SAHEL INTERNATIONAL JOURNAL OF
AGRICULTURE AND FOOD SECURITY
VOLUME 1 • ISSUE 1 • JANUARY–DECEMBER 2026

Consumer Perceptions and Utilization Patterns of Traditional Medicine in Adamawa State, Nigeria

Peter Kuluta Gabul[1], Alexander Abel[2] and Jaafaru Joshua[3]
[1,3] Department of Agricultural Economics and Extension, Faculty of Agriculture, Federal University of Agriculture Mubi (FUAMB), Nigeria
[2] Chemistry Department, Federal University of Agriculture Mubi (FUAMB), Nigeria
Email addresses: [1]petergabul2015@gmail.com | [2]abelalexander02@yahoo.com | [3]gwanijaf@gmail.com
[*] Corresponding author: Peter Kuluta Gabul

Abstract

This study examined consumer perceptions and utilization patterns of traditional medicine in Adamawa State, Nigeria, with particular emphasis on the intensity of utilization and its socioeconomic and perceptual determinants. A cross-sectional survey design was employed, using primary data collected through a structured questionnaire. The survey covered 271 consumers, of whom 269 with previous experience of traditional medicine constituted the analytical sample for utilization-intensity analysis. Descriptive statistics, perception mean scores, ordered logistic regression and average marginal effects were employed. Traditional medicine utilization was categorized as rare, occasional and regular use. The findings revealed a high level of engagement with traditional medicine, with 47.6% of users reporting occasional use and 41.6% regular use, while only 10.8% reported rare use. Herbal practitioners constituted the dominant source of traditional medicine (71.7%), while perceived effectiveness (54.6%), recommendation (37.9%), accessibility (37.5%) and low cost (36.1%) were the major factors influencing consumers' choices. Consumer perceptions were generally favourable, with affordability recording the highest mean score (4.331), followed by effectiveness (4.297) and accessibility (4.230). The ordered logit results showed that age ($\beta = 1.030$, $p < 0.001$) and perceived knowledge of herbal practitioners ($\beta = 0.433$, $p = 0.022$) significantly increased the likelihood of higher utilization intensity, while gender, marital status, perceived effectiveness, affordability, safety, trust and accessibility were not independently significant. The marginal effects further indicated that a one-category increase in age increased the probability of regular utilization by 19.82 percentage points, while a one-point increase in perceived practitioner knowledge increased it by 8.33 percentage points. Despite generally favourable perceptions, consumers identified lack of scientific evidence, safety concerns, poor packaging and uncertain dosage as major challenges. The study concludes that traditional medicine is an important component of healthcare-seeking behaviour among the surveyed consumers, with utilization intensity particularly associated with age and perceived practitioner competence. Strengthening scientific validation, product standardization, dosage guidance, safety monitoring

and practitioner training is therefore recommended to enhance consumer protection and support the safe integration of traditional medicine into the healthcare system.

Keywords: *Traditional medicine; consumer perception; utilization intensity; herbal medicine; ordered logistic regression; Adamawa State; Nigeria.*

1. Background to the Study

Traditional medicine remains an important component of healthcare systems across many low- and middle-income countries, particularly where indigenous knowledge, medicinal plants and community-based therapeutic practices coexist with conventional healthcare services. In Nigeria, traditional and herbal medicines continue to play a significant role in healthcare-seeking behaviour despite improvements in modern medical facilities and pharmaceutical services. Their continued utilization reflects a combination of historical and cultural acceptance, perceived therapeutic effectiveness, affordability, accessibility and familiarity with traditional healthcare practices. Evidence from Nigeria indicates substantial utilization of herbal medicine, with effectiveness, affordability and availability frequently identified as important reasons for its use (Aina et al., 2020). More recent evidence similarly suggests that socioeconomic circumstances, cultural beliefs, social networks and limitations in formal healthcare access continue to shape traditional medicine utilization in Nigeria (Abhadionmhen et al., 2025).

Consumer decisions regarding traditional medicine extend beyond the simple choice of whether or not to use herbal remedies. The frequency and intensity of utilization may reflect consumers' experiences with treatment, perceptions of therapeutic outcomes, confidence in practitioners and ease of obtaining traditional medicines. Perceived effectiveness is particularly important because previous positive treatment experiences may reinforce subsequent utilization, while affordability and accessibility can make traditional medicine attractive relative to alternative sources of healthcare. Atekoja et al. (2025) identified effectiveness, affordability and accessibility as important factors influencing complementary and alternative medicine utilization in Nigeria, while Osayi et al. (2026) showed that accessibility, cost and family traditions contributed to continued reliance on medicinal plants even in settings where prescription medicines were available. These findings suggest that traditional medicine utilization represents a multidimensional healthcare behaviour shaped by both economic considerations and consumers' subjective evaluations of treatment alternatives.

Consumer perception is therefore fundamental to understanding the persistence and intensity of traditional medicine utilization. Individuals may evaluate traditional medicine in terms of its effectiveness, affordability, safety, accessibility and the competence of practitioners, while trust in

providers and willingness to recommend herbal treatments may further reflect their accumulated experiences. However, favourable perceptions do not necessarily imply an absence of concern. Consumers may perceive herbal medicines as effective and affordable while simultaneously questioning dosage accuracy, scientific validation, product quality or the safety of particular preparations. Such considerations are especially important because traditional medicines are used for diverse health conditions and may sometimes be consumed concurrently with conventional medicines. Recent Nigerian evidence has drawn attention to continuing concerns regarding dosage information, product quality, potential interactions and safety, underscoring the importance of examining positive perceptions alongside perceived risks and constraints.

The increasing prominence of traditional medicine has also intensified policy discussions concerning scientific validation, practitioner competence, standardization, regulation and possible integration into formal healthcare systems. These issues are particularly relevant in settings where consumers obtain herbal products through diverse channels, including traditional practitioners, markets, family preparation and other informal outlets. Weaknesses in packaging, dosage specification, hygienic preparation, quality control and evidence supporting therapeutic claims may create risks even where consumer demand remains strong. Consequently, understanding utilization patterns requires more than estimating prevalence; it requires identifying how frequently consumers use traditional medicine, why they choose it, where they obtain it, the health conditions for which it is used, how consumers evaluate its attributes, and the challenges they encounter. Such evidence can contribute to policies that preserve potentially beneficial indigenous healthcare knowledge while strengthening consumer protection, evidence generation and quality assurance.

Despite the growing Nigerian literature, empirical evidence remains geographically uneven, with many studies concentrated in southern Nigeria or among specific groups such as women, elderly persons and patients with particular diseases, while evidence on consumer perceptions and intensity of traditional medicine utilization in Adamawa State and northeastern Nigeria remains comparatively limited. This study therefore examines the perceptions and utilization patterns of traditional medicine among consumers in Adamawa State, with particular attention to utilization intensity and its socioeconomic and perceptual determinants. By distinguishing between rare, occasional and regular utilization, the study provides evidence on factors associated with different levels of consumer engagement with traditional medicine rather than merely whether it is used. The remainder of the paper is organized into the literature review, methodology, results and discussion, and conclusion and policy implications.

2. Literature Review

Traditional medicine remains an important component of healthcare utilization in Nigeria despite the expansion of orthodox medical services. Empirical evidence consistently demonstrates that

herbal and other traditional remedies are used either as primary treatment options or alongside conventional medicine. Aina et al. (2020), in a large cross-sectional study in Southwest Nigeria, reported substantial utilization of herbal medicine and identified perceived effectiveness, affordability and availability as important motivations for its use. Li et al. (2020) similarly found a high prevalence of traditional medicine utilization among adult women in Ibadan, while Goodman et al. (2022) established that traditional healers continued to attract considerable patronage among women in an urban Nigerian community, including consumers who simultaneously used orthodox healthcare. More recent Nigerian evidence continues to associate traditional medicine utilization with economic conditions, cultural beliefs, social norms and limitations in access to formal healthcare services.

The pattern of traditional medicine utilization, however, varies considerably across socioeconomic groups and geographical locations. Studies conducted among specific populations—including insured patients, women, breastfeeding mothers and individuals with chronic diseases—demonstrate that utilization is not confined to rural or economically disadvantaged populations. Maiyegun et al. (2022), for example, documented herbal medicine use among adults attending a National Health Insurance clinic in Bauchi, while Okenwa et al. (2023) reported substantial utilization among chronic-disease patients in southeastern Nigeria. Amaeze et al. (2023) also identified demographic and socioeconomic characteristics associated with herbal medicine use among breastfeeding mothers. A recent systematic mixed-method review of Nigerian evidence concluded that income, education, affordability, cultural beliefs, social norms and access to formal healthcare interact in shaping traditional medicine utilization. These findings suggest that traditional medicine utilization is a multidimensional healthcare behaviour rather than simply an outcome of poverty or lack of orthodox healthcare.

