European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v13i2.6528 Volume 13 | Issue 2 | 2026

THE IMPACT OF ATHLETES' ATTITUDE, KNOWLEDGE, AND AWARENESS OF THEIR BELIEF ABOUT AUTOCHTHONOUS BOTANICAL SUPPLEMENTS IN OYO STATE: A STRUCTURAL EQUATION MODELLING APPROACH

Adisa, Olawumi[i1],
Ayorinde, John Oluwasogo[2],
Adegbesan, Olufemi Adegbola[3],
Oyeniyi, Yinka James[4],
Ogundeji, Sunday Peter[5],
Olowofolahan, Oluwakemi Adeola[6],
Balogun, Olaitan Johnson[7],
Bello, Olunike Adedoyin[8],
Olaseinde, Peggy-joe Nwanefuru[9]
[1]Lecturer I,
Department of Human Kinetics,
University of Ibadan,
Ibadan, Nigeria
[2]Reader,
Department of Pharmaceutics and Industrial Pharmacy,
University of Ibadan,
Ibadan, Nigeria
[3]Professor,
Department of Human Kinetics,
University of Ibadan,
Ibadan, Nigeria
[4]Professor,
Department of Pharmaceutics & Pharmaceutical Technology,
Usmanu Danfodiyo University,
Sokoto, Nigeria
[5]Senior Lecturer,
Department of Haematology,
University of Ibadan,
Ibadan, Nigeria
[6]Senior Lecturer,
Department of Biochemistry,
University of Ibadan,
Ibadan, Nigeria
[7]Lecturer II,

[i] Correspondence: email wumiadisa@gmail.com

Department of Health Education,
University of Ibadan,
Ibadan, Nigeria
[8]Department of Biology,
Osun State College of Education,
Ila-Orangun, Nigeria
[9]Deputy Director,
Department of Physiotherapy,
University College Hospital,
Ibadan, Nigeria

Abstract:
Autochthonous botanical supplements (ABS) refer to locally sourced plant-based products traditionally used for their medicinal, nutritional, or therapeutic properties. While the use of supplements is not inherently banned in sports, emerging evidence reveals cases of professional athletes being entangled in controversial and contestable doping allegations linked to ABS usage. This study was therefore designed to determine the impact of athletes' attitudes, knowledge, and awareness on their beliefs about ABS in Oyo State, Nigeria. Equally, the study determined the pattern of usage of ABS among athletes. Using structural equation modeling for our data analysis, our findings indicate that the total effect of athletes' attitudes toward ABS on their beliefs was the most significant, effectively doubling the direct impact of knowledge regarding these supplements. This observation also holds for the direct effects of both attitude and knowledge, while awareness exhibited a very weak positive effect. Additionally, the mediating effect of awareness rendered the indirect effects of attitude and knowledge equivalent in magnitude, both moving in a positive direction. The study concluded that athletes' awareness of ABS closes the gap that exists in the effect of knowledge and attitude on their beliefs about autochthonous botanical supplements.

Keywords: botanicals, supplements usage, doping, attitude and knowledge, awareness and belief

1. Introduction

In recent years, the use of autochthonous botanical supplements has gained traction among athletes seeking natural alternatives to enhance performance and recovery. Autochthonous botanical supplements (ABS) refer to locally sourced plant-based products traditionally used for their medicinal, nutritional, or therapeutic properties. While the use of supplements is not inherently banned in sports, emerging evidence reveals cases of professional athletes being entangled in controversial and contestable doping allegations linked to ABS usage.

The use of plant-based supplements to enhance athletic performance, as said earlier, is gaining popularity as athletes seek natural alternatives to synthetic drugs, hoping to avoid doping detection. Though ancient athletes used herbs for performance, there is little scientific evidence to prove their effectiveness or safety. Many supplements claim to boost endurance, reduce fatigue, and improve recovery, but these claims lack solid research, and some may even pose health risks.

A key concern is that some supplements contain banned substances not listed on the label, leading to accidental doping. Athletes may believe these products are safer and more natural, but the risks remain. As botanical doping becomes more widespread, further research is needed to understand its true impact. Athletes, therefore, should exercise caution and seek professional advice before using such supplements when preparing for competitions.

The principle of competition underlies the apparent desire to do whatever is necessary to succeed in modern sports. It is this competitive nature of sports that studies have agreed is a driving factor for problematic behaviours in sports, which contradict the industry's perceived moral and ethical standards (Boardley & Kavussanu, 2007; Shields & Bredemeier, 2007; Johnson, 2012; Mudrak et al., 2018). Predominant among the problematic behaviours in sports is doping. More commonly, doping is considered the use of the banned substance(s) or method(s) to enhance sporting performance. It has also been described as an anti-social and maladaptive behaviour that threatens the spirit of sport and opposes the concept of sportspersonship (Barkoukis et al., 2011; Yager & O'Dea, 2014; Zucchetti et al., 2015; World Anti-Doping Agency (WADA), 2020). Doping challenges the notion of a "level playing field" in sports. Doping is also regarded as violating one or more of the ten anti-doping rules established in the World Anti-Doping Code. These rules include the use, attempted use, trafficking, or possession of prohibited substance(s) as well as evading or tampering with doping control procedures (Drug-Free Sport New Zealand, 2020; WADA, 2020). Despite its prohibition, doping has occurred in athletes younger than 10 years of age, among able and disabled athletes, and it is an issue at all levels of sport due to its sophistication and complexity (Nicholls and Cope et al., 2017). As WADA continually increases the number of prohibited substances and methods in sports, athletes are also coming up with different doping substances and methods. One of these new trending methods in doping is the use of autochthonous botanicals to enhance performance in sports. A recently concluded research by Adisa, Balogun, Olaseinde and Adegbesan (2023) shows that the use of autochthonous botanicals is now prevalent among elite disabled athletes in Lagos State, Nigeria. The study revealed that athletes are erroneously resorting to taking botanicals with the mindset that it is safe (since they are natural supplements), enhances performance, and can easily evade detection and have little or no side effects.

The use of ABS is not peculiar to Nigeria or Africa; it is gradually becoming a global problem in sport, as many athletes are now getting caught in the web of unintentional doping related to ABS. According to Adisa and Odior (2024), unintentional doping refers to the inadvertent ingestion of prohibited substances, often as a result of consuming dietary supplements, herbal remedies, or functional foods. Unlike deliberate doping, this form of violation stems from a lack of awareness or misinformation about the composition of ingested products. According to the World Anti-Doping Agency (WADA), ignorance is not a defence, and athletes are held strictly liable for any prohibited substances detected in their systems (WADA, 2023).

A case involving a Dutch professional cyclist highlighted the risks of using supplements containing Ephedra. The cyclist tested positive for norpseudoephedrine during a doping test after consuming a liquid herbal supplement with Ephedra listed among its 15 ingredients. Further investigation revealed the supplement contained 6.8–8.2 mg/ml of norpseudoephedrine and 0.02–0.03 mg/ml of ephedrine, which could explain the positive result. The predominance of norpseudoephedrine suggested the supplement had been deliberately spiked, showing the risk of hidden substances in herbal supplements. This case underlined the need for stricter quality control, as some banned substances occur naturally in plants and may unknowingly lead to doping violations (Ros, Pelders, De Smet, 1999).

Another study by Kuei Hui Chan et al. (2008) warned athletes about the use of Kakkon-to, a Traditional Chinese Medicine used for colds, containing Ephedrae Herba, a source of ephedrines banned by WADA. In their study, six healthy volunteers took a single 2.5g dose of Kakkon-to, and urine tests showed traces of ephedrine and norpseudoephedrine. The highest detected concentration of ephedrine was 4.35 ± 1.82 μg/mL, below WADA's 10 μg/mL limit. However, when the supplement was taken three times a day for three days, the urine tested positive for ephedrine, indicating that repeated use could lead to doping violations. These findings stress the importance of athletes being cautious with herbal supplements, as prolonged use may result in positive doping tests.

It is on this premise that more researches are needed to establish facts concerning erroneous conceptions and or misconceptions about ABS. The focus of this research, therefore, is to investigate the impact of athletes' attitude, knowledge, and awareness on their beliefs about autochthonous botanical supplements in Oyo State, Nigeria, empirically, using a structural equation modelling approach.

Usage of ABS holds deep cultural roots in Oyo State, Nigeria, where traditional medicine plays a pivotal role in health and wellness. However, the extent to which athletes understand, perceive, and embrace these indigenous supplements remains largely unexplored.

