature. The questionnaire combined closed-ended and 5-point Likert scale questions to measure knowledge, perception, sources of information, and barriers to involvement in anti-doping activities.

The questionnaire was organized into four sections:

- Section A – Demographic Information: Collected data on age, gender, qualifications, duration of practice, and professional position.
- Section B – Knowledge of Anti-Doping: Included closed-ended questions (Yes, No, I don't know) regarding awareness of anti-doping agencies, banned substances, pharmacists' roles, and legal consequences.
- Section C – Perception of Anti-Doping: Used a 5-point Likert scale (Strongly Agree to Strongly Disagree) to assess pharmacists' attitudes toward anti-doping and professional responsibility.
- Section D – Sources of Information and Barriers: Identified where pharmacists obtained anti-doping information and the challenges, they faced in providing guidance.

Questionnaires were distributed during Association of Community Pharmacists of Nigeria (ACPN) approved gatherings with an expected completion time of 5–10 minutes per participant.

2.8 Data Analysis

Collected data were entered into Microsoft Excel Window 10 and thereafter, transferred to Statistical Package of Social Sciences (SPSS) version 22 for analysis. The reliability of the questionnaire was evaluated using Cronbach's alpha. A Cronbach alpha of 0.85 indicating good reliability.

Descriptive statistics (frequencies, percentages) summarized demographic characteristics, knowledge, and perception levels. Pearson's Chi-square tests were used to assess associations between socio-demographic factors and participants' responses, with significance set at $p <$

0.05. Knowledge and perception scores were computed by summing responses for each objective and classifying them into predefined categories.

- Knowledge: Poor (0–40%), Fair (41–60%), Good (61–100%)
- Perception: Positive (61–100%), Neutral (41–60%), Negative (0–40%)

Logistic regression was done to determine the relationship between knowledge and perceptions of antidoping. Results were considered statistically significant at $P < 0.05$.

2.9 Outcome Measures

The primary outcomes measured were the knowledge and perception of anti-doping among community pharmacists.

Secondary outcomes included:

- Knowledge of antidoping
- Perception of pharmacist to anti-doping
- Sources of information on anti-doping.
- Barriers limiting pharmacists' involvement in anti-doping activities.

2.10 Ethical Consideration

Ethical approval was obtained from the Research Ethics Committee of the Faculty of Pharmacy, University of Benin. Participants were fully informed about the study's purpose, assured of their anonymity, and participation was voluntary. Only non-identifiable data were collected, and participants had access to the researcher's contact information for further inquiries.

CHAPTER THREE

RESULTS

3.1 Socio-Demographic Characteristics of Respondents

The study sample consisted of 169 community pharmacists which indicate 100% response rate. The majority (65.7%) of respondents were male, primarily falling within the 26–35 years age bracket (66.9%). Most pharmacists held a Bachelor of Pharmacy (BPharm) degree (67.5%)4. In terms of experience, over half (53.3%) had been practicing between 1–5 years. Finally, the vast majority (92.3%) of participants held a senior position, identified as either Superintendent or Chief Pharmacist. The detailed breakdown of age, gender, qualification, duration of practice, and position is in Table 3.1

Table 3.1: Socio-demographic characteristics of respondents

Characteristics	Frequency	Percentage (%)
Age (years)		
20–25	6	3.6
26–30	59	34.9
31–35	54	32.0
36–40	24	14.2
41 and above	26	15.4
Gender		
Male	111	65.7
Female	58	34.3
Qualification		
BPharm	114	67.5
PharmD	47	27.8
Masters	8	4.7
Duration of Practice		
Less than 1 year	14	8.3
1–5 years	90	53.3
6–10 years	53	31.4
More than 10 years	12	7.1
Position in Pharmacy		
Superintendent/Chief Pharmacist	156	92.3
Intern Pharmacist	8	4.7
Locum Pharmacist	5	3.0
Total	**169**	**100**

3.2 Knowledge Of Anti-Doping Among Community Pharmacists

The overall level of anti-doping knowledge among community pharmacists was predominantly fair (53.3%), while 42.6% demonstrated poor knowledge Figure 3.1. Analysis by duration of professional practice revealed three domains with statistically significant associations. A highly significant relationship was observed regarding awareness of whether beta-blockers are prohibited in all sports ($p = 0.002$), with the most experienced pharmacists (>10 years) showing the greatest level of uncertainty (66.7% responded “I don’t know”). Another significant association was found concerning the inclusion of anti-doping content in Continuing Professional Development (CPD) programmes ($p = 0.006$), where the >10 years group recorded the highest proportion of affirmative responses (58.3%). Similarly, awareness of the legal implications for pharmacists involved in doping violations varied significantly across experience groups ($p = 0.006$), with the least experienced group (<1 year) most frequently acknowledging awareness (92.9%). The detailed distribution of knowledge levels and corresponding significance values across practice-duration groups is presented in Table 3.2.

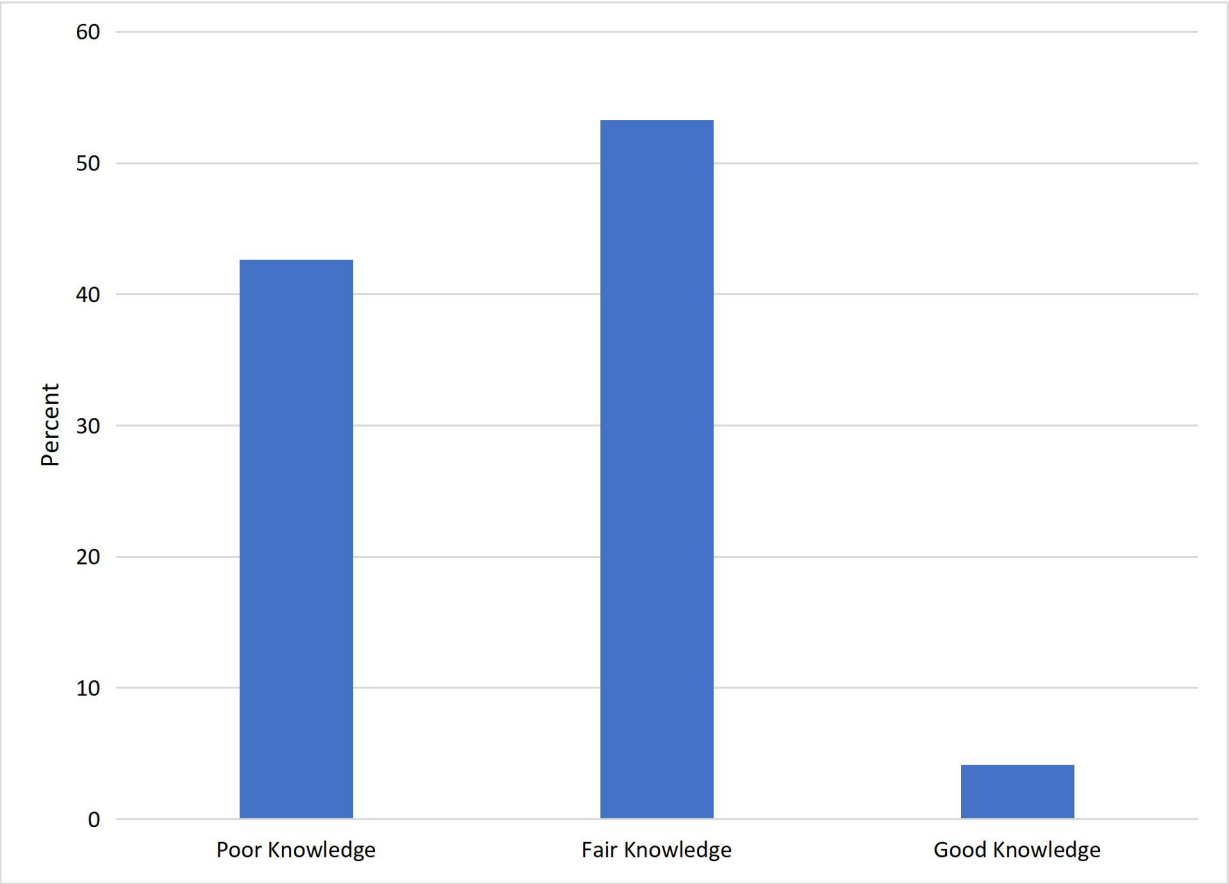

Figure 3.1: Knowledge of anti-doping among community pharmacists

3.3 Perception Of Anti-Doping Among Community Pharmacists

As shown in Figure 3, the majority of respondents (75.1%) demonstrated a positive perception toward anti-doping, while 23.7% had a neutral perception and only 1.2% exhibited a negative perception.

