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HEPATIC AND RENAL TOXICITIES LINKED TO HERBAL REMEDIES IN WEST AFRICA: A CRITICAL REVIEW OF AN UNDER-REPORTED PUBLIC HEALTH PROBLEM

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Abstract

Background: Herbal remedies are widely used across West Africa for health promotion and disease management due to cultural acceptability, affordability, and limited access to conventional healthcare. However, their potential to induce organ toxicity remains poorly recognised and under-reported.

Objective: This review aimed to critically synthesise available evidence on hepatotoxicity and nephrotoxicity associated with herbal remedy use in West Africa, with emphasis on toxicological mechanisms, clinical manifestations, regulatory challenges, and public health implications.

Methods: A critical narrative review of peer-reviewed literature and grey sources published between 2000 and 2024 was conducted using major biomedical databases and regional repositories. Relevant studies addressing herbal medicine-associated hepatic and renal toxicity were identified, appraised, and synthesised narratively.

Results: Reviewed evidence showed that herbal remedies are associated with diverse hepatic and renal injuries ranging from asymptomatic biochemical abnormalities to acute liver failure, acute kidney injury, and chronic kidney disease. Toxicity was linked to phytochemical cytotoxicity, oxidative stress, immune-mediated injury, herb–drug interactions, and heavy metal contamination. Under-reporting was driven by poor patient disclosure, limited clinician awareness, weak pharmacovigilance systems, and inadequate regulatory oversight.

Conclusions: Herbal remedy-associated hepatotoxicity and nephrotoxicity represent under-recognised but preventable public health problems in West Africa. Strengthening regulatory frameworks, integrating herbal medicines into pharmacovigilance systems, improving clinical vigilance, and promoting targeted public health education are essential to reducing toxicity-related morbidity and improving the safe use of herbal medicines in the region.

Keywords: herbal medicine toxicity, hepatotoxicity, nephrotoxicity, pharmacovigilance, regulatory oversight, West Africa.

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INTRODUCTION

Herbal remedies constitute a major component of healthcare delivery across West Africa, where they are widely used for the prevention and treatment of acute and chronic diseases. Factors such as cultural acceptability, affordability, limited access to orthodox healthcare, and the perception that herbal products are "natural" and therefore safe have contributed to their extensive use among diverse populations[1,2]. However, this widespread consumption has not been matched by commensurate efforts to systematically evaluate the toxicological safety of these products, particularly with respect to organ-specific toxicity. The liver and kidneys play central roles in the metabolism, detoxification, and excretion of xenobiotics, rendering them especially vulnerable to toxic injury. Hepatotoxicity and nephrotoxicity are among the most frequently reported adverse effects associated with drug exposure, yet herbal remedy–induced organ damage remains under-recognised and under-reported [3,4]. Increasing global evidence indicates that herbal products can cause a spectrum of liver injuries ranging from asymptomatic transaminitis to acute liver failure, as well as renal manifestations including acute kidney injury, interstitial nephritis, and progression to chronic kidney disease [5-7].

In West Africa, the burden of herbal medicine–associated toxicity is likely underestimated. Clinical presentations of liver and kidney injury are often attributed to endemic conditions such as viral hepatitis, hypertensive nephropathy, or diabetic kidney disease, while the contribution of herbal exposure is frequently overlooked [8]. In addition, patients may fail to disclose herbal medicine use due to fear of stigmatisation or the belief that such products are harmless, further complicating diagnosis and reporting [9].

Several mechanisms have been implicated in herbal remedy–induced hepatotoxicity and nephrotoxicity. These include direct cytotoxic effects of phytochemicals, bioactivation of compounds via cytochrome P450 enzymes, oxidative stress, mitochondrial dysfunction, immune-mediated injury, and toxic effects arising from contaminants such as heavy metals, pesticides, and mycotoxins [10-12]. Polyherbal formulations, which are common in West African traditional medicine, introduce additional complexity through synergistic or additive toxic effects and unpredictable toxicokinetic profiles [13].

Local clinical evidence increasingly supports the relevance of this problem. In a study examining transaminitis among patients with non-viral hepatitis, it was highlighted that there was a significant prevalence of unexplained liver enzyme elevation, raising concerns about non-infectious and potentially toxic etiologies, including herbal medicine exposure [14]. Such findings underscore the need for heightened clinical suspicion and systematic evaluation of herbal remedies as contributors to liver injury in African populations. Despite these concerns, regulatory oversight and pharmacovigilance systems for herbal products in most West African countries remain weak. Pre-market toxicological evaluation is often limited or absent, post-marketing surveillance is poorly structured, and standardised reporting frameworks for herbal medicine–related adverse effects are lacking [15]. Consequently, the true public health impact of herbal remedy–associated hepatotoxicity and nephrotoxicity remains largely obscured.