Athletes' beliefs about these supplements are likely shaped by their attitude, knowledge, and awareness, yet the relationship among these factors is not well established. Research has shown that while some athletes recognize the potential benefits of botanical supplements, others harbour scepticism due to concerns about safety, efficacy, and the lack of standardised regulation. Moreover, misconceptions and limited access to scientifically validated information may hinder or promote their acceptance, creating a gap between traditional practices and modern sports science.

The research problem, therefore, lies in understanding the intricate interplay between athletes' attitudes, knowledge, and awareness and how these factors influence their beliefs about autochthonous botanical supplements. Addressing this gap is crucial, as beliefs ultimately shape usage patterns, impacting performance outcomes and health. This study employs Structural Equation Modelling (SEM) to unravel these relationships, offering a robust framework to identify the key predictors of athletes' beliefs and providing evidence-based insights to inform education and policy initiatives.

This study is part of a larger research project in Nigeria that uses a multi-parameter approach to examine the prevalence, usage, vulnerabilities, attitudes, types, potential banned substances, and risks of autochthonous botanical doping in sports. The main research employs metacognition and self-regulation interventions, along with pharmacokinetics, pharmacological, haematological, and biochemical tests to understand the components of these botanical substances. This specific aspect focuses on addressing key research questions and testing the following hypotheses.

2. Research Question

- What is the pattern of autochthonous botanical supplements usage among athletes in Oyo State, Nigeria?

2.1 Research Hypothesis

- **H_{01}:** There is no significant total effect of Attitude and Knowledge on belief and awareness about autochthonous botanical supplements among elite athletes in Oyo State, Nigeria.
- **H_{02}:** There is no significant direct effect of Attitude and Knowledge on belief and awareness about autochthonous botanical supplements among elite athletes in Oyo State, Nigeria.
- **H_{03}:** There is no indirect effect of Attitude and Knowledge on belief through awareness about autochthonous botanical supplements among elite athletes in Oyo State, Nigeria.

3. Material and Methods

The purpose of this study is to determine the impact of athletes' attitudes, knowledge, and awareness on their beliefs about ABS in Oyo State, Nigeria. Equally, the study determined the pattern of usage of ABS among athletes. A descriptive survey research design of a correlational type was adopted for this study. The population comprised all Oyo State athletes who have been representing the State or Nigeria in various competitions. The sample for this study consisted of 66 state athletes revealed through a baseline study to have been taken ABS. A multistage sampling technique was employed in the following order: Stratified Sampling technique was used to categorise all the state athletes into the existing sports associations of the state; Stratified Random Sampling was also used to categorize the athletes into semiprofessional and Professional Athletes. Thereafter, all athletes who are or have engaged in ABS usage are purposively enumerated with selections made according to their proportions; Snowball Sampling was also used to identify athletes who had engaged in ABS but did not initially disclose.

The research instrument utilized in this study is a self-developed questionnaire designed in accordance with the variables being tested. The questionnaire is divided into two parts: Part A (having Sections 1 and 2) and Part B (having Sections 1 - 4). Part A sections: Section 1 gathers demographic data from the respondents, while Section 2 collects information on the variables on patterns of ABS Usage. Part B, a 4-point Likert scale, consisting of sections 1 – 4, collected data on Attitude, Knowledge, Awareness and Beliefs. The instrument was validated through expert opinions, and careful observations were made by consulting the literature on behavioural domains to ensure contextual relevance. To assess the reliability of the instrument, it was administered to 30 similar respondents in the North Central region. The collected data were analysed using Cronbach's alpha coefficient, yielding the following reliability coefficients: (r=0.75) for patterns, (r=0.87) for Attitude, (r=0.78) for Knowledge, and (r=0) for Awareness. The reliability coefficient for Belief was (r=0.85. Descriptive statistics, including frequency counts, percentages and bar charts, were used to analyse the demographic data/information and the research questions, while inferential statistics, specifically multiple regression analysis, were utilized to test hypotheses at a 0.05 alpha level. The revised text improves clarity, readability, and technical accuracy while correcting grammatical and punctuation errors. It also enhances vocabulary and structure for better comprehension.

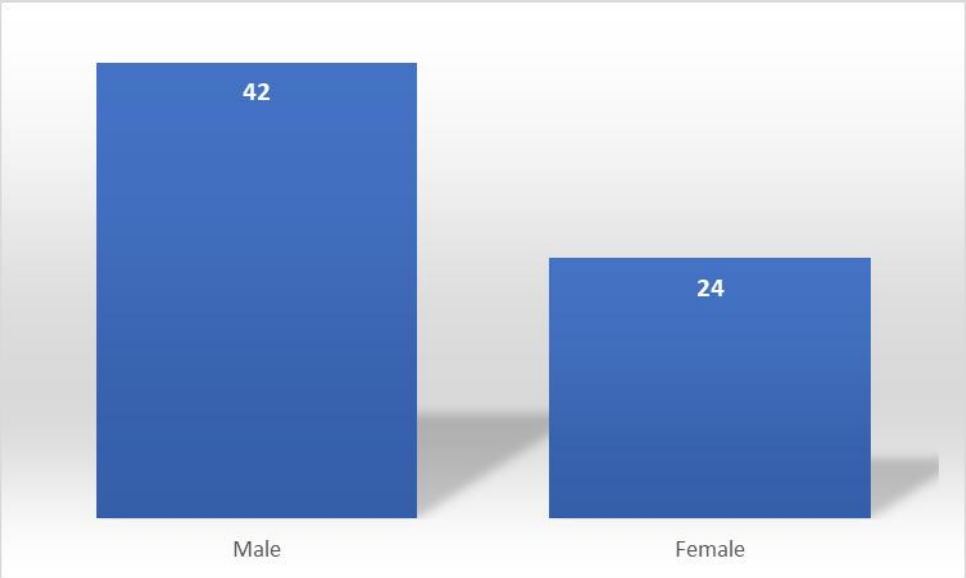
4. Results and Discussion

4.1 Demographics

4.1.1 Gender

The study analyzed the use of autochthonous botanical supplement doping among athletes, with data collected from both male and female participants. Of the total athletes, 63.6% were male (42 athletes), while 36.4% were female (24 athletes). Figure 4.1 illustrates the gender distribution.

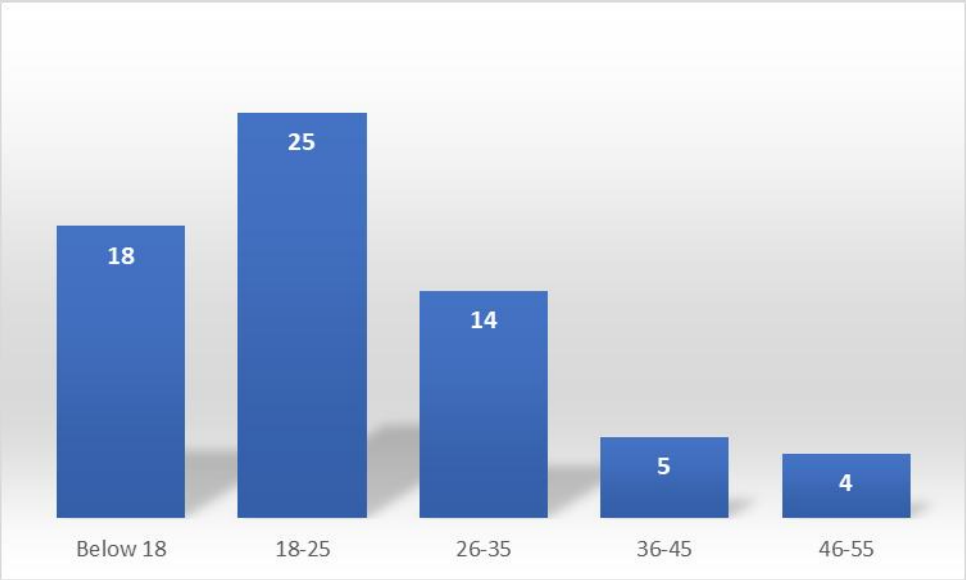
Figure 4.1: Bar Chart Showing Frequency Distribution of Athletes



4.1.2 Age Group

Figure 4.2 shows that 27.3% of athletes were below 18 years (18 athletes). The largest age group, 18–25 years, accounted for 37.9% (25 athletes). Athletes aged 26–35 years constituted 21.2% (14 athletes), while 7.6% (5 athletes) were in the 36–45 age group. Lastly, 6.1% (4 athletes) were aged 46–55 years.