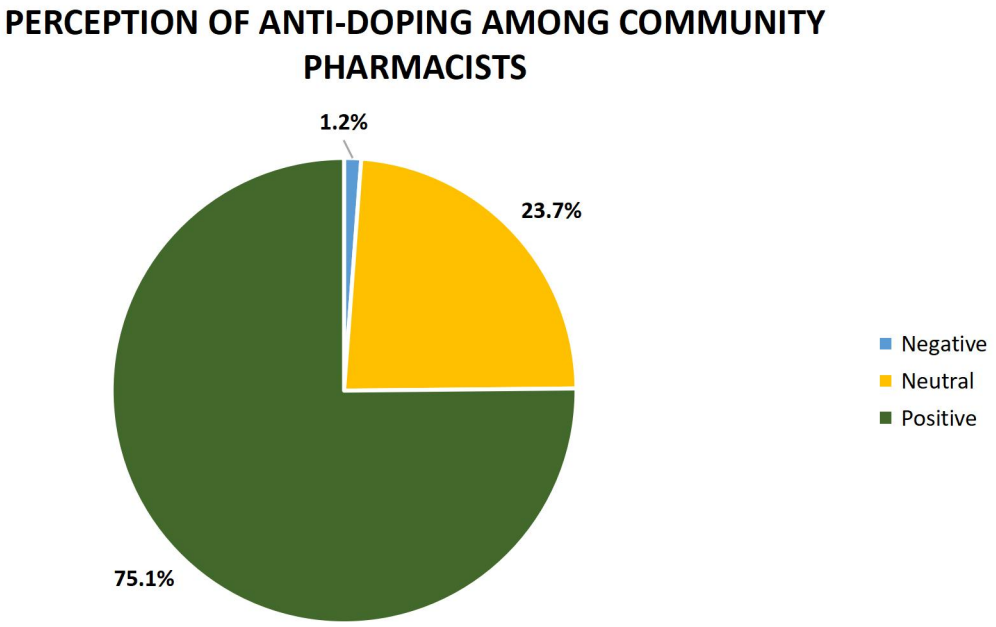

Figure 3.2 Perception of anti-doping among community pharmacists

Table 3.2 Knowledge of anti-doping among community pharmacists by duration of practice

Variable	Response category	< 1 year (n,%)	1–5 years (n,%)	6–10 years (n,%)	> 10 years (n,%)	Total n	p-value
Aware of anti-doping agency?	Yes	10 (71.4%)	38 (42.2%)	28 (52.8%)	8 (66.7%)	84	.144
	No	1 (7.1%)	38 (42.2%)	19 (35.8%)	2 (16.7%)	60	
	I don't know	3 (21.4%)	14 (15.6%)	6 (11.3%)	2 (16.7%)	25	
	Total (n)	14	90	53	12	169	
Global anti-doping standards?	Yes	13 (92.9%)	77 (85.6%)	44 (83.0%)	8 (66.7%)	142	.580
	No	1 (7.1%)	8 (8.9%)	5 (9.4%)	3 (25.0%)	17	
	I don't know	0 (0.0%)	5 (5.6%)	4 (7.5%)	1 (8.3%)	10	
	Total (n)	14	90	53	12	169	
Otcs contain banned substances?	Yes	12 (85.7%)	79 (89.8%)	47 (88.7%)	9 (75.0%)	147	.182
	No	0 (0.0%)	5 (5.7%)	1 (1.9%)	0 (0.0%)	6	
	I don't know	2 (14.3%)	4 (4.5%)	5 (9.4%)	3 (25.0%)	14	
	Total (n)	14	88	53	12	167	
Testosterone banned?	Yes	14 (100.0%)	61 (67.8%)	45 (84.9%)	8 (66.7%)	128	.079
	No	0 (0.0%)	6 (6.7%)	3 (5.7%)	1 (8.3%)	10	
	I don't know	0 (0.0%)	23 (25.6%)	5 (9.4%)	3 (25.0%)	31	
	Total (n)	14	90	53	12	169	
Pharmacists can help prevent doping?	Yes	11 (78.6%)	84 (93.3%)	51 (96.2%)	11 (91.7%)	157	.051
	No	0 (0.0%)	2 (2.2%)	2 (3.8%)	0 (0.0%)	4	
	I don't know	3 (21.4%)	4 (4.4%)	0 (0.0%)	1 (8.3%)	8	
	Total (n)	14	90	53	12	169	
Know where to find wada list?	Yes	5 (35.7%)	18 (20.0%)	9 (17.0%)	3 (25.0%)	35	.128
	No	8 (57.1%)	61 (67.8%)	30 (56.6%)	5 (41.7%)	104	
	I don't know	1 (7.1%)	11 (12.2%)	14 (26.4%)	4 (33.3%)	30	
	Total (n)	14	90	53	12	169	
Are all supplements safe?	Yes	10 (71.4%)	68 (75.6%)	33 (62.3%)	12 (100.0%)	123	.057
	No	3 (21.4%)	6 (6.7%)	5 (9.4%)	0 (0.0%)	14	
	I don't know	1 (7.1%)	16 (17.8%)	15 (28.3%)	0 (0.0%)	32	
	Total (n)	14	90	53	12	169	
Insulin without tue?	No	14 (100.0%)	53 (58.9%)	36 (67.9%)	8 (66.7%)	111	.082
	Yes (	0 (0.0%)	8 (8.9%)	3 (5.7%)	2 (16.7%)	13	
	I don't know	0 (0.0%)	29 (32.2%)	14 (26.4%)	2 (16.7%)	45	
	Total n	14	90	53	12	169	

Variable	Response category	< 1 year (n,%)	1–5 years (n,%)	6–10 years (n,%)	> 10 years (n,%)	Total n	p-value
Beta-blockers prohibited in all sports?	No	10 (71.4%)	40 (44.4%)	20 (38.5%)	4 (33.3%)	74	.002
	Yes	4 (28.6%)	9 (10.0%)	2 (3.8%)	0 (0.0%)	15	
	I don't know	0 (0.0%)	41 (45.6%)	30 (57.7%)	8 (66.7%)	79	
	Total n	14	90	52	12	168	
Rely solely on medication labels?	No	13 (92.9%)	60 (66.7%)	40 (75.5%)	9 (75.0%)	122	.224
	Yes	1 (7.1%)	17 (18.9%)	10 (18.9%)	3 (25.0%)	31	
	I don't know	0 (0.0%)	13 (14.4%)	3 (5.7%)	0 (0.0%)	16	
	Total n	14	90	53	12	169	
Anti-doping in cpd training?	Yes	7 (50.0%)	23 (25.6%)	9 (17.0%)	7 (58.3%)	46	.006
	No	7 (50.0%)	46 (51.1%)	37 (69.8%)	3 (25.0%)	93	
	I don't know	0 (0.0%)	21 (23.3%)	7 (13.2%)	2 (16.7%)	30	
	Total (n)	14	90	53	12	169	
Pharmacist face legal consequences?	Yes	13 (92.9%)	67 (74.4%)	33 (62.3%)	9 (75.0%)	122	.006
	No	1 (7.1%)	3 (3.3%)	3 (5.7%)	3 (25.0%)	10	
	I don't know	0 (0.0%)	20 (22.2%)	17 (32.1%)	0 (0.0%)	37	
	Total (n)	14	90	53	12	169	
Only athletes responsible?	No	11 (78.6%)	59 (65.6%)	36 (67.9%)	11 (91.7%)	117	.468
	Yes	3 (21.4%)	21 (23.3%)	12 (22.6%)	0 (0.0%)	36	
	I don't know	0 (0.0%)	10 (11.1%)	5 (9.4%)	1 (8.3%)	16	
	Total n	14	90	53	12	169	
Know how to report doping violation?	Yes	1 (7.1%)	12 (13.3%)	4 (7.5%)	1 (8.3%)	18	.856
	No	8 (57.1%)	49 (54.4%)	35 (66.0%)	7 (58.3%)	99	
	I don't know	5 (35.7%)	29 (32.2%)	14 (26.4%)	4 (33.3%)	52	
	Total (n)	14	90	53	12	169	