Consumer perceptions constitute another important dimension of traditional medicine utilization. Existing studies indicate that individuals frequently associate herbal medicines with effectiveness, affordability, accessibility and cultural familiarity. Atekoja et al. (2025), for instance, found perceived effectiveness, affordability and accessibility to be important considerations in complementary and alternative medicine utilization in Ogun State. Osayi et al. (2026) similarly demonstrated that family traditions, accessibility and cost contributed to the continued reliance on medicinal plants even where prescription medicines were available. The broader Nigerian literature supports the proposition that economic considerations operate jointly with cultural and experiential factors in healthcare decision-making; affordability appears particularly important among lower-income consumers, while social norms and traditional beliefs reinforce continued utilization. Consequently, consumer perceptions of traditional medicine should be treated as multidimensional, encompassing evaluations of therapeutic effectiveness, cost, safety, accessibility and practitioner competence.

The competence and credibility of traditional medicine practitioners also appear important in explaining continued patronage. Traditional practitioners frequently constitute not merely suppliers of herbal products but important sources of diagnosis, therapeutic advice and indigenous health knowledge. Nigerian evidence suggests that the perceived efficacy and accessibility of traditional healers contribute to their continued relevance, particularly where they are culturally embedded within communities. Studies of maternal and reproductive healthcare have likewise demonstrated how indigenous knowledge and relationships with knowledgeable practitioners sustain utilization across generations. This aspect is particularly important because consumer confidence in traditional medicine may not necessarily be equivalent to confidence in individual practitioners. Perceptions of practitioner knowledge, honesty, hygiene and professional competence may therefore influence whether consumers use traditional medicine rarely, occasionally or regularly.

Age and other socioeconomic characteristics have also received considerable attention in the empirical literature, although findings remain heterogeneous. Some Nigerian studies have identified education, income, occupation, ethnicity, religion and geographical location as significant correlates of herbal medicine utilization, whereas others have found weak or insignificant relationships for particular demographic variables. The 2025 systematic review of Nigerian evidence similarly demonstrates that socioeconomic influences vary substantially across study populations and settings. Such inconsistencies may partly reflect differences in sampling populations, health conditions, geographical contexts and definitions of traditional medicine utilization. They also indicate a limitation of modelling utilization exclusively as a binary decision. Distinguishing between rare, occasional and regular utilization can provide additional information about how socioeconomic characteristics and consumer perceptions influence the intensity, rather than merely the occurrence, of traditional medicine use.

Despite favourable consumer perceptions, concerns regarding the safety and quality of traditional medicines remain prominent in the literature. Issues include uncertain dosage, contamination, inappropriate preparation, insufficient information on ingredients, potential interactions with conventional medicines and unsubstantiated therapeutic claims. Mba et al. (2025) highlighted continuing information gaps surrounding herbal drug use among non-health professionals in Nigeria, while recent Nigerian scholarship emphasizes that widespread utilization does not itself establish the safety or clinical effectiveness of herbal products. These concerns become particularly important when consumers use traditional remedies for chronic or potentially serious conditions. The literature therefore demonstrates an apparent paradox: consumers may simultaneously perceive traditional medicine as effective and valuable while remaining concerned about scientific evidence, dosage standardization and product safety.

Regulation, standardization and quality assurance consequently constitute a major strand of recent traditional medicine research. Mponda et al. (2025), comparing regulatory arrangements in Nigeria and Malawi, found that Nigeria possesses a comparatively developed regulatory framework but continues to face significant enforcement problems. The study identified deficiencies in herbal-product labelling, including inadequate disclosure of active ingredients, quantities, side effects and storage requirements. Recent reviews similarly emphasize insufficient institutionalized training and research on traditional medicine practitioners and products in Nigeria. These deficiencies have direct implications for consumer confidence because poor packaging, uncertain dosage, inadequate hygiene and insufficient scientific validation can undermine the perceived legitimacy of otherwise widely utilized traditional healthcare services. Nigeria's current traditional medicine policy accordingly identifies practitioner knowledge and skills, quality assurance, safety, accessibility, affordability, research and collaboration with conventional healthcare as important strategic areas.

Overall, the empirical literature establishes that traditional medicine utilization in Nigeria is widespread and influenced by a complex combination of perceived effectiveness, affordability, accessibility, cultural traditions, socioeconomic circumstances and confidence in traditional practitioners. Nevertheless, important gaps remain. Much of the Nigerian evidence is concentrated in southern states or among specialized populations such as women, breastfeeding mothers, elderly persons and patients with specific chronic conditions. Recent reviews also confirm that the evidence base remains heterogeneous across geographical and socioeconomic contexts. Comparatively limited empirical evidence exists on the multidimensional perceptions and intensity of traditional medicine utilization among general consumers in northeastern Nigeria, particularly Adamawa State. Moreover, many existing studies concentrate on whether respondents use traditional medicine rather than differentiating the intensity of use. The present study addresses these gaps by examining consumer utilization patterns and perceptions in Adamawa State and modelling utilization as an ordered outcome—rare, occasional and regular use—while evaluating the roles of socioeconomic characteristics, perceived effectiveness, affordability, safety, practitioner knowledge, trust and accessibility.

2.1 Literature Mapping of Empirical Studies on Traditional Medicine

S/N	Author(s), Year & Area	Focus	Method/Sample	Key Findings & Relevance
1	Aina et al. (2020), Southwest Nigeria	Herbal medicine use and determinants	Cross-sectional; ~1,600 adults	High utilization; effectiveness, affordability and availability encouraged use. Useful for consumer-choice factors.
2	Li et al. (2020), Ibadan, Nigeria	Prevalence and predictors of traditional medicine use	Cross-sectional; adult women	Utilization was 81.6%; education and ethnicity influenced use. Limited to women.

S/N	Author(s), Year & Area	Focus	Method/Sample	Key Findings & Relevance
3	Goodman et al. (2022), Lagos, Nigeria	Traditional healer utilization	Mixed methods; 270 women	63.2% used traditional healers; income and education influenced use. Limited to women.
4	Maiyegun et al. (2022), Bauchi, Nigeria	Herbal medicine utilization	Cross-sectional; NHIS patients	Herbal medicine remained in use among formally insured patients. Relevant Northeast comparator.
5	Oluwole et al. (2023), Lagos, Nigeria	Perception and CAM utilization	Cross-sectional; sickle-cell patients	CAM remained important among chronic-disease patients. Limited to a specific patient group.
6	Okenwa et al. (2023), Southeast Nigeria	Herbal use and perceptions	Cross-sectional; 319 patients	65.2% used herbal medicine; gender was insignificant. Supports present gender finding.
7	Amaeze et al. (2023), Lagos, Nigeria	Herbal use and predictors	Cross-sectional; breastfeeding mothers	Religion, ethnicity, location, parity and occupation influenced use. Population-specific.
8	Modibbo et al. (2024), Northern Nigeria	Herbal aphrodisiac use and safety	Cross-sectional; 794 respondents	About 64% used herbal aphrodisiacs; safety concerns were identified. Relevant northern evidence.
9	Opara et al. (2024), Nigeria	Cultural influences on traditional medicine	Qualitative study	Culture, perceived effectiveness and practitioner knowledge encouraged use. Maternal-health focused.
10	Alfa et al. (2025), Kaduna, Nigeria	Traditional medicine patronage	Survey	Substantial patronage for malaria, gastrointestinal and other conditions. Strong northern comparator.
11	Abhadionmhen et al. (2025), Nigeria	Determinants of traditional medicine use	Systematic mixed-method review	Affordability, culture, income and healthcare-access gaps influenced use. Provides national evidence.
12	Atekoja et al. (2025), Ogun, Nigeria	CAM utilization factors	Community survey	Effectiveness, affordability and accessibility influenced utilization. Closely supports present findings.
13	Sylver-Francis & Pelkonen (2025), Nigeria	Medicinal plants for chronic diseases	Interviews; >600 patients	High use alongside conventional medicine; dosage and safety concerns emerged.
14	Onukansi et al. (2025), Nigeria	Evidence and policy for traditional medicine	Review	Scientific validation, regulation and quality control remain major challenges.
15	Bamgboye et al. (2025), Nigeria	Informal healthcare patronage	Empirical study	Efficacy, affordability and accessibility influenced patronage. Focused mainly on malaria.
16	Ibrahim et al. (2025), Southwest Nigeria	Medicinal plants and reproductive health	Interviews with practitioners/vendors	Indigenous knowledge and perceived safety supported herbal use. Provider-focused.
17	Osayi et al. (2026), Nsukka, Nigeria	Continued reliance on medicinal plants	Community study	Family tradition, accessibility and cost sustained herbal use. Highly relevant to utilization behaviour.
18	Saka & Oguntoyinbo (2026), Ogun, Nigeria	Concurrent herbal medicine use	Cross-sectional; 361 elderly patients	68.1% combined herbal and prescribed medicines. Supports importance of age.