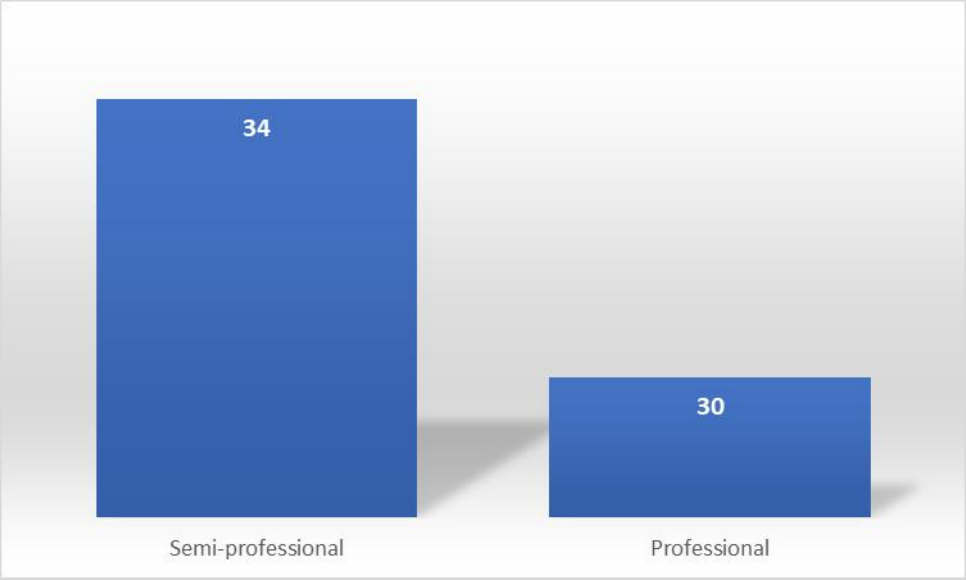
Figure 4.2: Bar Chart Showing the Frequency Distribution of Athletes' Ages



4.1.3 Athletes' Professionalism

These types of athletes were observed in the study.

Figure 4.3: Bar Chart Showing the Frequency Distribution of the Type of Athletes



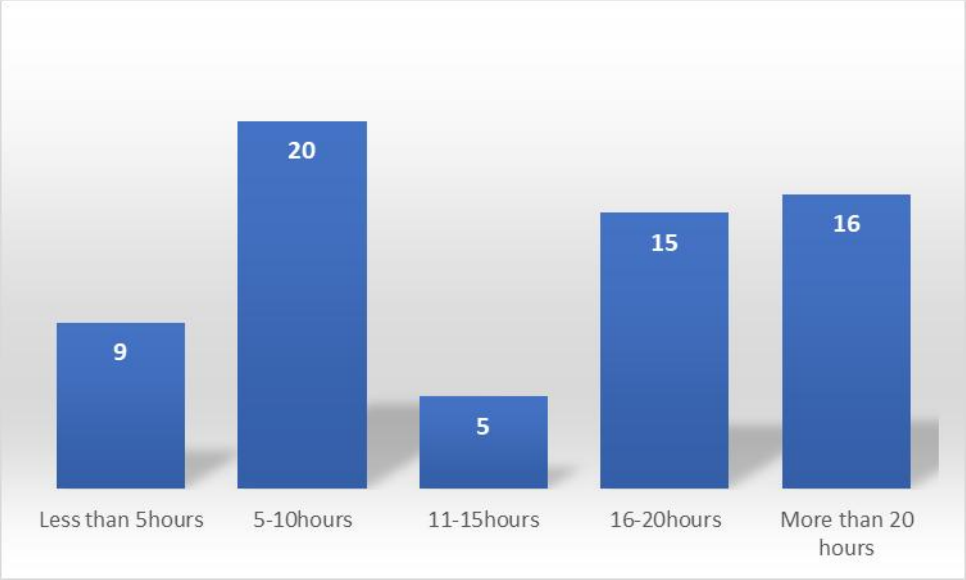
Among the athletes, 53.1% were semi-professional (34 athletes), while 46.9% were professional (30 athletes).

4.1.4 Training Hours

13.8% of athletes trained for less than 5 hours per week (9 athletes). Those training 5–10 hours per week accounted for 30.8% (20 athletes), while 7.7% (5 athletes) trained 11–15

hours per week. Additionally, 23.1% (15 athletes) trained 16–20 hours per week, and 24.6% (16 athletes) trained for more than 20 hours per week.

Figure 4.4: Bar Chart Showing the Frequency Distribution of Time Spent on Training



4.1.5 Sport Participation

Figure 4.5: Bar Chart Showing the Sport Participation of the Athletes

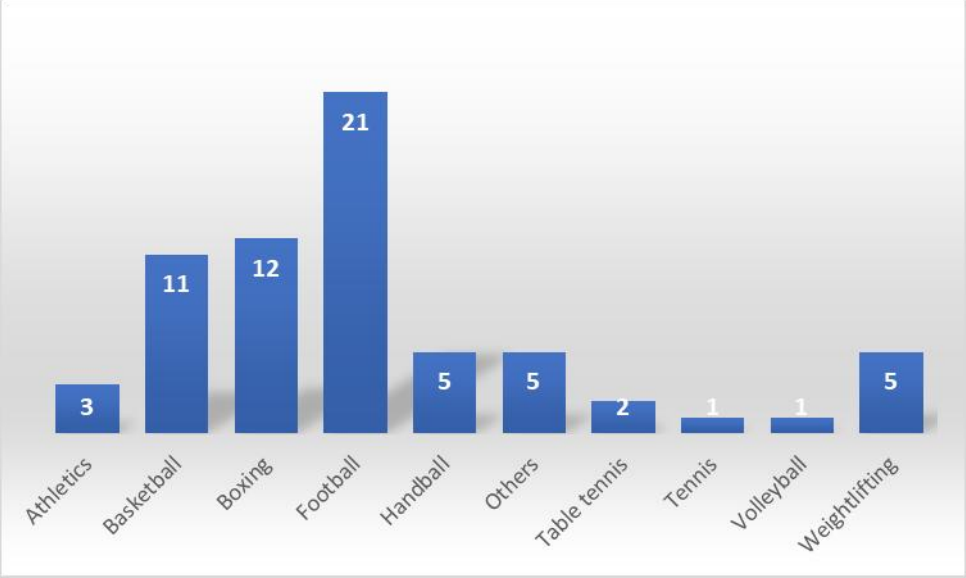


Figure 4.5 shows that the athletes participated in a variety of sports. Football had the highest representation with 20.6% (21 athletes), followed by Boxing at 11.8% (12 athletes) and Basketball at 10.8% (11 athletes). Weightlifting and Handball each represented 4.9% (5 athletes). Athletics accounted for 2.9% (3 athletes), Table Tennis for

2.0% (2 athletes), and Tennis and Volleyball each for 1.0% (1 athlete each). Other sports made up 4.9% (5 athletes).

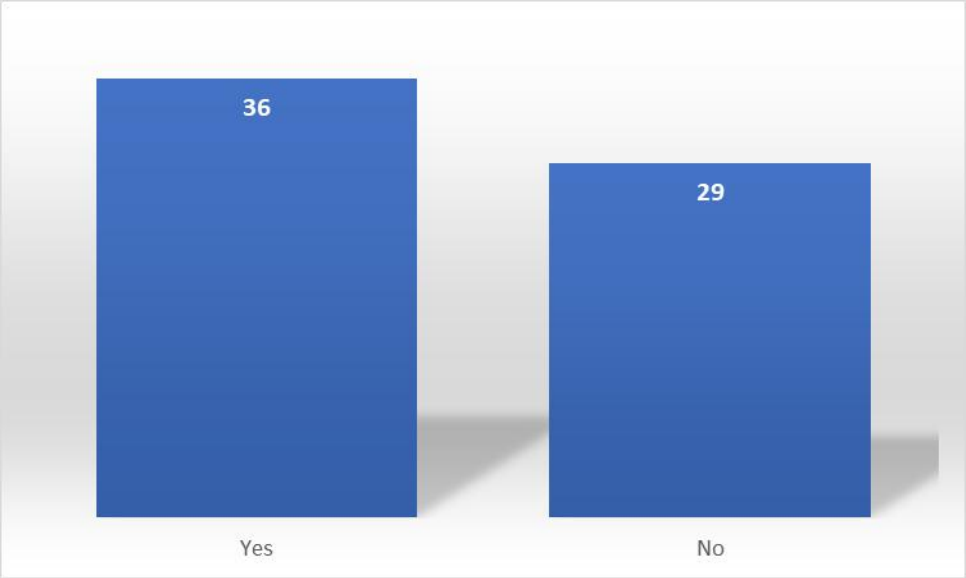
4.1.6 Research Question

1) What is the pattern of autochthonous botanical supplements usage among athletes in Oyo State, Nigeria?