3.4 Knowledge Of Anti-Doping Among Community Pharmacists By Position

Analysis of anti-doping knowledge by position in pharmacy revealed one statistically significant difference in awareness of whether beta-blockers are prohibited in all sports ($p = 0.006$). Intern Pharmacists were the most knowledgeable (87.5% "No"), while Superintendent/Chief Pharmacists showed the highest uncertainty (50.3% "I Don't Know"). Although not significant, Locum Pharmacists demonstrated strong core knowledge, with 100.0% correctly identifying testosterone as banned and insulin as requiring a TUE. They also reported the highest rate of CPD-based anti-doping education (60.0%) compared to 25.6% among Superintendent/Chief Pharmacists. Across all groups, a consistent procedural gap remained: most respondents were unsure of where to find the WADA Prohibited List, particularly Intern Pharmacists (87.5%), and few knew how to report a doping violation. Full details of knowledge responses by position are presented in Table 3.3.

Table 3.3: Knowledge of Anti-doping among pharmacists by position

Knowledge Item	Position	No (%)	Yes (%)	I Don't Know (%)	Total (n)	p-value
Aware of Anti-Doping Agency?	Superintendent/Chief	36.5	48.7	14.7	156	.576
	Intern Pharmacist	25.0	50.0	25.0	8	
	Locum Pharmacist	20.0	80.0	0.0	5	
Responsible for Global Standards?	Superintendent/Chief	10.9	84.0	5.1	156	.425
	Intern Pharmacist	0.0	87.5	12.5	8	
	Locum Pharmacist	0.0	80.0	20.0	5	
OTCs Contain Banned Substances?	Superintendent/Chief	3.9	88.3	7.8	154	.425
	Intern Pharmacist	0.0	75.0	25.0	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Testosterone Banned?	Superintendent/Chief	6.4	74.4	19.2	156	.637
	Intern Pharmacist	0.0	87.5	12.5	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Can Pharmacists Help Prevent Doping?	Superintendent/Chief	2.6	93.6	3.8	156	.089
	Intern Pharmacist	0.0	75.0	25.0	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Know Where to Find WADA List?	Superintendent/Chief	59.6	21.2	19.2	156	.403
	Intern Pharmacist	87.5	12.5	0.0	8	
	Locum Pharmacist	80.0	20.0	0.0	5	
Are All Dietary Supplements Safe?	Superintendent/Chief	71.8	19.9	156	156	.678
	Intern Pharmacist	12.5	75.0	12.5	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Insulin without TUE?	Superintendent/Chief	63.5	28.8	156	156	.202
	Intern Pharmacist	12.5	87.5	0.0	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Beta-blockers Prohibited in All Sports?	Superintendent/Chief	41.9	50.3	155	155	.006
	Intern Pharmacist	12.5	87.5	0.0	8	
	Locum Pharmacist	40.0	40.0	20.0	5	
Rely Solely on Medication Labels?	Superintendent/Chief	71.2	10.3	156	156	.555
	Intern Pharmacist	25.0	75.0	0.0	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Anti-doping in CPD Training?	Superintendent/Chief	25.6	18.6	156	156	.274
	Intern Pharmacist	62.5	37.5	0.0	8	
	Locum Pharmacist	20.0	60.0	20.0	5	

Pharmacist Face Legal Consequences?	Superintendent/Chief	70.5 (Yes)	23.7 (IDK)	156	156	.306
	Intern Pharmacist	12.5	87.5	0.0	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Only Athletes Responsible?	Superintendent/Chief	67.3	10.3	156	156	.415
	Intern Pharmacist	12.5	87.5	0.0	8	
	Locum Pharmacist	0.0	100.0	0.0	5	
Know How to Report Doping Violation?	Superintendent/Chief	10.3	31.4	156	156	.941
	Intern Pharmacist	62.5	12.5	25.0	8	
	Locum Pharmacist	60.0	20.0	20.0	5	

3.5 Knowledge Of Anti-Doping Among Community Pharmacists By Qualification

Table 3.4 shows the perceptions of pharmacists across qualification levels. A large proportion of respondents with a Bachelor of Pharmacy (BPharm) degree (47.4%) and Doctor of Pharmacy (PharmD) degree (40.4%) strongly agreed that community pharmacists play an important role in educating athletes about anti-doping regulations ($p = .001$). However, only 6.2% of BPharm holders and 6.4% of PharmD holders strongly agreed that they were confident in their knowledge of substances prohibited by the World Anti-Doping Agency ($p = .036$). While 46.5% of BPharm and 38.3% of PharmD respondents agreed that providing anti-doping advice should be part of their professional responsibility, fewer (7.9% of BPharm and 12.8% of PharmD) strongly agreed that pharmacists are adequately trained to counsel athletes ($p = .002$). Awareness of the consequences of dispensing performance-enhancing drugs was generally high, with 55.3% of BPharm and 59.6% of PharmD respondents strongly agreeing that such actions could harm athletes, though this difference was not significant ($p = .850$). Only 18.4% of BPharm and 27.7% of PharmD respondents agreed that they regularly update themselves with anti-doping guidelines, while 66.7% and 48.9%, respectively, strongly agreed that there is a need for more training programs ($p = .013$). Overall, more than half of BPharm (51.8%) and PharmD (51.1%) respondents strongly agreed that pharmacists should collaborate with sports authorities to promote clean sport ($p = .017$).

Table 3.4: Knowledge of Anti-Doping Among Community Pharmacists by Qualification

Knowledge Item	Qualification	No (%)	Yes (%)	I Don't Know (%)	Total (n)	p-value
Aware of Anti-Doping Agency?	BPharm	39.5	45.6	14.9	114	.401
	PharmD	29.8	57.4	12.8	47	
	Masters	12.5	62.5	25.0	8	
Responsible for Global Standards (e.g., WADA)?	BPharm	11.4	82.5	6.1	114	.829
	PharmD	6.4	87.2	6.4	47	
	Masters	12.5	75.0	12.5	8	
OTCs Contain Banned Substances?	BPharm	4.4	85.1	10.5	112	.692
	PharmD	2.1	91.5	6.4	47	
	Masters	0.0	100.0	0.0	8	
Testosterone Classified as Banned?	BPharm	5.3	71.9	22.8	114	.257
	PharmD	6.4	85.1	8.5	47	
	Masters	12.5	75.0	12.5	8	
Pharmacists Can Help Prevent Doping?	BPharm	1.8	95.6	2.6	114	.170
	PharmD	4.3	85.1	10.6	47	
	Masters	0.0	100.0	0.0	8	
Know Where to Find WADA List?	BPharm	66.7	14.9	18.4	114	.030
	PharmD	55.3	31.9	12.8	47	
	Masters	25.0	37.5	37.5	8	
All Dietary Supplements Safe?	BPharm	67.5	10.5	22.0	114	.001
	PharmD	61.7	6.4	31.9	47	
	Masters	37.5	0.0	62.5	8	
Insulin Without TUE?	BPharm	62.3	7.9	29.8	114	.007
	PharmD	76.6	2.1	21.3	47	
	Masters	50.0	25.0	25.0	8	
Beta-blockers Prohibited in All Sports?	BPharm	39.8	8.0	52.2	113	.024
	PharmD	48.9	17.0	34.0	47	
	Masters	25.0	25.0	50.0	8	
Rely Solely on Medication Labels?	BPharm	21.1	68.4	10.5	114	.430
	PharmD	10.6	80.9	8.5	47	
	Masters	25.0	75.0	0.0	8	
Anti-doping in CPD Training?	BPharm	52.6	26.3	21.1	114	.064
	PharmD	53.2	34.0	12.8	47	