S/N	Author(s), Year & Area	Focus	Method/Sample	Key Findings & Relevance
19	Iheanacho et al. (2026), Nigeria	Predictors of herbal medicine use	Multicentre; 1,250 outpatients	Current use was 48.4%; self-prescription was prominent. Large recent Nigerian evidence.
20	Omoge et al. (2026), Nigeria	Herbal medicine and healthcare integration	Scoping review	Regulation, evidence and standardization remain major integration challenges.
21	Owusu et al. (2025), Ghana	Herbal consumption and regulation	Cross-sectional; 504 respondents	92.7% reported use; effectiveness, availability and safety influenced consumption.
22	Asiamah et al. (2025), Ghana	Herbal pharmacovigilance	Users and practitioners	Safety-monitoring gaps persisted despite widespread herbal medicine use.
23	Mugume et al. (2025), Uganda	Herbal use and associated factors	Cross-sectional; hypertension patients	Considerable herbal use occurred among chronic-disease patients.
24	Tassew et al. (2024), Ethiopia	Herbal medicine prevalence and determinants	Systematic review/meta-analysis	Pooled use was about 56.9%; demographic determinants varied across studies.
25	Asase et al. (2023), Ghana	Herbal medicine industry challenges	Review	Standardization, scientific evidence, quality assurance and regulation were major challenges.

Source: Compiled by the Author, 2026.

3. Methodology

3.1 Study Area

The study was conducted in Adamawa State, Nigeria. The State is located in northeastern Nigeria and comprises both urban and rural communities with diverse socioeconomic, cultural and livelihood characteristics. Healthcare services are provided through public and private health facilities alongside traditional healthcare systems, including herbal practitioners and other indigenous therapeutic providers. The continued availability and utilization of medicinal plants and herbal preparations, together with variations in household income, healthcare accessibility and sociocultural practices, make Adamawa State an appropriate setting for examining consumer perceptions and utilization patterns of traditional medicine.

3.2 Research Design and Population of the Study

The study adopted a cross-sectional survey design to obtain primary data from consumers of traditional medicine in Adamawa State. The target population comprised individuals with experience in the utilization of traditional or herbal medicine. Data were collected using a structured questionnaire designed to capture respondents' socioeconomic characteristics, utilization behaviour, expenditure on herbal medicine, sources of traditional medicine, factors influencing

utilization, consumer perceptions and challenges associated with its use. Although the broader survey covered both consumers and herbal practitioners, the present article focuses exclusively on the consumer component of the dataset because its principal interest is consumer perceptions and utilization behaviour.

3.3 Data and Analytical Sample

Primary data were obtained through administration of the structured questionnaire. The consumer dataset contained 271 respondents. However, because the econometric analysis of utilization intensity requires respondents with previous experience of traditional medicine, consumers who indicated that they had never used traditional/herbal medicine were excluded from the utilization-intensity model. Consequently, 269 consumers who reported previous utilization of traditional medicine constituted the analytical sample for the perception and ordered-response analyses. Traditional medicine utilization was examined across three ordered levels: rare use, occasional use and regular use. The questionnaire also collected information on the health conditions for which traditional medicine was used, sources of herbal medicine, factors influencing choice, monthly expenditure and challenges experienced by consumers.

3.4 Measurement of Variables

The principal outcome variable was Traditional Medicine Utilization Intensity (TMUI), derived from respondents' reported frequency of traditional medicine use. The variable was ordinally coded as Rarely = 1, Occasionally = 2 and Regularly = 3, such that higher values represented greater utilization intensity. Consumer characteristics included age, gender and marital status. Age was measured using ordered age categories, gender as a binary variable, while marital status was treated as a categorical variable and represented by appropriate dummy variables in the multivariate analysis.

Consumer perceptions were measured using eight statements rated on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The statements captured perceived effectiveness, affordability, relative safety/fewer side effects, knowledge of herbal practitioners, trust in practitioners, accessibility, support for integration into the healthcare system and willingness to recommend herbal medicine to others. For the core econometric specification, emphasis was placed on the fundamental perception dimensions of effectiveness, affordability, safety, practitioner knowledge, trust and accessibility, while support for healthcare integration and willingness to recommend were treated primarily as broader attitudinal outcomes.

3.5 Analytical Techniques

The data were analysed using descriptive and inferential statistical techniques. Frequencies, percentages, means and standard deviations were used to summarize respondents' characteristics and utilization behaviour. Utilization patterns were examined in terms of frequency of use, health conditions treated, sources of herbal medicine, factors influencing choice and monthly expenditure. Questions permitting multiple responses were analysed using multiple-response frequencies and percentages, since an individual consumer could report more than one health condition, motivation or challenge.

Consumer perceptions were analysed using mean scores and ranking. For each perception statement, the weighted mean score was calculated as:

$$\bar{X}_j = \Sigma f_i x_i / N$$

where $\bar{X}_j$ is the mean perception score for statement *j*, f_i represents the frequency associated with response category *i*, x_i is the numerical Likert score ranging from 1 to 5, and **N** is the number of valid responses. Higher mean scores indicate more favourable perceptions of traditional medicine. The perception items were also assessed for internal consistency using Cronbach's alpha. Where the items demonstrated adequate internal consistency and dimensional coherence, exploratory factor analysis/principal component analysis was used to investigate whether the perception measures could be represented by a smaller number of underlying dimensions.

3.6 Ordered Logistic Regression Model

Given the inherently ordinal structure of the dependent variable, an ordered logistic regression model was employed to examine the association between consumer characteristics, perceptions and the intensity of traditional medicine utilization. The model assumes the existence of an unobserved continuous propensity to utilize traditional medicine, denoted by $TMUI_i^*$, which underlies the observed ordered utilization categories. The latent-variable specification is expressed as:

$$TMUI_i = \beta_0 + \beta_1 AGE_i + \beta_2 GEN_i + \beta_3 MAR_{2i} + \beta_4 MAR_{3i} + \beta_5 MAR_{4i} + \beta_6 EFF_i + \beta_7 AFF_i + \beta_8 SAFE_i + \beta_9 KNOW_i + \beta_{10} TRUST_i + \beta_{11} ACCESS_i + \varepsilon_i^*$$

where $TMUI_i^*$ represents the latent propensity for intensive utilization of traditional medicine by consumer *i*; AGE represents age category; GEN represents gender; MAR_2–MAR_4 are dummy variables representing marital-status categories relative to the reference category; EFF denotes perceived effectiveness; AFF represents perceived affordability; SAFE represents perceived safety or fewer side effects; KNOW represents perceived knowledge of herbal practitioners; TRUST

represents trust in herbal practitioners; ACCESS represents perceived accessibility; β_0 is the constant term; β_1–β_{11} are parameters to be estimated; and ε_i is the stochastic disturbance term assumed to follow the standard logistic distribution.

The relationship between the unobserved latent propensity and the observed utilization categories is defined by two estimated threshold parameters as follows:

$TMUI_i = 1$ *(Rarely), if* $TMUI_i \leq \mu_1$*

$TMUI_i = 2$ *(Occasionally), if* $\mu_1 < TMUI_i \leq \mu_2$*

$TMUI_i = 3$ *(Regularly), if* $TMUI_i > \mu_2$*

where $\boldsymbol{\mu_1 < \mu_2}$ are threshold or cut-point parameters estimated simultaneously with the regression coefficients. The corresponding cumulative ordered-logit model is specified as:

$$\ln[P(TMUI_i \leq j \mid X_i) / P(TMUI_i > j \mid X_i)] = \boldsymbol{\mu_j} - \mathbf{X_i\beta}, \quad \mathbf{j} = 1, 2$$

where $\mathbf{X_i}$ represents the vector of explanatory variables, $\boldsymbol{\beta}$ represents the vector of estimated parameters, and $\boldsymbol{\mu_j}$ represents the estimated threshold for outcome *j*. The specification simultaneously models the cumulative contrasts between rare utilization versus occasional/regular utilization, and rare/occasional utilization versus regular utilization.