The following sub-variables represent the patterns of ABS usage among the athletes under study in this research.

a. Dietary Supplement Usage

Figure 4.6: Bar Chart Showing Frequency Distribution of Dietary Supplements

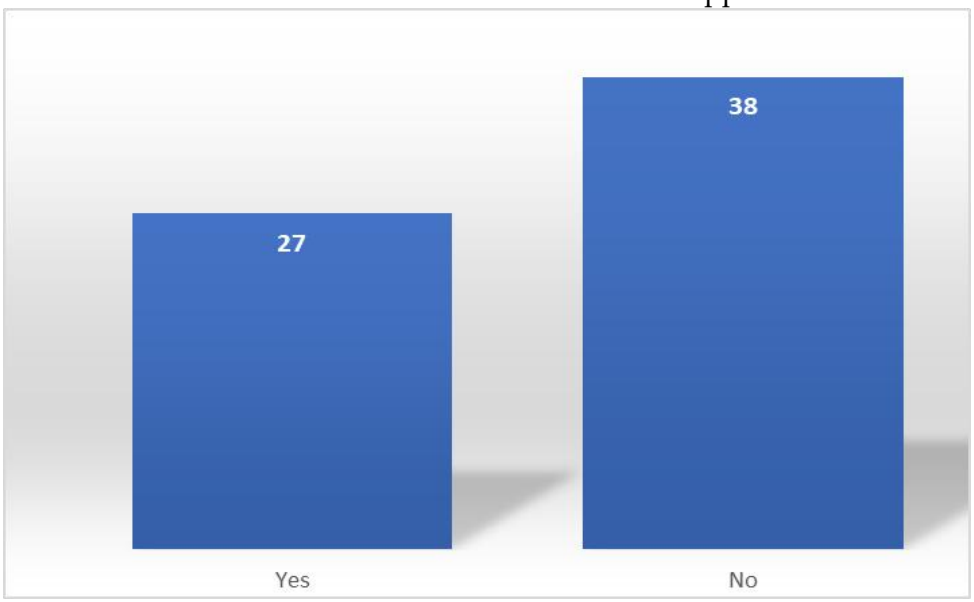


Among the athletes, 35.3% (36 athletes) reported using dietary supplements, while 28.4% (29 athletes) indicated they do not take dietary supplements.

b. Autochthonous Botanical Supplement Usage

The use of autochthonous botanical supplements (Figure 4.7) shows that 37.3% (38 athletes) reported not using them, while 26.5% (27 athletes) indicated they do use these supplements.

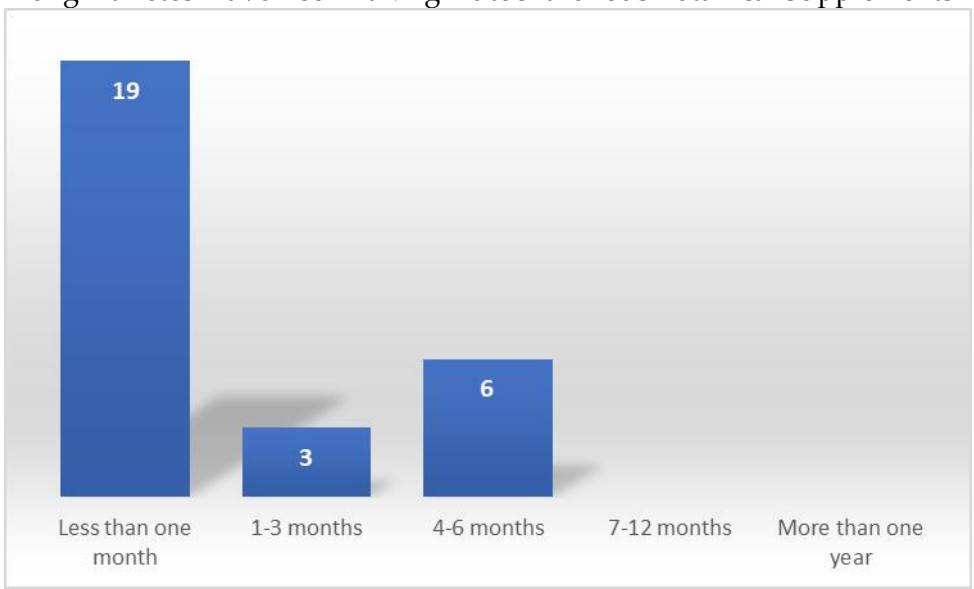
Figure 4.7: Bar Chart Showing the Frequency Distribution of Autochthonous Botanical Supplements



c. Duration of Autochthonous Botanical Supplement Usage

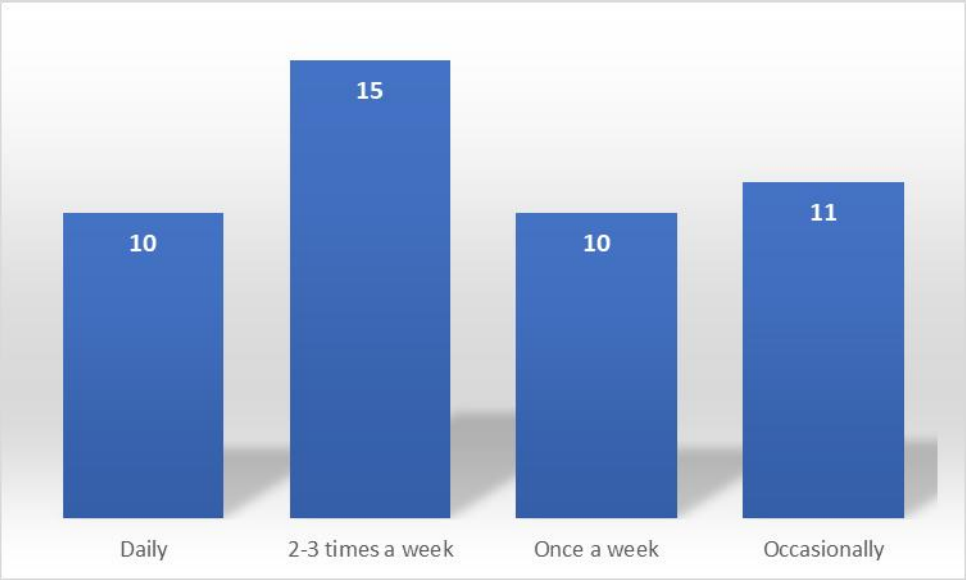
For athletes using autochthonous botanical supplements, 41.3% (19 athletes) reported using them for less than 1 month. A smaller portion, 6.5% (3 athletes), had been using them for 1–3 months. Additionally, 13.0% (6 athletes) had been using them for 4–6 months, 17.4% (8 athletes) for 7–12 months, and 21.7% (10 athletes) for more than 12 months.