	Masters	100.0	0.0	0.0	8	
Pharmacist Face Legal Consequences?	BPharm	7.0	69.3	23.7	114	.718
	PharmD	4.3	76.6	19.1	47	
	Masters	0.0	87.5	12.5	8	
Only Athletes Responsible for Compliance?	BPharm	20.2	69.3	10.5	114	.276
	PharmD	25.5	68.1	6.4	47	
	Masters	37.5	62.5	0.0	8	
Know How to Report Doping Violation?	BPharm	61.4	10.5	28.1	114	.642
	PharmD	51.1	12.8	36.2	47	
	Masters	62.5	0.0	37.5	8	

3.6 Perception Of Community Pharmacists On Anti-Doping By Duration Of Practice

The analysis revealed a statistically significant association between confidence in knowledge of WADA substances and duration of practice ($p = 0.022$), with the 6–10 years group recording the highest proportion of disagreement (39.6%). Similarly, pharmacists with over 10 years of experience reported the highest level of disagreement (75.0%) concerning adequate training to counsel athletes. Another significant association was identified for the need for additional anti-doping training programs ($p = 0.050$), where near-universal agreement was observed among pharmacists with 6–10 years (100.0%) and 1–5 years (97.8%) of practice experience. Detailed findings are presented in Table 3.4.

Table 3.5: Perception of Community Pharmacists on Anti-Doping by Duration of Practice

Variable	Duration of Practice	SD/D (%)	N (%)	Agree/S (%)	Total (n)	p-value
I believe community pharmacists play an important role in educating athletes about anti-doping regulations	Less than 1 year	0.0	7.1	92.8	14	.053
	1-5 years	0.0	7.8	92.2	90	
	6-10 years	7.5	13.2	79.2	53	
	More than 10 years	0.0	0.0	100.0	12	
I am confident in my knowledge of substances prohibited by the World Anti-Doping Agency (WADA)	Less than 1 year	28.6	28.6	42.8	14	.022
	1-5 years	21.3	46.1	32.5	89	
	6-10 years	39.6	26.4	34.0	53	
	More than 10 years	33.3	41.7	25.0	12	
Providing anti-doping advice should be part of a community pharmacist's professional responsibility	Less than 1 year	0.0	7.1	92.9	14	.393
	1-5 years	3.3	10.0	86.6	90	
	6-10 years	7.5	13.2	79.2	53	
	More than 10 years	0.0	0.0	100.0	12	
Community pharmacists are adequately trained to counsel athletes on doping-related issues	Less than 1 year	50.0	14.3	35.7	14	.086
	1-5 years	38.9	34.4	26.7	90	
	6-10 years	43.4	17.0	39.6	53	
	More than 10 years	75.0	8.3	16.7	12	
Dispensing performance-enhancing substances without proper guidance can harm an athlete's career and health	Less than 1 year	7.1	0.0	92.8	14	.547
	1-5 years	3.3	4.4	92.2	90	
	6-10 years	0.0	0.0	100.0	53	
	More than 10 years	0.0	0.0	100.0	12	
I regularly update myself with current anti-doping guidelines and banned substances lists	Less than 1 year	35.7	21.4	42.9	14	.613
	1-5 years	43.3	35.6	21.1	90	
	6-10 years	37.7	37.7	24.6	53	
	More than 10 years	41.7	41.7	16.7	12	
There is a need for more anti-doping training programs for pharmacists	Less than 1 year	0.0	7.1	92.9	14	.050
	1-5 years	0.0	2.2	97.8	90	
	6-10 years	0.0	0.0	100.0	53	
	More than 10 years	0.0	8.3	91.7	12	
Athletes frequently consult community	Less than 1 year	14.3	42.9	42.8	14	.251
	1-5 years	20.0	27.8	52.2	90	
	6-10 years	18.9	30.2	50.9	53	

pharmacists regarding supplements and medications	More than 10 years	33.3	0.0	66.7	12	
I feel prepared to identify and advise against the use of substances that may lead to doping violations	Less than 1 year	7.1	21.4	71.4	14	.098
	1-5 years	25.5	21.1	53.3	90	
	6-10 years	34.0	17.0	49.0	53	
	More than 10 years	8.3	25.0	66.6	12	
Pharmacists should collaborate with sports authorities to promote clean sport and prevent doping	Less than 1 year	7.1	0.0	92.9	14	.499
	1-5 years	3.3	8.9	87.8	90	
	6-10 years	0.0	3.8	96.3	53	
	More than 10 years	0.0	8.3	91.7	12	

NB;

SD = Strongly Disagree D = Disagree N = Neutral A = Strongly Agree

3.7 Perception Of Community Pharmacists On Anti-Doping By Position

The analysis of pharmacists' perceptions toward anti-doping, categorized by their position in the pharmacy, revealed a high acknowledgment of professional responsibility. Both Locum Pharmacists and Superintendent/Chief Pharmacists demonstrated near-complete agreement (100.0% and 95.6%, respectively) that dispensing performance-enhancing substances without proper guidance could negatively affect an athlete's health and career. All Locum Pharmacists (100.0%) agreed that providing anti-doping advice forms part of their professional duty. self-reported competence was notably lower among Intern Pharmacists, with only 12.5% expressing confidence in their knowledge of WADA-regulated substances. A statistically significant difference ($p = 0.043$) was observed in the frequency of updating anti-doping knowledge, where Locum Pharmacists reported the highest rate of regular self-updating (80.0%), compared to Intern Pharmacists (12.5%). The detailed perception results are in Table 3.5.

Table 3.6: Perception of Community Pharmacists on Anti-Doping by Position

Variable	Position	SD/ D(%)	N (%)	Agree/SA (%)	Total (n)	p-value
I believe community pharmacists play an important role in educating athletes about anti-doping regulations	Superintendent/ Chief Pharmacist	2.6	9.0	88.4	156	.200
	Intern Pharmacist	0.0	12.5	87.5	8	
	Locum Pharmacist	0.0	0.0	100.0	5	
I am confident in my knowledge of substances prohibited by the World Anti-Doping Agency (WADA)	Superintendent/ Chief Pharmacist	28.4	38.7	33.0	155	.264
	Intern Pharmacist	37.5	50.0	12.5	8	
	Locum Pharmacist	20.0	0.0	80.0	5	
Providing anti-doping advice should be part of a community pharmacist's professional responsibility	Superintendent/ Chief Pharmacist	4.5	9.0	86.5	156	.847
	Intern Pharmacist	0.0	25.0	75.0	8	
	Locum Pharmacist	0.0	20.0	80.0	5	
Community pharmacists are adequately trained to counsel athletes on doping-related issues	Superintendent/ Chief Pharmacist	42.9	26.3	30.8	156	.834
	Intern Pharmacist	62.5	0.0	37.5	8	
	Locum Pharmacist	40.0	40.0	20.0	5	
Dispensing performance-enhancing substances without proper guidance can harm an athlete's career and health	Superintendent/ Chief Pharmacist	1.9	2.6	95.6	156	.184
	Intern Pharmacist	12.5	0.0	87.5	8	
	Locum Pharmacist	0.0	0.0	100.0	5	
I regularly update myself with current anti-doping guidelines and banned substances lists.	Superintendent/ Chief Pharmacist	40.4	37.2	22.4	156	.043
	Intern Pharmacist	62.5	25.0	12.5	8	
	Locum Pharmacist	20.0	0.0	80.0	5	