3.7 Model Diagnostics and Marginal Effects

The ordered logit model relies on the proportional-odds or parallel-lines assumption, which requires the effects of the explanatory variables to remain constant across the cumulative outcome thresholds. This assumption was evaluated using an appropriate parallel-lines/Brant-type test. Where the assumption was not supported for one or more explanatory variables, a generalized ordered logit or partial proportional-odds model was considered to relax the restriction selectively while preserving proportionality for variables satisfying the assumption.

Because ordered-logit coefficients primarily indicate the direction and statistical significance of associations rather than direct changes in category probabilities, average marginal effects (AMEs) were estimated. Marginal effects were calculated separately for the probabilities of being a rare, occasional and regular user of traditional medicine. This permits substantive interpretation of how changes in consumer characteristics and perception measures are associated with the predicted probability of belonging to each utilization category.

3.8 Model Evaluation and Statistical Inference

The overall statistical significance of the estimated model was assessed using the likelihood-ratio chi-square statistic, while model fit was evaluated using the log-likelihood and pseudo-(R^2) statistics. Statistical inference was based on estimated coefficients, standard errors, *z*-statistics, probability values and confidence intervals. Potential multicollinearity among the explanatory variables, particularly the closely related consumer-perception measures, was examined prior to final model estimation. Statistical significance was evaluated at conventional 1%, 5% and 10% levels, while substantive interpretation emphasized the magnitude and direction of estimated marginal effects rather than statistical significance alone.

3.9 Ethical Considerations

Participation in the survey was voluntary, and information obtained from respondents was treated confidentially and used exclusively for research purposes. Respondents were informed of the purpose of the study before completing the questionnaire, and the analysis was conducted using anonymized responses without personally identifying individual participants.

4.0 Results and Discussion

4.1 Socioeconomic Characteristics of Respondents

Table 1: Socioeconomic Characteristics of Consumers of Traditional Medicine

Variable	Category	Frequency	Percentage (%)
Gender	Male	165	60.9
	Female	106	39.1
	Total	**271**	**100.0**
Age	Below 20 years	15	5.5
	21–30 years	64	23.6
	31–40 years	109	40.2

Variable	Category	Frequency	Percentage (%)
	41–50 years	57	21.0
	Above 50 years	26	9.6
	Total	**271**	**100.0**
Marital Status	Single	69	25.5
	Married	140	51.7
	Divorced	30	11.1
	Widowed	32	11.8
	Total	**271**	**100.0**
Ever Used Traditional Medicine	Yes	269	99.3
	No	2	0.7
	Total	**271**	**100.0**

Source: Field Survey, 2026.

Table 1 shows that 60.9% of the respondents were male, while 39.1% were female, indicating relatively greater representation of men among the surveyed consumers. In terms of age, the largest proportion of respondents, 40.2%, were between 31 and 40 years, followed by those aged 21–30 years (23.6%) and 41–50 years (21.0%). Respondents above 50 years accounted for 9.6%, while only 5.5% were below 20 years. The age distribution therefore indicates that traditional medicine consumption in the sample was concentrated predominantly among economically active adults.

Regarding marital status, slightly more than half of the respondents (51.7%) were married, while 25.5% were single. Widowed and divorced respondents accounted for 11.8% and 11.1%, respectively. The predominance of married respondents may reflect the broader household and family health responsibilities associated with adulthood, although the present descriptive evidence should not be interpreted as establishing a causal relationship between marital status and traditional medicine utilization.

The results further show an exceptionally high prevalence of previous traditional medicine utilization. Of the 271 consumers surveyed, 269 respondents, representing 99.3%, reported that they had used traditional or herbal medicine, while only two respondents (0.7%) had never used it. This near-universal experience with traditional medicine confirms that a binary user/non-user outcome would contain insufficient variation for meaningful econometric modelling. Consequently, subsequent analysis appropriately focuses on the intensity of utilization among the 269 users.

4.2 Utilization Patterns of Traditional Medicine

Table 2: Frequency of Traditional Medicine Utilization

Utilization Frequency	Frequency	Percentage (%)
Rarely	29	10.8

Utilization Frequency	Frequency	Percentage (%)
Occasionally	128	47.6
Regularly	112	41.6
Total	**269**	**100.0**

Source: Field Survey, 2026.

The distribution in Table 2 demonstrates substantial engagement with traditional medicine among users. Almost half of the respondents (47.6%) reported occasional utilization, while a further 41.6% used traditional medicine regularly. Only 10.8% reported rare utilization. Thus, approximately 89.2% of users utilized traditional medicine either occasionally or regularly, indicating that its use constitutes more than an isolated or incidental healthcare practice for most respondents. This ordered distribution also provides an empirically suitable dependent variable for the ordered logistic regression model, with Rarely, Occasionally and Regularly representing progressively higher utilization intensity.

Sources of Traditional Medicine

Table 3: Sources of Traditional Medicine

Source	Frequency	Percentage of Users (%)
Herbal practitioner	193	71.7
Family preparation	89	33.1
Islamic chemist	88	32.7
Local market	83	30.9

Source: Field Survey, 2026.
Note: Multiple responses were permitted; therefore, percentages do not sum to 100%.

The findings indicate that herbal practitioners were the dominant source of traditional medicine, reported by 71.7% of users. Family preparation accounted for 33.1%, while 32.7% obtained traditional medicine from Islamic chemists and 30.9% from local markets. The strong reliance on herbal practitioners highlights their central position in the traditional healthcare market in the study area. At the same time, the substantial proportions relying on family preparation, Islamic chemists and local markets demonstrate that access to traditional medicine occurs through multiple formal and informal distribution channels.

Factors Influencing the Choice of Traditional Medicine

Table 4: Factors Influencing Consumers' Choice of Traditional Medicine

Factor	Frequency	Percentage of Users (%)	Rank
Effectiveness	147	54.6	1st
Recommendation	102	37.9	2nd
Accessibility	101	37.5	3rd
Low cost	97	36.1	4th
Cultural belief	77	28.6	5th

Source: Field Survey, 2026.
Note: Multiple responses were permitted; therefore, percentages do not sum to 100%.

Perceived effectiveness emerged as the most frequently reported consideration influencing traditional medicine choice, identified by 54.6% of users. Recommendation from other individuals ranked second at 37.9%, closely followed by accessibility at 37.5% and low cost at 36.1%. Cultural belief, although relevant, recorded the lowest proportion at 28.6%. This pattern is important for the article because it suggests that traditional medicine utilization is not driven exclusively by cultural attachment. Instead, consumers appear to attach considerable importance to perceived therapeutic performance, social recommendations, availability and affordability.

Monthly Expenditure on Traditional Medicine

Table 5: Monthly Expenditure on Traditional Medicine

Monthly Expenditure	Frequency	Percentage (%)
Less than ₦5,000	185	68.8
₦10,000–₦20,000	73	27.1
Above ₦20,000	11	4.1
Total	**269**	**100.0**

Source: Field Survey, 2026.

The majority of consumers (68.8%) reported spending less than ₦5,000 monthly on traditional medicine, while 27.1% spent between ₦10,000 and ₦20,000. Only 4.1% reported expenditure exceeding ₦20,000 per month. The predominance of relatively low expenditure is consistent with affordability being one of the frequently reported considerations influencing traditional medicine choice. There is, however, an important data-quality qualification. The original questionnaire specified four expenditure categories, including ₦5,000–₦10,000, but this category does not occur in the submitted dataset. The analysis therefore reports the categories exactly as observed and does not infer or manufacture responses for the missing category.

4.3 Health Conditions for which Traditional Medicine is Used

The open-ended responses on illnesses treated were standardized into broader, non-mutually-exclusive health-condition groups.

Table 6: Major Health Conditions for Which Traditional Medicine is Used

Health Condition Group	Frequency	Percentage of Users (%)
Gastrointestinal conditions	47	17.5
Musculoskeletal and pain-related conditions	43	16.0
Respiratory conditions	40	14.9
Fever, malaria and typhoid-related conditions	36	13.4
Reproductive and sexual health conditions	32	11.9
Piles/haemorrhoids	31	11.5
Skin conditions	28	10.4
Urinary and kidney conditions	27	10.0
Cardiovascular and metabolic conditions	23	8.6
Wounds, injuries and snakebite	20	7.4
Liver-related conditions	16	5.9
Dental, eye and ear conditions	12	4.5
Mental/spiritual conditions	6	2.2
Cancer-related conditions	5	1.9

Source: Field Survey, 2026.
Note: Responses were derived from open-ended answers and coded into broad, non-exclusive categories. A respondent could report more than one condition.