Figure 4.8: Bar Chart Showing the Frequency Distribution of How long Athletes Have Been Taking Autochthonous Botanical Supplements



d. Frequency of Autochthonous Botanical Supplement Usage

Figure 4.9: Bar Chart Showing the Frequency distribution of How Often Athletes Take These Supplements



32.6% (15 athletes) reported taking the supplements 2–3 times a week, while 21.7% (10 athletes) used them daily. An equal proportion, 21.7% (10 athletes), used the supplements once a week, and 23.9% (11 athletes) used them occasionally.

f. Reasons for Using Autochthonous Botanical Supplements

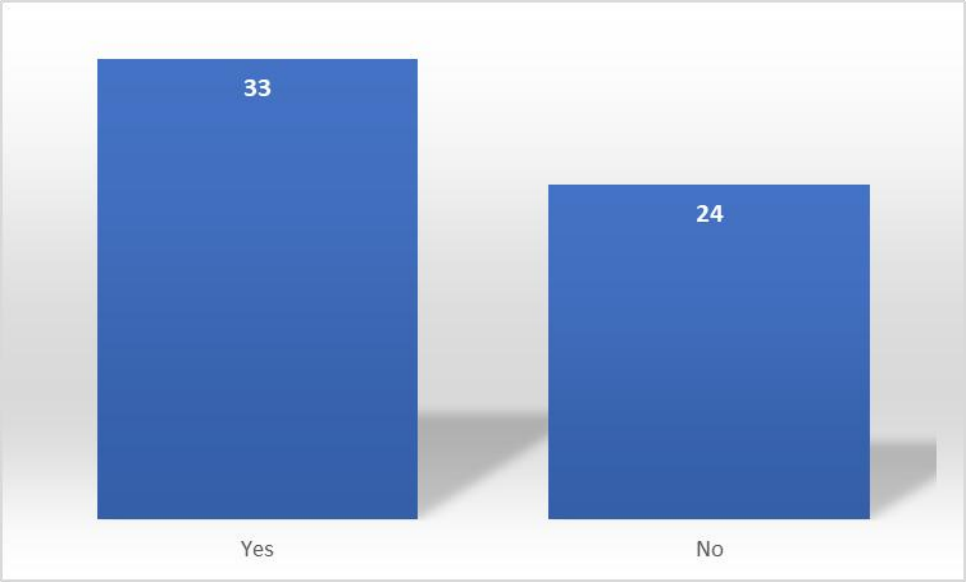
The reasons athletes provided for using autochthonous botanical supplements were as follows:

- General health and wellness**:** 21.6% (22 athletes),
- Enhance recovery**:** 9.8% (10 athletes),
- Improve performance**:** 8.8% (9 athletes),
- Occasionally recommended by a coach/trainer: 1.0% (1 athlete),
- Occasionally recommended by a colleague**:** 1.0% (1 athlete),
- Other reasons**:** 2.0% (2 athletes).

g. Performance Improvement from Autochthonous Botanical Supplements

When asked if they noticed any improvement in their performance since taking the supplements, 57.9% (33 athletes) reported noticing an improvement, while 42.1% (24 athletes) did not notice any improvement.

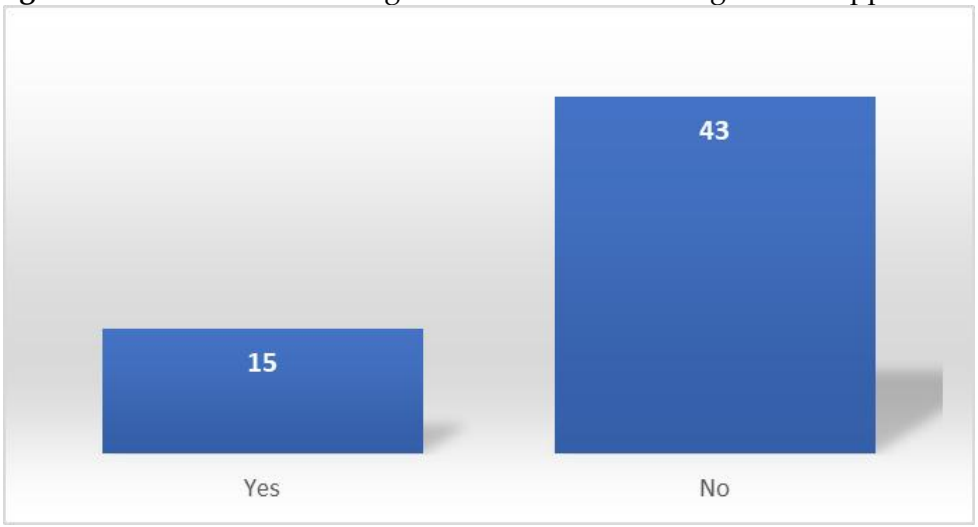
Figure 4.10: Bar Chart Showing Side Effects of Taking These Supplements



h. Side Effects of Autochthonous Botanical Supplements

When asked if they had experienced any side effects from taking autochthonous botanical supplements, 25.9% (15 athletes) reported experiencing side effects, while 74.1% (43 athletes) indicated they had not experienced any side effects.

Figure 4.11: Bar Chart Showing Side Effects from Taking These Supplements



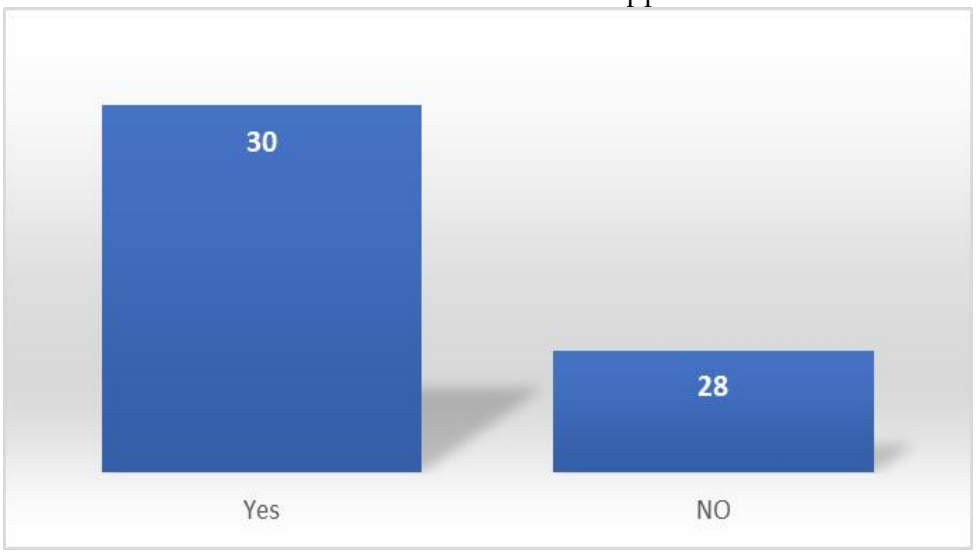
i. Satisfaction with Autochthonous Botanical Supplements

When asked about their satisfaction with the results of taking autochthonous botanical supplements:

- Very satisfied: 22.0% (11 athletes),
- Satisfied: 44.9% (22 athletes),
- Neutral: 22.4% (11 athletes),
- Dissatisfied: 0.0% (0 athletes),
- Very dissatisfied: 10.2% (5 athletes).

j. Performance Improvement from Autochthonous Botanical Supplements

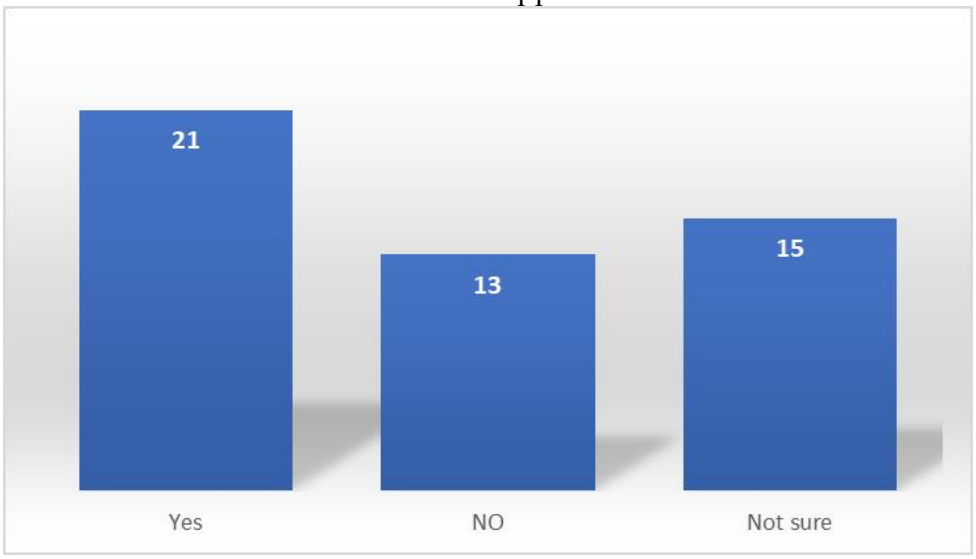
Figure 4.12: Bar Chart Showing Whether Athletes Would Recommend Autochthonous Botanical Supplements to Others



When asked if they noticed any improvement in their performance since taking the supplements, 57.9% (33 athletes) reported noticing an improvement, while 42.1% (24 athletes) did not notice any improvement.

k. Future Plans for Using Autochthonous Botanical Supplements

Figure 4.13: Bar Chart Showing Plans to Continue Using Autochthonous Botanical Supplements in the Future



25.4% (15 athletes) stated they plan to continue using them, while 39.0% (23 athletes) indicated they do not plan to continue using these supplements. Additionally, 35.6% (21 athletes) were not sure about their future usage.