There is a need for more anti-doping training programs for pharmacists	Superintendent/ Chief Pharmacist	0.0	1.9	98.1	156	.150
	Intern Pharmacist	0.0	12.5	87.5	8	
	Locum Pharmacist	0.0	0.0	100.0	5	
Athletes frequently consult community pharmacists regarding supplements and medications.	Superintendent/ Chief Pharmacist	20.5	26.9	52.5	156	.303
	Intern Pharmacist	12.5	12.5	75.0	8	
	Locum Pharmacist	20.0	80.0	0.0	5	
I feel prepared to identify and advise against the use of substances that may lead to doping violations.	Superintendent/ Chief Pharmacist	26.3	20.5	53.2	156	.365
	Intern Pharmacist	12.5	25.0	62.5	8	
	Locum Pharmacist	20.0	0.0	80.0	5	
Pharmacists should collaborate with sports authorities to promote clean sport and prevent doping.	Superintendent/ Chief Pharmacist	1.9	7.1	91.0	156	.285
	Intern Pharmacist	12.5	0.0	87.5	8	
	Locum Pharmacist	0.0	0.0	100.0	5	

NB;

SD = Strongly Disagree, D = Disagree, N = Neutral, SA = Strongly Agree

3.8 Perception Of Community Pharmacists On Anti-Doping By Qualification

Table 3.7 presents the perception of pharmacists on anti-doping according to their qualification, Significant associations ($p < 0.05$) were observed in pharmacists' perception of their role in athlete education ($p = .001$), confidence in knowledge of WADA-prohibited substances ($p = .036$), adequacy of training to counsel athletes ($p = .002$), regular updating with anti-doping guidelines ($p = .000$), need for additional training ($p = .013$), and collaboration with sports authorities ($p = .017$). Pharmacists with higher qualifications (PharmD and Masters) were generally more likely to agree that pharmacists play an important role in athlete education, require more anti-doping training, and should collaborate with sports authorities.

Table 3.7: Perception of Community Pharmacists on Anti-Doping by Qualification

Perception Item	Qualification	SD/D(%)	N (%)	SA/A (%)	Total (n)	p-value
Community pharmacists play an important role in educating athletes	BPharm	0.0	11.4	88.6	114	.001
	PharmD	8.5	4.3	87.2	47	
	Masters	0.0	0.0	100.0	8	
Confident in knowledge of WADA-prohibited substances	BPharm	32.7	43.4	23.9	113	.036
	PharmD	38.3	23.4	38.3	47	
	Masters	0.0	50.0	50.0	8	
Providing anti-doping advice is part of pharmacists' professional responsibility	BPharm	3.5	8.8	87.7	114	.201
	PharmD	8.5	10.6	80.9	47	
	Masters	0.0	25.0	75.0	8	
Community pharmacists are adequately trained to counsel athletes	BPharm	46.5	24.6	28.9	114	.002
	PharmD	44.7	17.0	38.3	47	
	Masters	0.0	87.5	12.5	8	
Dispensing performance-enhancing substances without guidance harms athletes	BPharm	8.8	3.5	87.7	114	.850
	PharmD	0.0	0.0	100.0	47	
	Masters	0.0	0.0	100.0	8	
Regularly updates self with anti-doping guidelines	BPharm	36.8	44.7	18.4	114	.000
	PharmD	57.5	8.5	34.0	47	
	Masters	0.0	62.5	37.5	8	
Need more anti-doping training programs for pharmacists	BPharm	0.0	3.5	96.5	114	.013

	PharmD	0.0	0.0	100.0	47	
	Masters	0.0	0.0	100.0	8	
Athletes frequently consult pharmacists	BPharm	20.2	27.2	52.6	114	.640
	PharmD	21.3	23.4	55.3	47	
	Masters	12.5	62.5	25.0	8	
Feels prepared to advise against doping violations	BPharm	27.2	23.7	49.1	114	.176
	PharmD	31.9	12.8	55.3	47	
	Masters	37.5	12.5	50.0	8	
Pharmacists should collaborate with sports authorities	BPharm	3.5	9.6	86.9	114	.017
	PharmD	0.0	0.0	100.0	47	
	Masters	0.0	0.0	100.0	8	

3.9: Sources Of Information For Pharmacists On Anti-Doping

Analysis of pharmacists' sources of anti-doping information revealed a predominant reliance on online and formal learning channels. As shown in Figure 3, Online academic resources accounted for the largest proportion of responses (32.5%), followed by Continuing Professional Development (CPD) programs (18.7%) and social media platforms (17.8%). Professional textbooks contributed 16.4%, while professional colleagues accounted for 13.6%. The "Others" category represented 0.9% of total responses. A total of 326 responses were recorded across 169 participants for multiple responses to sources of information. The percentages are based on the total number of responses.