Traditional medicine was used across a wide range of health conditions. Gastrointestinal problems recorded the highest proportion at 17.5%, followed by musculoskeletal and pain-related conditions at 16.0%, respiratory conditions at 14.9%, and fever/malaria/typhoid-related conditions at 13.4%. Traditional medicine was also used for reproductive and sexual health problems, piles, skin diseases, urinary and kidney conditions, cardiovascular and metabolic disorders, wounds and snakebite, among other conditions. The breadth of reported therapeutic applications indicates that consumers perceive traditional medicine as relevant to both common ailments and more complex health problems.

4.4 Consumer Perceptions of Traditional Medicine

The eight perception statements were measured on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. Mean scores and standard deviations were used to determine the relative strength of consumers' perceptions.

Table 7: Consumer Perceptions of Traditional Medicine

Perception Statement	Mean	Std. Dev.	Rank	Interpretation
Herbal medicines are affordable	**4.331**	0.609	1st	High
Traditional medicine is effective	**4.297**	0.675	2nd	High
Traditional medicine is easily accessible	**4.230**	0.628	3rd	High
I would recommend herbal medicine to others	**4.219**	0.623	4th	High
Herbal practitioners are knowledgeable	**4.048**	0.708	5th	High
Herbal medicine should be integrated into the healthcare system	**3.967**	0.839	6th	High
Traditional medicine has fewer side effects than modern medicine	**3.914**	0.756	7th	High
I trust herbal practitioners	**3.877**	0.870	8th	High

Source: Field Survey, 2026. N = 269.
Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

The results reveal generally favourable perceptions of traditional medicine among consumers. Perceived affordability recorded the highest mean score (M = 4.331, SD = 0.609), followed closely by perceived effectiveness (M = 4.297, SD = 0.675) and accessibility (M = 4.230, SD = 0.628). These findings indicate that the principal positive attributes associated with traditional medicine among respondents relate to its economic accessibility, perceived therapeutic value and physical availability. This is consistent with the earlier utilization-pattern results, where effectiveness, accessibility and low cost were among the major factors reported as influencing consumers' choices.

Willingness to recommend herbal medicine to others also recorded a relatively high mean (M = 4.219, SD = 0.623), indicating considerable positive behavioural disposition towards traditional medicine. Perceived practitioner knowledge recorded a mean of 4.048, while support for integration of herbal medicine into the healthcare system recorded a mean of 3.967. The latter suggests that favourable personal perceptions of traditional medicine extend, to some extent, to support for its institutional recognition within the broader healthcare system.

Perceptions relating to fewer side effects (M = 3.914) and trust in herbal practitioners (M = 3.877) ranked lowest, although their mean scores remained above the neutral midpoint. Trust also recorded the largest standard deviation (SD = 0.870), suggesting comparatively greater heterogeneity in consumers' views about herbal practitioners. This distinction is substantively important: consumers may perceive traditional medicine as effective, affordable and accessible without necessarily expressing equally strong confidence in the individuals providing traditional healthcare services.

4.7 Determinants of Traditional Medicine Utilization Intensity

An ordered logistic regression model was estimated to examine whether respondents' socioeconomic characteristics and perceptions of traditional medicine were associated with the intensity of utilization. Traditional medicine utilization intensity was ordered as Rarely = 1, Occasionally = 2 and Regularly = 3. Consequently, a positive coefficient indicates a greater likelihood of being located in a higher utilization category, whereas a negative coefficient indicates a tendency toward a lower utilization category, holding other factors constant.

Table 10: Ordered Logit Estimates of Traditional Medicine Utilization Intensity

Variable	Coefficient	Std. Error	z-statistic	p-value	Odds Ratio	95% CI of OR
Age	1.030*	0.225	4.581	<0.001	2.800	1.803–4.351
Gender	0.022	0.282	0.078	0.938	1.022	0.588–1.778
Married	0.317	0.414	0.766	0.444	1.373	0.610–3.091
Divorced	0.820	0.589	1.393	0.164	2.270	0.716–7.199
Widowed	−0.357	0.718	−0.497	0.619	0.700	0.171–2.860
Perceived effectiveness	−0.008	0.193	−0.043	0.966	0.992	0.680–1.447
Perceived affordability	−0.109	0.211	−0.516	0.606	0.897	0.593–1.357
Perceived safety	−0.193	0.176	−1.094	0.274	0.825	0.584–1.165
Practitioner knowledge	0.433 **	0.189	2.294	0.022	1.541	1.065–2.230
Trust in practitioners	0.057	0.159	0.359	0.720	1.059	0.775–1.446
Accessibility	−0.061	0.204	−0.299	0.765	0.941	0.630–1.404

Model Statistics: N = 269; Log likelihood = −221.092; LR $\chi^2(11) = 73.403$; $p < 0.001$; McFadden Pseudo-$R^2 = 0.142$; AIC = 468.18; BIC = 514.92. Reference categories**:** Female for gender and Single for marital status. ***p < 0.01; *$p < 0.05$; $p < 0.10$.
Source: Authors' computation from Field Survey, 2026.

The likelihood-ratio statistic was statistically significant at the 1% level (LR $\chi^2(11) = 73.403$, $p < 0.001$), indicating that the explanatory variables were jointly associated with traditional medicine utilization intensity. The McFadden pseudo-(R^2) of 0.142 indicates a meaningful improvement in model fit relative to an intercept-only specification. Among the variables included in the model, however, only

age and perceived practitioner knowledge were individually statistically significant at conventional levels.

Age exerted a positive and highly significant influence on traditional medicine utilization intensity ($\beta = 1.030$, $p < 0.001$). The estimated odds ratio of 2.800 implies that, holding the other variables constant, a one-category increase in age was associated with approximately 2.8 times higher proportional odds of belonging to a higher rather than a lower traditional medicine utilization category. Thus, progression from younger to older age categories was strongly associated with greater intensity of traditional medicine use. This result suggests that accumulated experience with traditional healthcare, greater exposure to indigenous therapeutic practices, changing healthcare needs over the life course, or stronger familiarity with herbal treatment may contribute to increased utilization among older consumers.

Perceived knowledge of herbal practitioners was also positive and statistically significant ($\beta = 0.433$, $p = 0.022$). Its odds ratio of 1.541 indicates that a one-point increase on the five-point practitioner-knowledge perception scale was associated with approximately a 54.1% increase in the proportional odds of being in a higher utilization category, holding other variables constant. This finding emphasizes the importance of perceived practitioner competence in sustaining intensive utilization. Consumers who regard herbal practitioners as knowledgeable may have greater confidence in diagnosis, preparation of remedies and treatment recommendations, thereby increasing the likelihood of regular rather than occasional or rare utilization.

Gender and marital status did not exert statistically significant independent effects after controlling for perceptions and other characteristics. Similarly, perceived effectiveness, affordability, safety, trust and accessibility were not individually statistically significant in the multivariate specification. This result should not be interpreted as indicating that these attributes are unimportant to consumers. Descriptively, they received high perception scores and were frequently reported as factors influencing consumers' choices. Rather, the econometric result indicates that, after simultaneously controlling for age, marital characteristics and the other perception dimensions, their unique marginal associations with utilization intensity could not be statistically distinguished from zero. The distinction between descriptive importance and independent multivariate effects is therefore important in interpreting the findings.

4.8 Average Marginal Effects

Because ordered-logit coefficients do not directly indicate changes in the probability of each utilization category, average marginal effects were estimated for rare, occasional and regular utilization.

Table 11: Average Marginal Effects on Traditional Medicine Utilization Intensity

Variable	Rarely	Occasionally	Regularly
Age	**−0.0863**	**−0.1119**	**0.1982**
Gender	−0.0018	−0.0024	0.0042
Married	−0.0265	−0.0346	0.0612
Divorced	−0.0556	−0.1054	0.1610
Widowed	0.0328	0.0339	−0.0667
Perceived effectiveness	0.0007	0.0009	−0.0016
Perceived affordability	0.0091	0.0118	−0.0210
Perceived safety	0.0161	0.0209	−0.0371
Practitioner knowledge	−0.0363	−0.0470	0.0833
Trust in practitioners	−0.0048	−0.0062	0.0110
Accessibility	0.0051	0.0066	−0.0118

Source: Authors' computation from Field Survey, 2026.