4.2 Hypothesis

H_{01}: There is no significant total effect of Attitude and Knowledge on belief and awareness about autochthonous botanical supplements among elite athletes in Oyo State, Nigeria.

Table 1.1: Showing the Total Effect of Attitude and Knowledge on Belief and Awareness About Autochthonous Botanical Supplements among Elite Athletes

Total Effect	Attitude	Knowledge	Awareness	Belief
Awareness	0.462	0.408	0	0
Belief	0.755	0.26	0.055	0

Table 1.1 shows that attitude has a total effect on awareness of athletes about autochthonous botanical supplements (0.462) and belief in (0.755). Knowledge has a total effect on awareness (0.408) and belief (0.26) on autochthonous botanical supplements. Awareness has a total positive effect on athletes' belief (0.055) on autochthonous botanical supplements.

The significant impact of attitude on belief is consistent with previous studies. For instance, a study on dietary supplement usage among athletes found that positive

attitudes towards supplements were strongly associated with increased usage (Knapik et al., 2016). Similarly, research on traditional medicine usage indicated that favorable attitudes significantly predicted higher belief and usage rates (Adams et al., 2011). The effect of knowledge on belief is corroborated by studies emphasizing the importance of education. A study on herbal supplement use among athletes highlighted that greater knowledge about supplements was linked to higher usage and belief in their efficacy (Tian et al., 2019). Conversely, some research suggests that knowledge does not always translate to belief or usage, indicating that other factors may moderate this relationship (Maughan et al., 2007). The modest effect of awareness on belief contrasts with studies where awareness significantly influenced supplement usage. For example, a study on nutritional supplement awareness among athletes found that higher awareness levels were associated with increased belief in their benefits (Sobal & Marquart, 1994). This discrepancy may be due to cultural differences or varying definitions of awareness across studies.

H_{02}: There is no significant direct effect of Attitude and Knowledge on belief and awareness about autochthonous botanical supplements among elite athletes in Oyo State, Nigeria.

The table also shows that attitude has a direct positive effect on awareness 0.462, and belief, 0.729. Knowledge also has a direct effect on awareness (0.408) and belief (0.238) on autochthonous botanical supplements. Awareness, too, has a direct effect (0.055) on athletes' belief on autochthonous botanical supplements. The key findings reveal that attitude has a direct positive effect on both awareness (0.462) and belief (0.729), knowledge influences awareness (0.408) and belief (0.238), while awareness has a smaller direct effect (0.055) on belief. These findings align with and diverge from existing literature in various ways. The significant impact of attitude on belief aligns with previous research indicating that positive attitudes towards supplements are strong predictors of increased usage (Knapik et al., 2016). Similarly, Adams et al. (2011) found that favorable attitudes towards traditional medicine significantly predicted higher belief and usage rates among athletes. The direct effect of attitude on awareness is also supported by studies highlighting that athletes with positive perceptions of supplements actively seek out more information, enhancing their awareness (Tian et al., 2019). The direct influence of knowledge on belief corroborates findings from previous studies, which emphasized the importance of education in shaping athletes' perceptions of supplements (Maughan et al., 2007). Athletes who are more informed about the composition and benefits of botanical supplements are more likely to adopt favorable beliefs, as also noted in studies focusing on herbal supplement use among athletes (Tian et al., 2019). However, some studies suggest that knowledge alone does not guarantee belief, as external factors like peer influence and cultural norms may moderate the

relationship (Sobal & Marquart, 1994). The modest effect of awareness on belief contrasts with other studies that found awareness to be a significant driver of supplement adoption (Sobal & Marquart, 1994). In some contexts, increased awareness has been linked to heightened belief in the efficacy of supplements, though this may vary due to cultural differences and the availability of credible information (Adams et al., 2011). The smaller effect size observed in this study could imply that while awareness plays a role, athletes' beliefs are more strongly shaped by attitudes and knowledge.

H_{03}: There is no indirect effect of Attitude and Knowledge on belief through awareness about autochthonous botanical supplements among elite athletes in Oyo State, Nigeria.

Table 1.2: Showing the Direct and Indirect Effects of Attitude and Knowledge on Belief and Awareness About Autochthonous Botanical Supplements among Elite Athletes

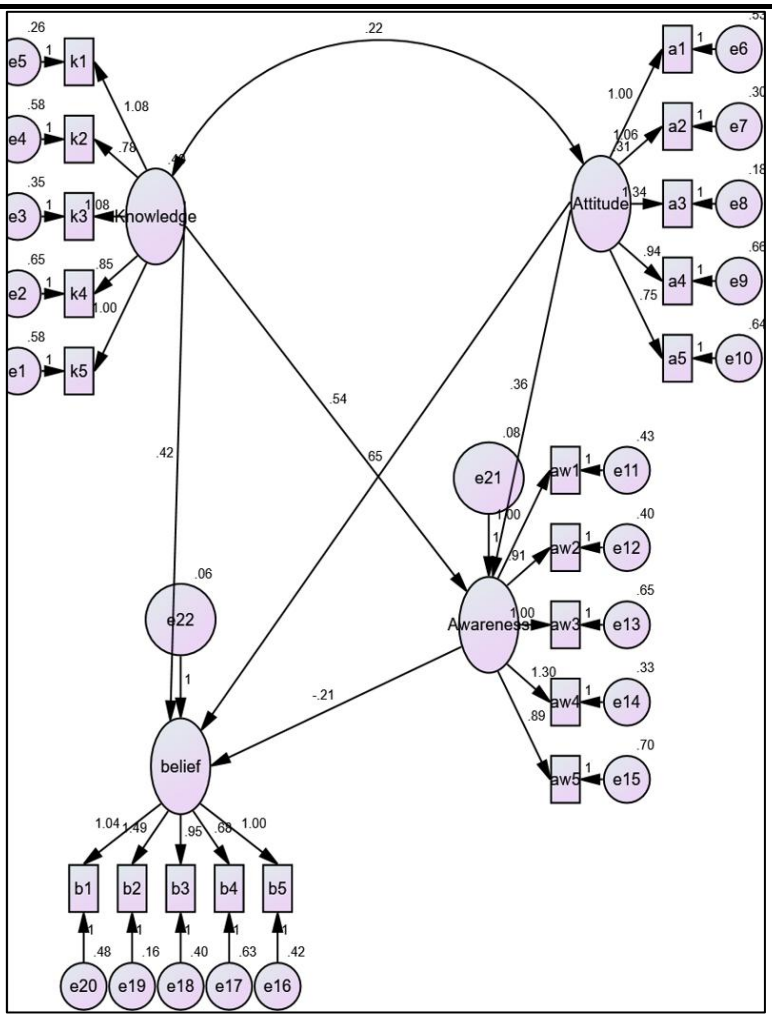
Total Effect	Attitude	Knowledge	Awareness	Belief
Awareness	0	0	0	0
Belief	0.026	0.023	0	0

Table 1.2 revealed that attitude has an indirect effect on athletes' belief (0.026) about autochthonous botanical supplements, and knowledge also has an indirect effect on athletes' belief (0.023) about autochthonous botanical supplements. The indirect effect of attitude on belief may operate through mediators such as perceived norms or risk perceptions. For instance, a study by Daher et al. (2021) highlighted that educational interventions targeting attitudes could indirectly influence doping intentions by altering perceptions of supplement risks. Knowledge may indirectly affect belief through factors like confidence in supplement use or perceived efficacy. A study (El Khoury & Antoine-Jonville, 2024) assessing gym users' knowledge and attitudes toward supplements found that increased knowledge indirectly influenced supplement use by enhancing self-efficacy and perceived benefits.

4.3 Hypothesized Model

The hypothesized model showed unacceptable fit on CFI (0.118). Unacceptable fit was also found with Chi-Square (293.52; df= 16, p=0.00).