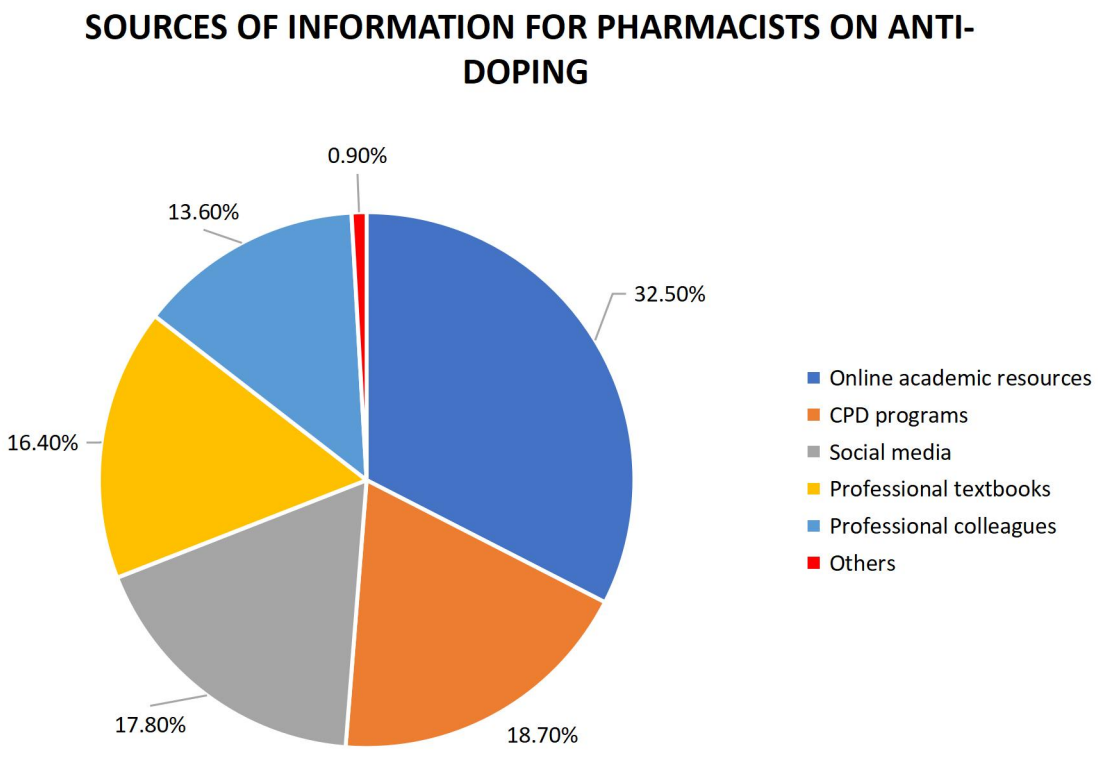

Figure 3.3: Sources of information for pharmacists on anti-doping

3.10 Specific Access To Anti-Doping Resources

The analysis of pharmacists' access to specific anti-doping resources reveals significant gaps in procedural knowledge and training. A large majority of pharmacists (81.1%) reported that they have never accessed the World Anti-Doping Agency (WADA) website for information, which is the official global source. Similarly, 68.0% of respondents stated they have not used drug databases or mobile apps (like Global DRO) to check the doping status of medications. The majority (65.1%) reported that they have not received anti-doping information through workshops, seminars, or CPD programs. Despite these barriers to accessing official and structured information, a plurality of pharmacists (45.6%) reported that they do rely on professional pharmacy associations or regulatory bodies for anti-doping updates and guidelines.

Table 3.8 Specific access to anti-doping resources

Variable	Response	Percentage (%)
Have you ever accessed the World Anti-Doping Agency (WADA) website for information on banned substances?	No	81.1
	Yes	16.6
	I Don't Know	2.4
Do you rely on professional pharmacy associations or regulatory bodies for anti-doping updates and guidelines?	No	41.4
	Yes	45.6
	I Don't Know	13.0
Have you used drug databases or mobile apps (e.g., Global DRO, Drugs.com) to check the doping status of medications?	No	68.0
	Yes	28.4
	I Don't Know	3.6
Have you received anti-doping information through workshops, seminars, or continuing professional development (CPD) programs?	No	65.1
	Yes	32.0
	I Don't Know	3.0

3.11 Barriers To Anti-Doping Involvement

The analysis of barriers to anti-doping involvement reveals that the most significant obstacles are systemic and educational.88.8% of pharmacists feel that a lack of training or education limits their ability to provide anti-doping advice, establishing this as the top deficiency. This is closely followed by resource issues, with 79.9% indicating limited access to up-to-date anti-doping information as a major challenge in their practice. External factors also play a large role, as 63.3% report that the lack of demand or questions from athletes discourages their involvement. Internal operational barriers are more equally divided, with a slight majority of 50.3% agreeing that time constraints in daily duties prevent engagement, versus 46.2% who disagree. Regarding professional certainty, 47.3% feel sure about their legal or professional responsibility, but a substantial 42.6% are unsure, highlighting a need for clearer professional guidelines. (Table 3.7)

Table 3.9 Barriers to anti-doping involvement

Variable	Response	Percentage (%)
Do you feel that a lack of training or education limits your ability to provide anti-doping advice?	Yes	88.8
	No	8.3
	I Don't Know	3.0
Is limited access to up-to-date anti-doping information a challenge for you in your practice?	Yes	79.9
	No	13.6
	I Don't Know	6.5
Do you think the lack of demand or questions from athletes discourages your involvement in anti-doping services?	Yes	63.3
	No	27.8
	I Don't Know	8.9
Do you believe that time constraints in your daily duties prevent you from engaging in anti-doping activities?	Yes	50.3
	No	46.2
	I Don't Know	3.6
Are you unsure about your legal or professional responsibility in advising athletes about banned substances?	Yes	42.6
	No	47.3
	I Don't Know	10.1

3.13 Relationship Between Knowledge, Awareness With Perception Of Antidoping

The Coefficients table indicates that the overall average knowledge score is a statistically significant predictor of the average professional perception score with a p-value of 0.028 ($p < 0.05$). The Standardized Coefficient (Beta) for knowledge is 0.169. Since this value is positive, it confirms that a positive relationship exists: as a pharmacist's knowledge level on anti-doping increases, their professional perception regarding anti-doping duties also increases. The Unstandardized Coefficient of 0.906 suggests that for every one-unit increase in the average knowledge score, the average perception score is expected to increase by 0.906 units.

The ANOVA table confirms the overall utility of the model. The model is determined to be statistically significant ($F = 4.897$, $p = 0.028$\$), meaning the predictor variable (average knowledge score) significantly contributes to the prediction of the outcome variable (average perception score), making the relationship a reliable one. The table further breaks down the variance, showing a Regression Sum of Squares of 1.298, which represents the variance explained by the knowledge score, and a substantially larger Residual Sum of Squares of 44.268, which represents the variance left unexplained by the model.

The Model Summary table reveals the low predictive power of the model. The R Square value of 0.028 signifies that the pharmacist's knowledge score only accounts for 2.8% of the total variance observed in their perception toward anti-doping. The remaining 97.2% of the variation in perception must be attributed to other factors not accounted for in this simple regression model. The Adjusted R^2 of 0.023 further confirms this weak explanatory power. Therefore, while the link is statistically real, knowledge level is only a minor determinant of a pharmacist's professional perception regarding anti-doping

Table 3.10: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.169[a]	.028	.023	.51486

a. Predictors: (Constant), avg_knowledge

Table 3.11: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.298	1	1.298	4.897	.028[b]
	Residual	44.268	167	.265		
	Total	45.566	168			

a. Dependent Variable: avg_perception
b. Predictors: (Constant), avg_knowledge

Table 3.12: Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.384	.179		18.914	.000
	avg_knowledge	.906	.410	.169	2.213	.028

a. Dependent Variable: avg_perception

CHAPTER FOUR

DISCUSSION

This study assessed the knowledge and perception of community pharmacists in Benin City regarding anti-doping practices, prohibited substances, and their professional role in promoting clean sport. A total of 169 community pharmacists participated, providing insights into socio-demographic patterns, knowledge levels, perception, barriers, and determinants associated with anti-doping awareness.

4.1 Socio-Demographic Characteristics of Respondents

The study population was predominantly male reflecting the relatively youthful nature of Nigeria's community pharmacy workforce. Most respondents held a Bachelor of Pharmacy (BPharm) degree. These findings align with previous reports describing the dominance of younger, Bachelor of Pharmacy-qualified males in community practice, often attributed to historical training trends and urban career preferences (Akindutire *et al.*, 2012). In terms of professional experience, over half (53.3%) had practiced for 1–5 years, this reinforces the impression of a youthful, early-to-mid-career workforce. A notable 92.3% occupied senior positions (Superintendent or Chief Pharmacist), reflecting the entrepreneurial nature of community pharmacy in Nigeria, where many practitioners quickly assume ownership or supervisory roles (Akintayo and Sunday, 2017).

However, the relatively low proportion of Doctor of Pharmacy (PharmD) holders and pharmacists with extended practice experience suggests a generational gap in advanced clinical exposure. Such a gap could influence pharmacists' understanding of specialized areas like sports pharmacy and anti-doping—fields that have gained relevance only in recent years (Hooper *et al.*, 2019).

4.2 Knowledge of Anti-Doping Practices

An investigation of pharmacists' knowledge of anti-doping practices, prohibited substances, and relevant agencies revealed that over half of the respondents had fair knowledge, while less than half demonstrated poor understanding. This suboptimal baseline is consistent with findings from Australia, Taiwan, and Ethiopia, where pharmacists exhibit awareness of doping but lack detailed procedural and regulatory knowledge (Greenbaum *et al.*, 2023; Lee *et al.*, 2023; Kedir *et al.*, 2023).

Core knowledge gaps were evident; as only few pharmacists knew where to access the World Anti-Doping Agency (WADA) Prohibited List, and very few understood how to report doping violations. Such findings are concerning since the World Anti-Doping Agency List serves as the cornerstone of anti-doping regulations (David, 2017). Without familiarity with it, pharmacists cannot confidently advise athletes or prevent inadvertent doping.