The marginal effects provide a clearer substantive interpretation of the significant variables. A one-category increase in age was associated, on average, with an 8.63 percentage-point reduction in the probability of rare utilization, an 11.19 percentage-point reduction in the probability of occasional utilization, and a 19.82 percentage-point increase in the probability of regular utilization, other variables held constant. The effect is therefore concentrated predominantly in shifting consumers toward regular traditional medicine use as age increases.

Likewise, a one-point improvement in consumers' assessment of herbal practitioners' knowledge was associated with a 3.63 percentage-point reduction in the probability of rare use, a 4.70 percentage-point reduction in occasional use, and an 8.33 percentage-point increase in the probability of regular utilization. The marginal-effects result reinforces the ordered-logit coefficient and indicates that practitioner competence, as perceived by consumers, may be particularly important in transforming intermittent use into regular utilization.

4.9 Assessment of the Proportional-Odds Assumption

A formal parallel-lines diagnostic was attempted to assess the central proportional-odds assumption underlying the ordered logistic model. However, an important feature of the data prevented reliable estimation of the unrestricted cumulative-logit comparison. Specifically, none of the 30 divorced respondents was classified as a rare user:

Marital Status	Rarely	Occasionally	Regularly	Total
Single	16	43	9	68
Married	9	64	66	139
Divorced	**0**	13	17	30

Marital Status	Rarely	Occasionally	Regularly	Total
Widowed	4	8	20	32
Total	**29**	**128**	**112**	**269**

The zero cell for divorced respondents in the rare-utilization category generates complete/quasi-complete separation when the first cumulative binary equation—rare versus occasional/regular utilization—is estimated. Consequently, an unrestricted Brant-type comparison with all marital-status dummy variables produces unstable parameter estimates and a singular information matrix. Under these circumstances, reporting a conventional Brant test statistic would be statistically misleading.

This is not a failure of the ordered logit model itself; the ordered model converges successfully and produces stable coefficient estimates. Rather, it reflects sparse outcome-category combinations in one covariate. Therefore, the proportional-odds assumption should be treated with caution, and the ordered-logit results should be interpreted as the primary parsimonious specification.

The proportional-odds assumption was assessed through cumulative-logit diagnostics. However, a zero cell for divorced respondents in the rare-utilization category generated separation in the unrestricted cumulative-logit specification, preventing stable estimation of a conventional Brant test. The ordered logit model was therefore retained as the principal parsimonious specification, while coefficient interpretation was complemented with average marginal effects.

Taken together, the ordered-response analysis indicates that traditional medicine utilization intensity is more strongly differentiated by consumers' age and perceptions of practitioner competence than by gender, marital status or individual perceptions of affordability, effectiveness, safety, trust and accessibility. Older consumers are substantially more likely to use traditional medicine regularly, while favourable assessments of herbal practitioners' knowledge independently increase the probability of regular use. The results therefore suggest that intensive traditional medicine utilization is associated not merely with favourable perceptions of the medicines themselves but also with confidence in the human expertise through which traditional healthcare is delivered.

4.10 Challenges Experienced by Consumers in the Utilization of Traditional Medicine

Table 12: Challenges Experienced by Consumers of Traditional Medicine

S/N	Challenge	Frequency	Percentage (%)	Rank
1	Lack of scientific evidence	102	37.9	1st
2	Safety concerns	95	35.3	2nd
3	Poor packaging	82	30.5	3rd

S/N	Challenge	Frequency	Percentage (%)	Rank
4	Uncertain dosage	71	26.4	4th
5	Lack of hygiene among herbalists	54	20.1	5th
6	Lies and excessive demand for money	49	18.2	6th
7	High cost	18	6.7	7th
8	Other challenges	3	1.1	8th

Source: Authors' computation from Field Survey, 2026.
Note: Multiple responses were permitted; therefore, frequencies and percentages do not sum to the sample size and 100%, respectively. Percentage is calculated as the number selecting each challenge divided by 269 consumers. Reporting multiple-response items as counts and percentages of respondents is appropriate because individual respondents may select several options.

The results in Table 12 indicate that the most prominent challenge confronting consumers of traditional medicine was lack of scientific evidence, reported by 102 respondents, representing 37.9% of consumers. This suggests that despite the generally favourable perception and high utilization of traditional medicine observed in the study, a substantial proportion of consumers remain concerned about the extent to which the efficacy, composition and therapeutic claims associated with herbal preparations are supported by systematic scientific validation. This finding is particularly noteworthy because perceived effectiveness received one of the highest scores in the earlier perception analysis. It therefore reveals an important distinction between consumers' experiential belief that traditional medicine works and their concern about the availability of formal scientific evidence supporting such treatments.

Safety concerns ranked second, reported by 35.3% of consumers, while poor packaging ranked third at 30.5%. These findings indicate that consumers' concerns extend beyond therapeutic effectiveness to the quality and presentation of herbal products. Inadequate packaging may expose herbal preparations to contamination, deterioration, inappropriate storage and difficulties in identifying product contents or instructions. The prominence of safety concerns is also consistent with the perception results, where the statement that traditional medicine has fewer side effects than modern medicine recorded a comparatively lower mean score than affordability, effectiveness and accessibility.

Another important challenge was uncertain dosage, reported by 26.4% of respondents. This represents a particularly relevant issue for consumer protection because uncertainty regarding the quantity, frequency and duration of herbal medicine consumption may increase the possibility of inappropriate use. Similarly, 20.1% of respondents identified lack of hygiene among herbalists as a challenge. Taken together, uncertain dosage, poor packaging, safety concerns and hygiene issues point towards broader concerns surrounding standardization and quality assurance in the preparation, handling and administration of traditional medicines.

Approximately 18.2% of consumers reported lies and excessive demands for money by some herbal practitioners, suggesting the existence of concerns regarding ethical conduct and consumer–practitioner relationships. In contrast, only 6.7% identified high cost as a challenge. The relatively low prevalence of cost-related complaints is consistent with the earlier perception analysis, where affordability recorded the highest mean score (4.331) among all perception attributes. Thus, the evidence across different sections of the questionnaire is internally coherent: consumers generally regard traditional medicine as affordable, while their more substantial concerns relate to scientific validation, safety, packaging, dosage and quality of practice.

Overall, the results reveal an interesting coexistence of high utilization and favourable consumer perceptions with substantial quality-assurance concerns. Consumers appear willing to utilize traditional medicine and generally regard it as affordable, effective and accessible, yet they simultaneously express reservations concerning scientific evidence, safety, dosage standardization, packaging and practitioner hygiene. This finding has important implications for the eventual policy recommendations of the study: interventions aimed at strengthening traditional medicine should focus not merely on increasing access, but particularly on evidence generation, product standardization, safety monitoring, appropriate dosage guidance, hygienic preparation, improved packaging and professional accountability among practitioners.

4.11 Discussion of Findings

The findings demonstrate that traditional medicine is deeply embedded in the healthcare behaviour of consumers in Adamawa State. Almost all respondents (99.3%) had previously used traditional or herbal medicine, while 89.2% of users reported either occasional or regular utilization. Although this prevalence should be interpreted within the context of a consumer-oriented sample rather than as a population prevalence estimate for the entire State, it nevertheless confirms that traditional medicine constitutes an established component of healthcare-seeking behaviour among the respondents. The finding is consistent with evidence from other parts of Nigeria. Aina et al. (2020), in a survey of 1,600 adults in Ekiti State, reported that about 85% had used herbal medicines during the preceding two years, while Okenwa et al. (2023) reported a prevalence of 65.2% among patients with chronic diseases in a Nigerian teaching hospital. The relatively higher level recorded in the present study reinforces the importance of examining not merely use versus non-use, but the intensity of utilization among an already highly exposed consumer population.

The study further revealed that herbal practitioners constituted the dominant source of traditional medicine, accounting for 71.7% of users, although family preparation, Islamic chemists and local markets also represented important supply channels. This pattern indicates that traditional medicine in Adamawa State operates through a pluralistic distribution system in which specialist practitioners coexist with household and informal-market sources. The finding underscores the

central role of practitioner–consumer interaction, particularly because traditional practitioners may perform functions extending beyond product supply to include diagnosis, prescription and therapeutic guidance. This is relevant to the broader Nigerian literature, which shows that traditional medicine remains embedded in social and community networks and is influenced by cultural familiarity and access to providers. The 2025 systematic review by Abhadionmhen et al. similarly concluded that healthcare access, social norms, cultural beliefs and socioeconomic circumstances interact in shaping traditional medicine use in Nigeria. The prominence of practitioners in the present study therefore provides an important context for understanding why perceived practitioner knowledge subsequently emerged as a significant determinant of utilization intensity.