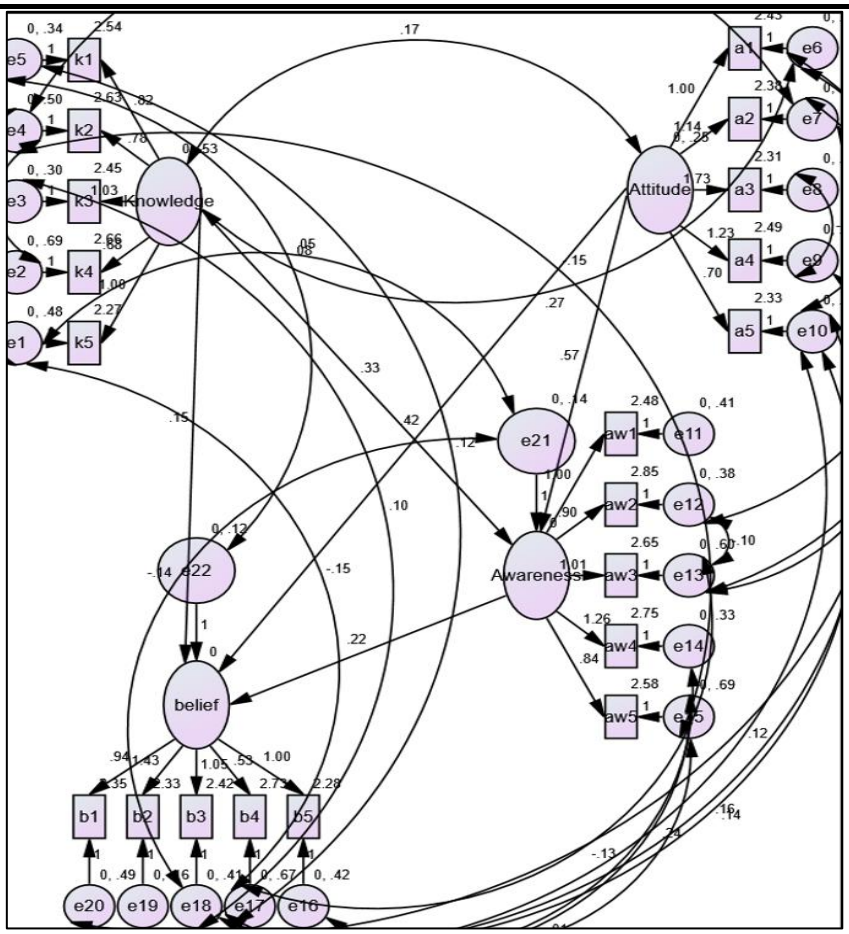
RMSEA=0.11



4.4 Improving the Hypothesized Model

A correlation path was created between an observed variable e18 and e21; e15 and e16, e10 and e20, e7 and e12, e6 and knowledge, e6 and e10, e5 and e22, e5 and e17, e4 and e7, e3 and e18, e1 and e17, e1 and e4, e15 and e17, e10 and e19, e9 and e8, e7 and e20, e4 and e15.

The fit model has a CF5 value of 0.99, RMSEA value = 0.97, Chi square = 234.72; $p>0.05$, hence, the outcome predicts belief in the drug perfectly.



5. Conclusion

The study's findings underscore the pivotal role of attitude and knowledge in shaping athletes' beliefs about autochthonous botanical supplements. While awareness also contributes, its effect is comparatively smaller. These insights suggest that interventions aiming to enhance positive attitudes and knowledge about these autochthonous botanical supplements could be more effective in influencing athletes' beliefs. The study's findings also indicate that attitude and knowledge not only have direct effects but also exert indirect influences on athletes' beliefs about autochthonous botanical supplements. These indirect pathways, though modest, underscore the complexity of belief formation and suggest that interventions should consider both direct and indirect mechanisms to effectively shape athletes' beliefs and behaviours regarding autochthonous botanical supplement use. Based on the findings of this study and the conclusions drawn, the following recommendations are made:

1) The government and sports federations should develop and implement 'Attitude Development Programs' for elite athletes. These programs should focus on providing targeted education to cultivate positive attitudes toward autochthonous

botanical supplements, emphasizing their cultural significance, safety, and potential performance benefits.

2) Knowledge Enhancement Initiatives should be organized through workshops and the provision of informational resources to improve athletes' knowledge about the composition, proper usage, and scientific evidence supporting these supplements. The content should be tailored to local contexts to ensure relevance and effectiveness.
3) Government and sport federations should also launch awareness campaigns leveraging digital media and peer education to increase exposure to credible information about autochthonous botanical supplements, addressing misconceptions and enhancing trust.
4) Sport federations, through holistic support systems, should develop mentorship programs involving sports scientists, nutritionists, and seasoned athletes to guide younger athletes in making informed decisions about supplement use, ensuring the integration of traditional and scientific knowledge.
5) African nations' sports ministries, agencies, and federations should collaborate with regulatory bodies to establish guidelines promoting the safe use of botanical supplements, incorporating them into broader athlete development and anti-doping frameworks.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Dr. Adisa Olawumi is a scholar and researcher in the Department of Human Kinetics, University of Ibadan, with a research focus on sport migration, finance, events management, and safety and security. Her academic contributions span over two decades, including studies on premarital genetic screening, intramural sports budgeting, inhibitors to recreational participation, and the underdevelopment of sport in Nigeria. She has co-authored multiple peer-reviewed journal articles and book chapters addressing the role of sport in community development, the economic impact of hosting sports events, doping prevention among athletes, and fan engagement through mobile marketing. Her research reflects a multidimensional approach to sports development and administration, with a strong emphasis on policy, health, and socio-economic dimensions in Nigeria and beyond. Dr. Olawumi continues strongly emphasizings to strongly emphasise mentoring students and collaborating on interdisciplinary projects that advance knowledge in sport science, education, and management.
Google Scholar: https://scholar.google.com/citations?user=QpGgZTsAAAAJ&hl=en
Research Gate: https://www.researchgate.net/lab/Olawumi-Adisa-Lab

Dr. John Oluwasogo Ayorinde is a seasoned pharmaceutical scientist and academic at the University of Ibadan, Nigeria, with a B. Pharm., M.Sc., and PhD in Pharmaceutics. With a growing body of scholarly work—28 publications, over 14,000 reads, and nearly 300 citations—he is widely recognized for his expertise in pharmaceutical formulations, solid dosage forms, drug delivery systems, and natural excipients. His research focuses on optimizing the material and release properties of oral drugs using novel plant-based polymers such as *Enterolobium cyclocarpum* and *Cedrela odorata*. Dr. Ayorinde's work also extends into public health and anti-doping science, contributing to studies on doping self-regulatory efficacy among Nigerian elite and Paralympic athletes. His multidisciplinary research bridges pharmaceutical innovation with health promotion, and he continues to collaborate extensively across academia and clinical science to improve drug formulation and delivery outcomes.
Google Scholar: http://pharm.ui.edu.ng/OJAyorinde
ResearchGate: https://www.researchgate.net/profile/John-Ayorinde-2
ORCID: https://orcid.org/0000-0003-1141-7795

Olufemi A. Adegbesan is a renowned Professor of Sport Psychology at the University of Ibadan, Nigeria, with over 700 citations to his credit. His research focuses on mental toughness, behavior modification, and the psychological foundations of elite athletic performance, particularly among Nigerian male and female soccer players. He has published influential studies on sport confidence, athlete burnout, team cohesion, imagery use, and choking under pressure. His collaborative work on sport talent identification and development in Nigeria has added significant value to the field of coaching science. As a member of editorial advisory boards and a mentor to emerging scholars, Professor Adegbesan continues to shape the landscape of sport psychology in Africa.

Oyeniyi Yinka James is a passionate scholar and graduate of Human Kinetics from the University of Ibadan. With a strong foundation in sports science and physical education, he has demonstrated keen academic potential and commitment to research and professional development. Under the supervision of Dr. Adisa Olawumi, he engaged in rigorous academic work that reflects his interest in sports performance, health promotion, and athlete development. His research orientation and drive for excellence position him as a promising contributor to the field of human kinetics.
Google Scholar: https://share.google/iInKdF1fdVKbv92yG
ORCID: https://orcid.org/0000-0002-6657-9188

Sunday Peter Ogundeji is a Lecturer in Haematology at the University of Ibadan, Nigeria, where he has served since September 2020. His research interests lie at the intersection of haematological disorders and metabolic diseases, with a particular focus on sickle cell anaemia. He has co-authored peer-reviewed journal articles, including *"Audit of Clinical and Laboratory Parameters of Hemoglobin SS Patients in a Nigerian Teaching*

Hospital" published in *Annals of Medicine*, and *"Rare Occurrence of Type 2 Diabetes Mellitus in Patients with Sickle Cell Anaemia"*, in the *Journal of Medical Science*. His work explores complex interactions between genetic blood disorders, inflammation, insulin resistance, and metabolic regulation. Dr. Ogundeji continues to contribute to advancing haematology research and clinical practice in Nigeria through academic scholarship and collaborative investigation.