Analysis by experience revealed complex patterns. Pharmacists with over 10 years' experience significantly exhibited the greatest uncertainty regarding beta-blocker prohibition in all sports, possibly reflecting outdated curricula or limited exposure to newer World Anti-Doping Agency updates. In contrast, the least experienced (<1 year) were most aware of the legal consequences of doping violations ($p = 0.006$), likely due to recent curricular emphasis on professional ethics and regulatory compliance (Kedir *et al.*, 2023).

Although the most experienced group reported the highest Continuing Professional Development (CPD) exposure ($p = 0.006$), this did not translate into better knowledge, suggesting that existing Continuing Professional Development programs remain superficial or lack practical engagement (Barkoukis *et al.*, 2022). The results collectively reveal a pressing need for structured and targeted anti-doping education, integrated into both undergraduate and continuing professional training.

4.3 Perception of Professional Role in Anti-Doping

Evaluation of pharmacists' perception of their professional role in promoting anti-doping awareness showed strong consensus that pharmacists have an ethical and professional responsibility to educate athletes and ensure the safe use of medications. A vast majority of respondents agreed that pharmacists should play a preventive role in doping control, affirming the pharmacist's image as a trusted and accessible healthcare provider (Ambrose, 2004). However, a notable paradox emerged between this strong sense of responsibility and pharmacists' self-assessed competence. Less than half felt confident in their knowledge of World Anti-Doping Agency-prohibited substances, and a majority did not feel adequately trained to identify or advise against potential doping risks. This reflects the Health Belief Model's assertion that perceived barriers—such as insufficient knowledge—can limit engagement despite strong perceived responsibility (Rosenstock, 1974).

By duration of practice, pharmacists with 6–10 years of experience reported the lowest confidence ($p = 0.022$), while those with over 10 years showed the highest recognition of training inadequacy ($p = 0.086$). This indicates awareness of personal limitations that increase with professional maturity. Positional analysis revealed that Locum Pharmacists demonstrated the highest self-updating behavior ($p = 0.043$), likely due to their need for versatility across diverse settings. Conversely, Intern Pharmacists displayed the lowest confidence, emphasizing the absence of anti-doping content in undergraduate curricula (Kawaguchi-Suzuki *et al.*, 2021).

4.4 Sources of Anti-Doping Information

Another objective of this study explored sources of anti-doping information and gaps in continuing education. The results revealed heavy reliance on informal channels such as online academic resources and social media, while formal and authoritative sources were rarely

utilized. Alarmingly, very many pharmacists had never accessed the World Anti-Doping Agency website, and never consulted drug databases like Global Drug Reference Online (Global DRO). Only few reported attending workshops or seminars addressing anti-doping. This pattern suggests that pharmacists rely more on easily accessible but potentially unreliable sources. While digital platforms offer convenience, they pose significant risks of misinformation, particularly on social media where unverified claims about supplements and performance enhancers proliferate (Roberts *et al.*, 2017). The underutilization of official resources signifies both a knowledge and structural gap, as professional associations have yet to institutionalize anti-doping education within Continuing Professional Development frameworks (Hooper *et al.*, 2019).

4.5 Barriers to Pharmacists' Involvement in Anti-Doping Activities

Barriers limiting pharmacists' involvement in anti-doping activities were also identified in this study. The top barriers were lack of training or education and limited access to up-to-date information, followed by low athlete demand. Time constraints and uncertainty about legal responsibilities also emerged as significant concerns.

These barriers reflect systemic deficiencies rather than individual neglect. The absence of structured training and institutional support restricts pharmacists' capacity to participate in doping prevention. Moreover, if pharmacists lack confidence and visibility in this area, athletes are unlikely to seek their advice—creating a self-perpetuating cycle of underutilization. Similar systemic barriers have been documented in other African settings (Ruwuya *et al.*, 2022; Ndasauka and Makwinja, 2023).

4.6 Factors Influencing Knowledge and Perception

Factors influencing knowledge and perception were also examined. Regression analysis revealed a statistically significant but weak positive relationship between knowledge and

perception (β = 0.169, p = 0.028), with knowledge explaining only 2.8% of the variation in perception. This suggests that while improved knowledge enhances perception to some extent, other contextual and psychological factors play more substantial roles. This aligns with Bandura's Social Learning Theory (1969), which emphasizes that attitudes and behaviours are shaped by environmental influences, role models, and reinforcement—not solely by cognitive knowledge. It also echoes the Health Belief Model's principle that awareness alone does not guarantee behavioural change (Rosenstock, 1974). Therefore, interventions should combine education with confidence-building strategies, institutional support, and value-based training to foster meaningful engagement (Barkoukis *et al.*, 2022).

4.7 Study Limitations

This study is limited to community pharmacists in Benin City, potentially limiting generalizability to rural or other urban settings in Nigeria. Future investigations should adopt a larger, multi-zone approach that includes pharmacists from all geopolitical regions of Nigeria. This will enhance the representativeness and generalizability of findings across diverse practice settings and cultural contexts.

The use of self-reported data may introduce social desirability bias, particularly on sensitive topics like legal responsibilities. Additionally, the cross-sectional design precludes causal inference. Future studies should include rural pharmacists, employ objective knowledge assessments (for example, case vignettes), and adopt longitudinal designs to evaluate the impact of educational interventions.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study set out to examine anti-doping awareness among community pharmacists in Benin City, Nigeria, exploring their knowledge, perceptions, sources of information, and the barriers that limit their participation. The findings reveal a clear and pressing reality: although community pharmacists in Benin City strongly believe in their professional responsibility to combat doping, they remain largely underprepared to carry out this role effectively.

While most pharmacists acknowledge that educating athletes and discouraging the misuse of performance-enhancing substances fall within their professional duties, this conviction is not matched by adequate knowledge or confidence. Many pharmacists struggle to identify banned substances and rely on informal information channels rather than authoritative bodies such as the World Anti-Doping Agency (WADA).

The barriers uncovered are largely systemic. A lack of targeted education and limited access to current, reliable information have created a cycle of inaction where uncertainty about legal obligations and low engagement from athletes further weaken pharmacists' involvement. Regression analysis further revealed that knowledge alone is not a strong predictor of professional perception, highlighting that awareness without empowerment is insufficient.

Therefore, improving pharmacists' contribution to anti-doping efforts requires more than disseminating information. It calls for a comprehensive and practical strategy one that builds confidence, clarifies professional boundaries, and equips pharmacists with the tools and institutional support needed to act decisively.

5.2 Recommendations

Based on this study, the following recommendations are proposed to key stakeholders to strengthen the role of pharmacists in anti-doping efforts:

A. For Pharmacy Educational Institutions and Regulatory Bodies

1. **Integrate Anti-Doping into Curricula:**

   Incorporate a comprehensive, stand-alone module on Sports Pharmacy and Anti-Doping into the Bachelor of Pharmacy (Bachelor of Pharmacy Degree) and Doctor of Pharmacy (Doctor of Pharmacy Degree) curricula. The module should cover key areas such as the World Anti-Doping Agency (WADA) Code, the Prohibited List, Therapeutic Use Exemptions (Therapeutic Use Exemptions), and the pharmacist's ethical and legal responsibilities.

2. **Develop Mandatory Continuing Professional Development (Continuing Professional Development):**

   Establish accredited Continuing Professional Development programs and workshops that provide hands-on training for practicing pharmacists. These programs should emphasize the practical use of anti-doping resources, including the World Anti-Doping Agency (WADA) website, Global Drug Reference Online (Global Drug Reference Online), and relevant databases for verifying drug status.