The factors influencing consumers' choices provide further evidence that utilization cannot be attributed solely to cultural attachment. Effectiveness ranked first, followed by recommendation, accessibility, low cost and cultural belief. This ordering suggests that consumers evaluate traditional medicine partly in pragmatic and experiential terms, particularly whether it appears to work, whether it can be accessed easily and whether treatment is economically manageable. The result strongly agrees with Aina et al. (2020), who identified efficacy and affordability among major reasons for herbal-medicine use in Southwest Nigeria. Atekoja et al. (2025) similarly reported effectiveness and affordability as prominent factors influencing complementary and alternative medicine utilization, while Osayi et al. (2026) found that accessibility, cost and family traditions sustained the use of medicinal plants for malaria and typhoid in Nsukka despite access to prescription medicines. Collectively, these findings suggest that continued traditional medicine use reflects a combination of perceived therapeutic utility, economic considerations, social influence and established healthcare practices rather than cultural belief alone.

The expenditure pattern reinforces the importance of affordability. More than two-thirds of consumers spent less than ₦5,000 per month on traditional medicine, and only 4.1% reported expenditure exceeding ₦20,000. This pattern corresponds with the perception analysis, where affordability recorded the highest mean score of 4.331. It also aligns with the wider Nigerian evidence identifying affordability as an important determinant of traditional medicine utilization, particularly where households face constraints in obtaining conventional healthcare. Abhadionmhen et al. (2025) found that socioeconomic conditions and affordability consistently feature among the factors shaping traditional medicine use across Nigerian studies. The present study nevertheless advances this evidence by showing that affordability appears to be widely valued descriptively but does not independently explain differences between rare, occasional and regular users once other variables are controlled. This distinction suggests that affordability may facilitate entry into traditional medicine utilization without necessarily determining how intensively an existing user subsequently consumes it.

Traditional medicine was also used for a remarkably broad spectrum of conditions, ranging from gastrointestinal, respiratory and musculoskeletal complaints to reproductive, urinary, cardiovascular, metabolic and liver-related conditions, as well as wounds, snakebite and some more serious conditions. This breadth indicates that consumers do not restrict traditional medicine to minor or self-limiting ailments but perceive it as therapeutically relevant across diverse health problems. Similar patterns have been reported among Nigerian patients with chronic diseases, where herbal medicines were used both for treatment and general well-being. Such extensive therapeutic application has important implications because the risks associated with inappropriate dosage, delayed referral, contamination or concurrent use with conventional medicine may become greater when traditional remedies are used for chronic or clinically serious illnesses. The finding therefore strengthens the argument for improving the interface between traditional practitioners and formal health services without disregarding the entrenched role of traditional medicine in community healthcare.

Consumers' perceptions were generally favourable, with affordability, effectiveness and accessibility occupying the highest positions. Willingness to recommend herbal medicine to others was also high, suggesting that positive personal experiences may reinforce social diffusion of traditional medicine through recommendations and informal networks. At the same time, trust in practitioners and perceptions that traditional medicine has fewer side effects than modern medicine recorded comparatively lower mean scores. This pattern suggests an important distinction between consumers' assessment of the medicine as a therapeutic product and their evaluation of the provider and safety environment surrounding its use. The findings are consistent with Atekoja et al. (2025), whose respondents reported perceived effectiveness, satisfaction and other benefits from complementary medicine, but they also reinforce the need to distinguish favourable treatment experiences from unquestioning confidence in safety. The low internal consistency found among the eight perception statements in the present study further confirms that consumer perception is multidimensional rather than a single homogeneous construct.

The ordered-logit estimates provide one of the study's most important contributions. Age had a positive and highly significant relationship with utilization intensity, with a one-category increase in age associated with 2.8 times higher proportional odds of belonging to a higher utilization category. The marginal effects further showed a 19.82 percentage-point increase in the probability of regular utilization as consumers moved one age category upward. This indicates that older consumers are considerably more likely to make traditional medicine a regular component of their healthcare behaviour. The finding accords with emerging evidence on continued herbal-medicine reliance among older Nigerians. Saka and Oguntoyinbo (2026), for instance, found widespread concurrent use of herbal and prescribed medicines among elderly patients with chronic diseases in Ogun State. The age effect in Adamawa State may reflect accumulated familiarity with indigenous healthcare, longer exposure to traditional therapeutic knowledge, greater chronic healthcare needs or stronger

attachment to established treatment practices, although the cross-sectional nature of the study does not permit these mechanisms to be interpreted causally.

Perceived practitioner knowledge was the second significant determinant of utilization intensity. A one-point increase in perceived practitioner knowledge increased the proportional odds of moving to a higher utilization category by approximately 54.1%, while the marginal effect indicated an 8.33 percentage-point increase in the probability of regular use. This result is especially significant given that herbal practitioners were the principal source of traditional medicine for 71.7% of respondents. It suggests that regular utilization depends not merely on favourable perceptions of herbal products but on confidence in the expertise of those providing them. Consumers who believe that practitioners possess sufficient knowledge may be more willing to rely on their diagnoses, prescriptions and preparation methods over time. The finding also gives empirical support to recent policy emphasis on professional competence and evidence-based traditional medicine practice. Nigeria has continued to strengthen policy attention to standards, practitioner ethics and evidence-based traditional medicine, while comparative regulatory research has identified continuing gaps in regulation, advertising claims, manufacturing practice and product labelling.

In contrast, gender, marital status, effectiveness, affordability, safety, trust and accessibility were not statistically significant independent predictors of utilization intensity. This does not contradict their descriptive importance. Rather, it indicates that these factors did not significantly differentiate rare, occasional and regular users after age, practitioner knowledge and other perception dimensions were simultaneously controlled. This interpretation is particularly important because effectiveness, affordability and accessibility were highly rated and frequently reported as reasons for choosing traditional medicine. The result also reflects the heterogeneity in previous Nigerian studies regarding demographic determinants. Okenwa et al. (2023), for example, found no significant relationship between gender and herbal-medicine utilization among chronic-disease patients, while the broader Nigerian systematic review indicates that socioeconomic and demographic effects vary according to location, population and healthcare context. The present findings therefore suggest that variables influencing the decision to use traditional medicine may differ from those determining the frequency or intensity of continued use.

The challenges reported by consumers expose an important tension between acceptance and quality assurance. Lack of scientific evidence ranked first, followed by safety concerns, poor packaging and uncertain dosage. This is noteworthy because consumers simultaneously rated traditional medicine as effective and affordable. The results therefore distinguish experiential effectiveness—the belief derived from personal or community experience that treatment works—from scientifically established evidence of efficacy, dosage, safety and quality. Concerns about packaging and dosage are supported by recent regulatory evidence. Mponda et al. (2025), in an assessment involving Nigeria and Malawi, identified deficiencies in regulatory coverage and

compliance relating to herbal medicinal products, including advertising claims and aspects of manufacturing and labelling. Earlier Nigerian research has also documented concerns regarding product contamination and quality control, illustrating why favourable consumer acceptance should not be interpreted as evidence that traditional preparations are uniformly safe.

Overall, the findings portray traditional medicine in Adamawa State as an established, accessible and positively perceived healthcare option operating alongside substantial concerns about evidence, safety and standardization. Consumers appear to value its affordability, perceived effectiveness and accessibility, yet regular utilization is more strongly associated with age and confidence in practitioner knowledge than with these product attributes themselves. This combination of high utilization and quality-related concerns suggests that policy should not focus primarily on stimulating demand for traditional medicine; demand already exists. The greater priority is to improve evidence generation, practitioner competence, dosage guidance, hygienic preparation, packaging, product traceability, safety monitoring and appropriate regulatory oversight. The study therefore extends the Nigerian literature by demonstrating that in Adamawa State the central empirical issue is not simply whether consumers use traditional medicine, but why some consumers become regular users and how continued utilization can be made safer, more evidence-informed and more accountable within the wider healthcare system.

5. Conclusion and Recommendations

The study concludes that traditional medicine is a well-established component of healthcare-seeking behaviour among consumers in Adamawa State, with most respondents using it either occasionally or regularly. Consumers generally perceive traditional medicine as affordable, effective and accessible, while herbal practitioners constitute the dominant source of treatment. However, the findings also reveal substantial concerns regarding scientific validation, safety, packaging, dosage accuracy and practitioner hygiene. The ordered-logit results further show that age and perceived practitioner knowledge significantly increase the likelihood of more intensive traditional medicine utilization, whereas gender, marital status and other perception attributes do not independently explain utilization intensity. Overall, the evidence suggests that the principal policy challenge is not increasing demand for traditional medicine but ensuring that its widespread use is supported by stronger scientific evidence, competent practitioners, appropriate regulation, quality assurance and effective consumer protection. Based on the findings from the study, the following recommendations have been put forward.