Google Scholar: https://scholar.google.com/citations?=en&user=EP1blnAAAAAJ
ORCID: https://orcid.org/0000-0003-2368-9237
ORCID: https://orcid.org/0000-0001-5617-3136
ResearchGate: https://www.researchgate.net/profile/Olufemi-Adegbesan
Google Scholar: https://scholar.google.com/citations?user=z_S-sPUAAAAJ&hl=en

Dr. Adeola Oluwakemi Olowofolahan is a Senior Lecturer in the Department of Biochemistry at the University of Ibadan, Nigeria, where she has served since 2012. A prolific researcher with expertise in mitochondrial biology, toxicology, and phytomedicine, her work focuses on mitochondrial-mediated cell death, the modulation of the mitochondrial permeability transition (mPT) pore, and the therapeutic potential of medicinal plant extracts in treating reproductive and metabolic disorders. Her numerous peer-reviewed publications explore the biochemical mechanisms underlying conditions such as endometrial hyperplasia, polycystic ovary syndrome, and uterine proliferative disorders—often using plant-based compounds like *Funtumia elastica*, *Drymaria cordata*, and *Annona muricata*. Dr. Olowofolahan's research integrates traditional medicinal knowledge with modern biochemical analysis, contributing significantly to drug discovery and reproductive health.

Google Scholar: https://scholar.google.com/citations?=en&user=EP1blnAAAAAJ
ORCID: https://orcid.org/0000-0001-6987-9082

Olaitan Johnson Balogun is a dedicated health researcher and scholar whose work focuses on public health challenges affecting vulnerable populations, particularly children and youth in Nigeria. With over 2,300 reads and 12 publications on platforms like ResearchGate and ORCID, his research spans critical areas such as unintentional childhood injuries, doping behaviour among elite athletes, and adolescent sexual health. His recent publications in the *African Journal of Disability* highlight the impact of maternal knowledge on preventing childhood injuries in Oyo State. He also co-authored a major study on doping self-regulatory efficacy among elite Nigerian athletes, exploring psychosocial factors influencing banned substance use. Balogun's interdisciplinary approach combines public health, sports science, and behavioural studies, contributing valuable insights to health education, injury prevention, and youth wellbeing in Africa.

Google Scholar: https://scholar.google.com/citations?user=QpGgZTsAAAAJ&hl=en
ResearchGate: https://www.researchgate.net/profile/Olaitan-Balogun
ORCID: https://orcid.org/0000-0001-9358-4305

Dr. Bello Olunike Adedoyin is a researcher and academic with a deep-rooted interest in plant science, ethnobotany, and sustainable agricultural development. Her scholarly work explores the growth dynamics, nutritional potential, and socio-economic value of underutilized and indigenous plant species in Nigeria. She has conducted extensive studies on the influence of hormones and imbibition on the growth and yield of *Abelmoschus esculentus* (okra), the proximate composition of *Tetracarpidium conophorum* (African walnut), and the toxicological effects of *Telfairia occidentalis* (fluted pumpkin) on laboratory animals. Through her ethnobotanical surveys, including studies on mangrove and wetland plants, she highlights the importance of local herbs and spices in promoting sustainable livelihoods. Dr. Bello's work contributes to both scientific understanding and policy-relevant discussions on food security, health, and environmental sustainability.
Google Scholar:
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Bello+Olunike+Adedoyin+&btnG=
ORCID ID: https://orcid.org/0000-0001-5465-1691
SciProfiles: https://sciprofiles.com/profile/548067
ResearcherID: https://www.webofscience.com/wos/author/record/HKO-1470-2023
Dr. Olaseinde Peggy-Joe Nwanefuru is a licensed physiotherapist and PhD candidate at the University of Ibadan, Nigeria. With a strong commitment to academic excellence and clinical impact, she is an ardent researcher whose work bridges physiotherapy practice and evidence-based inquiry. Her research interests span rehabilitation sciences, movement analysis, and functional recovery, with a focus on improving patient outcomes through innovative and practical interventions. She is dedicated to advancing physiotherapy education and practice in Nigeria and beyond.
Google Scholar: https://scholar.google.com/citations?user=bzkxvDbfk8YC&hl=en
ORCID: https://orcid.org/0009-0008-5347-1742

References

Adams J, Sibbritt D, Lui C.W, 2011. The use of complementary and alternative medicine among Australian athletes: findings from a national survey. Journal of Science and Medicine in Sport 14(6): 512-516.

Adisa O, Odior S.K., 2024. Vulnerability and Prevalence of Doping in School Sports. Legacy of Excellence in Education and Sports Management: A Festschrift for Prof. Ebenezer Olatunde Morakinyo. Department of Human Kinetics, University of Ibadan, Nigeria.

Barkoukis V, Lazuras L, Tsorbatzoudis H, Rodafinos A, 2011. Motivational and sportspersonship profiles of elite athletes in relation to doping behavior.

Psychology of Sport and Exercise 12(3): 205–212. https://doi.org/10.1016/j.psychsport.2010.10.003

Daher J, El Khoury D, Dwyer J.J.M, 2021. Education interventions to improve knowledge, beliefs, intentions and practices with respect to dietary supplements and doping substances: A narrative review. Nutrients 13(11): 3935. https://doi.org/10.3390/nu13113935

El Khoury D, Antoine-Jonville S, 2024. Knowledge, attitudes, and practices of gym users towards the use of dietary supplements: A cross-sectional study. Journal of Exercise Science & Fitness 22(1): 45-53. https://doi.org/10.1016/j.peh.2024.100307

Knapik J.J, Steelman R.A, Hoedebecke S.S, Austin K.G, Farina E.K, Lieberman H.R, 2016. Prevalence of dietary supplement use by athletes: systematic review and meta-analysis. Sports Medicine 46(1): 103-123. Retrieved from https://doi.org/10.1007/s40279-015-0387-7

Maughan R.J, Depiesse F, Geyer H, 2007. The use of dietary supplements by athletes. Journal of Sports Sciences 25(S1): S103-S113. Retrieved from https://doi.org/10.1080/02640410701607395

Nicholls A.R, Cope E, Bailey R, Koenen K, Dumon D, Theodorou N.C, Chanal B, Saint Laurent D, Müller D, Andrés M.P, Kristensen A.H, Thompson M.A, Baumann W, Laurent, J.-F, 2017. Children's First Experience of Taking Anabolic-Androgenic Steroids can Occur before Their 10th Birthday: A Systematic Review Identifying 9 Factors That Predicted Doping among Young People. Frontiers in Psychology 8, doi: https://doi.org/10.3389/fpsyg.2017.01015.

Ros, J.J.W., Pelders, M.G, De Smet P.A.G.M, 1999. A case of positive doping associated with a botanical food supplement. Pharmacy World and Science 21(1): 44–46. https://doi.org/10.1023/a:1008681612399

Sobal J, Marquart L.F, 1994. Vitamin/mineral supplement use among high school athletes. Adolescence, 29(116), 835-843. Retrieved from https://pubmed.ncbi.nlm.nih.gov/7892794/

Tian H.H, Ong W.S, Tan C.L, 2019. Nutritional supplement use among university athletes in Singapore. Singapore Medical Journal 50(2): 165-172. Retrieved from https://pubmed.ncbi.nlm.nih.gov/19296032/

World Anti-Doping Agency, 2019. World Anti-Doping Program 2019 Anti-Doping Rule Violations (ADRVs) Report. https://www.wada-ama.org/sites/default/files/2022-01/2019_adrv_report_external_final_12_december_2021_0_0.pdf. Accessed 14 May 2025.

World Anti-Doping Agency, 2020. ERA NEW. https://www.wada-ama.org/sites/default/files/resources/files/wada_ar_2020_final_web_en.pdf. Accessed 25 April 2025.

Yager Z, O'Dea J.A, 2014. Relationships between body image, nutritional supplement use, and attitudes towards doping in sport among adolescent boys: implications for prevention programs. Journal of the International Society of Sports Nutrition 11(1), doi: https://doi.org/10.1186/1550-2783-11-13.

Yesalis C, Bahrke M, 2002. Performance Enhancing Substances in Sport and Exercise. https://www.semanticscholar.org/paper/Performance-Enhancing-Substances-in-Sport-and-Yesalis-Bahrke/5bda4758c21e56e55a6a29407b15a7f75eaf8733. Accessed 15 Feb. 2025.