3. **Issue Practice Guidelines:**

   The Pharmacists Council of Nigeria (Pharmacists Council of Nigeria), in collaboration with the Pharmaceutical Society of Nigeria (Pharmaceutical Society of Nigeria), should develop and circulate clear professional guidelines outlining the

pharmacist's role in anti-doping practices. This will ensure consistency and accountability across all pharmacy settings.

B. For Professional Pharmacy Associations (e.g., Pharmaceutical Society of Nigeria)

1. Curate and Disseminate Resources:

Serve as a central source of reliable anti-doping information by regularly updating members on changes to the World Anti-Doping Agency (WADA) Prohibited List, creating a dedicated resource section on the association's website, and utilizing social media platforms to share relevant updates.

2. Foster Strategic Partnerships:

Establish formal collaborations with the National Anti-Doping Committee (National Anti-Doping Committee) and the Federal Ministry of Sports (Federal Ministry of Sports) to promote alignment, share resources, and enhance national anti-doping awareness initiatives.

3. Champion the Pharmacist's Role:

Actively promote the community pharmacist as a Clean Sport Advisor (Clean Sport Advisor), an accessible professional who provides accurate guidance to athletes and the public. This recognition can increase the visibility of pharmacists in sports health and expand their contribution to national clean sport efforts.

C. For Community Pharmacists and Pharmacy Owners

1. **Commit to Continuous Learning:**

   Pharmacists should personally take the initiative to consult verified databases, such as the World Anti-Doping Agency (WADA) and Global Drug Reference Online (Global

Drug Reference Online), to stay informed about the doping status of medications, especially when serving athletes or sports professionals.

2. **Establish Doping-Risk Management Protocols:**

   Pharmacies should develop simple in-house protocols for checking the doping risk of prescribed or over-the-counter medications. This can function similarly to existing drug-interaction or contraindication checks.

3. **Engage Actively with Patients:**

   Community pharmacists should take proactive steps to inquire if clients are involved in competitive sports or subject to anti-doping rules. Initiating these conversations can foster trust, improve public health awareness, and position the pharmacy as a reliable source of advice on safe medication use in sports.

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APPENDIX

QUESTIONNAIRE

This questionnaire is designed to assess the knowledge and perception of antidoping among community pharmacists in partial fulfillment of the requirements for the award of a Doctor of Pharmacy Degree in the Faculty of Pharmacy. This is strictly for research purpose and all information provided will be treated with utmost confidentiality.

Please tick the correct boxes and ensure no questions are left unanswered.

Section A: Demographic Information

1. Age (years): 20-25 [ ] 26-30 [ ] 31-35 [ ] 36-40 [ ] 41 and above [ ]
2. Gender: Male [ ] Female [ ]
3. Level of education: BPharm [ ] PharmD [ ] Masters [ ] PhD [ ] Others, Please specify _____
4. Duration of practice: Less than 1 year [ ] 1-5 years [ ] 6-10 years [ ] More than 10 years
5. Position: Superintendent/ chief pharmacist [ ] Intern pharmacist [ ] Locum pharmacist [ ]

Section B: Knowledge of Doping and Anti-Doping

Instructions: Please answer each question by selecting **Yes**, **No**, or **I Don't Know**.

1. **Are you aware of any Anti-Doping Agency?**

   ☐ Yes ☐ No ☐ I Don't Know

2. Which organization is responsible for setting global anti-doping standards?

   a) World Health Organization (WHO)

   b) World Anti-Doping Agency (WADA)

   c) International Olympic Committee (IOC)

3. **Do you know that certain over-the-counter medications can contain substances banned in sports?**

   ☐ Yes ☐ No ☐ I Don't Know

4. **Is testosterone classified as a banned substance under anti-doping regulations?**

   ☐ Yes ☐ No ☐ I Don't Know

5. **Can pharmacists help athletes avoid accidental doping by reviewing their medications and supplements?**

   ☐ Yes ☐ No ☐ I Don't Know

6. **Do you know where to find the current list of prohibited substances published by WADA?**

   ☐ Yes ☐ No ☐ I Don't Know

7. **Are all dietary supplements safe and allowed for use in competitive sports?**

   ☐ Yes ☐ No ☐ I Don't Know

8. Can athletes use insulin without a therapeutic use exemption (TUE)?

   ☐ Yes ☐ No ☐ I Don't Know

9. Are beta-blockers prohibited in all sports?

   ☐ Yes ☐ No ☐ I Don't Know

10. Can athletes rely solely on medication labels to determine if a substance is prohibited? ☐ Yes ☐ No ☐ I Don't Know

11. **Is anti-doping education included in your pharmacy continuing professional development (CPD) training?**

    ☐ Yes ☐ No ☐ I Don't Know

12. **Can a pharmacist face legal consequences for dispensing a banned substance to an athlete?**

☐ Yes ☐ No ☐ I Don't Know

13. **Is it true that only athletes are responsible for ensuring their medications comply with anti-doping rules?**

☐ Yes ☐ No ☐ I Don't Know

14. **Do you know how to report a suspected doping violation in your professional capacity?**

☐ Yes ☐ No ☐ I Don't Know

Section C: Perception of doping and anti-doping; Tick [✓] as appropriate

S/NO	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	I believe community pharmacists play an important role in educating athletes about anti-doping regulations.					
2	I am confident in my knowledge of substances prohibited by the World Anti-Doping Agency (WADA)					
3	Providing anti-doping advice should be part of a community pharmacist's professional responsibility					
4	Community pharmacists are adequately trained to counsel athletes on doping-related issues					
5	Dispensing performance-enhancing substances without proper guidance can harm an athlete's career and health					
6	I regularly update myself with current anti-doping guidelines and banned substances lists.					
7	There is a need for more anti-doping training programs for pharmacists.					
8	Athletes frequently consult community pharmacists regarding supplements and medications.					
9	I feel prepared to identify and advise against the use of substances that may lead to doping violations.					

10	Pharmacists should collaborate with sports authorities to promote clean sport and prevent doping.					

Section D: Sources of Anti-Doping Information

1. From where do you typically obtain information about anti-doping? (Tick all that apply)

   [ ] University lectures/courses

   [ ] Professional textbooks

   [ ] Online academic resources

   [ ] Social media platforms

   [ ] Professional colleagues

   `[ ] Continuing professional development (CPD) programs

   Other (specify)_____

2. Have you ever accessed the World Anti-Doping Agency (WADA) website for information on banned substances?

   ☐ Yes ☐ No ☐ I Don't Know

3. Do you rely on professional pharmacy associations or regulatory bodies for anti-doping updates and guidelines?

   ☐ Yes ☐ No ☐ I Don't Know

4. Have you used drug databases or mobile apps (e.g., Global DRO, Drugs.com) to check the doping status of medications?

   ☐ Yes ☐ No ☐ I Don't Know

5. Have you received anti-doping information through workshops, seminars, or continuing professional development (CPD) programs?

   ☐ Yes ☐ No ☐ I Don't Know

Section E: Barriers to Anti-Doping Involvement

Instruction: Tick **[✓]** as appropriate.

1. **Do you feel that a lack of training or education limits your ability to provide anti-doping advice?**

   ☐ Yes ☐ No ☐ I Don't Know

2. **Is limited access to up-to-date anti-doping information a challenge for you in your practice?**

   ☐ Yes ☐ No ☐ I Don't Know

3. **Do you believe that time constraints in your daily duties prevent you from engaging in anti-doping activities?**

   ☐ Yes ☐ No ☐ I Don't Know

4. **Are you unsure about your legal or professional responsibility in advising athletes about banned substances?**

   ☐ Yes ☐ No ☐ I Don't Know

5. **Do you think the lack of demand or questions from athletes discourages your involvement in anti-doping services?**

   ☐ Yes ☐ No ☐ I Don't Know