1. Strengthen scientific research and clinical evaluation of commonly used traditional and herbal medicines to establish efficacy, safety and appropriate dosage.

2. Provide formal training, certification and continuous capacity development for herbal practitioners, particularly in diagnosis, dosage, hygiene, record keeping and referral practices.
3. Strengthen regulation and quality-control mechanisms for herbal medicines, including product registration, inspection and monitoring of production and distribution channels.
4. Introduce minimum standards for packaging, labelling, dosage instructions, ingredients, expiry information and storage requirements for herbal products.
5. Establish stronger pharmacovigilance and adverse-effect reporting systems for traditional medicines, particularly where herbal and conventional medicines are used concurrently.
6. Promote consumer education on safe herbal-medicine use, appropriate dosage, possible side effects and the importance of seeking qualified medical attention for serious conditions.
7. Encourage structured collaboration between traditional medicine practitioners and conventional healthcare providers, particularly for referrals and management of chronic or complicated illnesses.
8. Government and relevant regulatory institutions should support evidence-based integration of traditional medicine into the healthcare system, while ensuring that integration is accompanied by standards for safety, competence and accountability.

References

Abhadionmhen, A. O., Imarenezor, E. P. K., Ogodo, A. C., & Ahuchaogu, A. (2025). Socioeconomic and cultural factors influencing traditional medicine (TM) use in Nigeria: A systematic mixed method review. *European Journal of Integrative Medicine, 74*, 102436. https://doi.org/10.1016/j.eujim.2025.102436

Afriyie, J., & Kumi-Kyereme, A. (2023). Predictors of herbal medicine use in Ashanti Region of Ghana. *Advances in Integrative Medicine*. https://doi.org/10.1016/j.aimed.2023.05.005

Aina, O., Gautam, L., Simkhada, P., & Hall, S. (2020). Prevalence, determinants and knowledge about herbal medicine and non-hospital utilisation in southwest Nigeria: A cross-sectional study. *BMJ Open, 10*(9), e040769. https://doi.org/10.1136/bmjopen-2020-040769

Alfa, H. H., Ajibuah, B. J., & Balarabe, M. (2025). Assessment of traditional medicine patronage in Kaduna State. *Science World Journal, 20*(2), 467–471. https://doi.org/10.4314/swj.v20i2.1

Amaeze, O. U., Olugbake, O. O., Okpara, U. A., & Aiyeolemi, A. A. (2023). Herbal medicine use and predictors among breastfeeding mothers attending primary healthcare centres in Lagos State, Nigeria. *The Nigerian Journal of Pharmacy, 57*(2), 679–689. https://doi.org/10.51412/psnnjp.2023.28

Asase, A. (2023). Ghana's herbal medicine industry: Prospects, challenges and ways forward from a developing country perspective. *Frontiers in Pharmacology, 14*, 1267398. https://doi.org/10.3389/fphar.2023.1267398

Asiamah, G. A., Forkuo, A. D., Turkson, B. K., Mireku-Gyimah, N. A., Antwi, A. O., Ansah, C., & Gyimah, L. S. (2025). Pharmacovigilance of herbal medicines in Ghana—Knowledge, perception and practice. *Scientific African, 29*, e02917. https://doi.org/10.1016/j.sciaf.2025.e02917

Atekoja, O. E., Salako, O. F., Oluseye, O. M., & Okanlawon, F. (2025). Factors influencing the utilization, and perceived benefits of complementary and alternative medicine in the management of common childhood diseases among residents of Makun community, Sagamu, Ogun State Nigeria. *Journal of Pediatric Nursing, 81*, 118–125. https://doi.org/10.1016/j.pedn.2025.01.016

Goodman, O. O., Adejoh, S. O., Adeniran, A., Emechebe, A. C., & Kuyinu, Y. A. (2022). We love orthodox medicine but still use our 'Elewe omo': Utilization of traditional healers among women in an urban community in Nigeria. *Journal of Family Medicine and Primary Care, 11*(1), 215–223. https://doi.org/10.4103/jfmpc.jfmpc_1302_21

Li, S., Odedina, S., Agwai, I., Ojengbede, O., Huo, D., & Olopade, O. I. (2020). Traditional medicine usage among adult women in Ibadan, Nigeria: A cross-sectional study. *BMC Complementary Medicine and Therapies, 20*, 93. https://doi.org/10.1186/s12906-020-02881-z

Modibbo, M. R., Ibrahim, H., Sulaiman, M. Y., & Zakir, B. (2024). Maganin Gargajiya: Assessing the benefits, challenges, and evidence of traditional medicine in Nigeria. *Cureus, 16*(10), e71425. https://doi.org/10.7759/cureus.71425

Mponda, J. S., Muula, A. S., Choko, A., Ajuwon, A. J., & Moody, J. O. (2025). Traditional medicine regulation status and challenges in Malawi and Nigeria. *BMC Complementary Medicine and Therapies, 25*, 53. https://doi.org/10.1186/s12906-025-04812-2

Okenwa, S. C., Ofili, S. C., Ekweozor, C. A., Onyishi, E., et al. (2023). Prevalence and perception of herbal medicine use among patients with chronic diseases in a Nigerian teaching hospital. *Asian Journal of Research in Medical and Pharmaceutical Sciences, 12*(3), 28–38. https://doi.org/10.9734/ajrimps/2023/v12i3218

Onukansi, F. O., Anokwuru, C. C., Eneh, S. C., Odey, G. O., Onah, D. O., Sokunbi, T., Innocent, D. C., Dozie, U. W., Umoke, P. C., Ojo, T. O., & Ezejindu, C. N. (2025). Investing in traditional medicine: Leveraging evidence and innovative research to strengthen the fight against malaria in Nigeria. *Malaria Journal, 24*, 232. https://doi.org/10.1186/s12936-025-05359-w

Osayi, E. E., Urama, D. C., Amujiri, A. N., Agyo, R. A., Afyare, A. A. A., & Andong, F. A. (2026). Family traditions, accessibility and cost shape the continued reliance on *Cajanus cajan* and *Azadirachta indica* for malaria and typhoid despite prescription medicines in urban and rural Nsukka, Nigeria. *BMC Complementary Medicine and Therapies*. https://doi.org/10.1186/s12906-026-05426-y

Oluwole, E. O., Akanji, I. O., & Busari, A. A. (2023). Perception, prevalence, and pattern of complementary and alternative medicine use among adults living with sickle cell disease in Lagos, Nigeria. *West African Journal of Pharmacy, 32*(2), 62–79. https://doi.org/10.60787/wapcp-32-2-243

Owusu, G., Antwi-Adjei, M., Ofori-Amoah, J., Tuekpe, R. M., Mainoo, A. E., Kodua, D., Abigail, A., & Millicent, O. (2025). Prevalence of herbal medicine consumption and regulatory compliance in some selected districts of the Bono region, Ghana. *BMC Complementary Medicine and Therapies, 25*, 202. https://doi.org/10.1186/s12906-025-04953-4

Saka, S. A., & Oguntoyinbo, E. T. (2026). Concurrent use of herbal and prescribed medicines and the associated factors among the elderly with chronic diseases in Ogun State, Nigeria. *West African Journal of Pharmacy, 37*(1), 149–160. https://doi.org/10.82351/wajp.vol37no1.444

Sylver-Francis, R. A., & Pelkonen, O. (2025). Medicinal plants as alternatives for the management of hypertension and diabetes in Nigeria: Analysis of the structured interview of Nigerian patients. *Phytomedicine Plus, 5*(1), 100708. https://doi.org/10.1016/j.phyplu.2024.100708

Tassew, W. C., Assefa, G. W., Zeleke, A. M., & Ferede, Y. A. (2024). Prevalence and associated factors of herbal medicine use among patients living with chronic disease in Ethiopia: A systematic review and meta-analysis. *Metabolism Open, 21*, 100280. https://doi.org/10.1016/j.metop.2024.100280

Usure, R. E., Kebebe, D., Mekasha, Y. T., Hasen, G., Waritu, N. C., Dubale, S., & Suleman, S. (2024). Traditional herbal medicine regulatory implementation in Ethiopia: A qualitative study. *Frontiers in Pharmacology, 15*, 1392330. https://doi.org/10.3389/fphar.2024.139233