Against this backdrop, a critical appraisal of existing evidence is urgently needed. This review, therefore, examined the toxicological and clinical evidence linking herbal remedy use to liver and kidney injury in West Africa, with emphasis on mechanisms of toxicity, diagnostic challenges, and systemic factors contributing to under-reporting. By highlighting gaps in knowledge and regulation, this work aims to inform clinicians, toxicologists, and policymakers, and to promote safer use and better surveillance of herbal medicines in the region.

METHODOLOGY

Study Design

This study was conducted as a critical narrative review of the toxicological evidence linking the use of herbal remedies to hepatotoxicity and nephrotoxicity in West Africa. The review employed a structured and transparent approach to identifying, selecting, appraising, and synthesising the literature, with an emphasis on mechanistic, clinical, and public health perspectives.

Literature Search Strategy

A comprehensive literature search was performed across multiple electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, Google Scholar, and African Journals Online (AJOL). Searches were conducted using combinations of Medical Subject Headings (MeSH) terms and free-text keywords related to herbal medicine, organ-specific toxicity, and the West African region. The literature search covered publications from January 2000 to December 2024 to capture contemporary evidence on herbal medicine–associated hepatotoxicity and nephrotoxicity.

Search terms included:

- *Herbal remedies* OR *traditional medicine* OR *herbal medicine*
- *Hepatotoxicity* OR *liver injury* OR *drug-induced liver injury*
- *Nephrotoxicity* OR *kidney injury* OR *acute kidney injury* OR *chronic kidney disease*
- *Toxicology* OR *safety assessment*
- *West Africa* OR names of individual West African countries

Boolean operators (AND, OR) were used to refine searches. Reference lists of relevant articles were also manually screened to identify additional eligible studies.

Eligibility Criteria

Inclusion Criteria

- Original research articles, clinical case reports/series, observational studies, experimental toxicology studies, and authoritative reviews. Particular attention was given to studies originating from West African countries, including Nigeria, Ghana, Senegal, Côte d'Ivoire, and The Gambia, as well as regional regulatory and policy documents.
- Studies reporting liver and/or kidney toxicity associated with herbal remedy use
- Publications in English
- Human, animal, and in vitro studies with clear toxicological relevance

Exclusion Criteria

- Studies lacking explicit evidence of hepatic or renal toxicity
- Articles without sufficient methodological detail to assess toxicological relevance
- Studies focusing solely on therapeutic efficacy without safety evaluation
- Opinion pieces, editorials, and non-peer-reviewed sources

Study Selection Process

Titles and abstracts retrieved from the database search were independently screened for relevance. Full-text articles of potentially eligible studies were subsequently reviewed to confirm inclusion based on the predefined criteria. Disagreements in study selection were resolved through critical appraisal and consensus.

Data Extraction and Synthesis

Data were extracted using a standardised framework capturing:

- Study design and setting
- Type of herbal remedy or formulation
- Exposure characteristics (dose, duration, preparation method)
- Evidence of hepatotoxicity and/or nephrotoxicity
- Diagnostic criteria and biomarkers used
- Proposed mechanisms of toxicity
- Study limitations and reporting gaps

Extracted data were synthesized narratively, with studies grouped according to type of organ toxicity (hepatic or renal) and level of evidence (experimental vs clinical).

Critical Appraisal of Evidence

Rather than quantitative meta-analysis, a qualitative critical appraisal was undertaken. Studies were evaluated for:

- Methodological rigor
- Biological plausibility of toxic mechanisms
- Adequacy of exposure and dose reporting

- Strength of causal inference
- Risk of bias and confounding factors

Particular attention was paid to issues of polyherbal formulations, contaminant exposure, herb–drug interactions, and diagnostic misclassification, which significantly influence toxicological interpretation.

Addressing Under-reporting and Public Health Implications

The review incorporated an analytical framework to explore reasons for under-reporting of herbal medicine-induced hepatotoxicity and nephrotoxicity. These included:

- Weak pharmacovigilance systems
- Limited patient disclosure of herbal use
- Overlapping clinical presentations with common endemic diseases
- Regulatory and surveillance gaps

Ethical Considerations

As this study involved analysis of previously published data, ethical approval was not required.

AI Disclosure

Figures 1–3 were generated using OpenAI's ChatGPT, with prompts specifying clinical spectra and mechanisms of herbal remedy-associated hepatotoxicity/nephrotoxicity. Human authors reviewed, edited, and verified all outputs for scientific accuracy, relevance, and alignment with reviewed evidence before inclusion.

Strengths and Limitations of the Methodology

The structured approach enhances transparency and reproducibility while allowing flexibility for critical interpretation. However, limitations include potential publication bias, language restriction to English, and heterogeneity in study designs and reporting quality.

RESULTS

1. Herbal Remedy-Associated Hepatotoxicity

Patterns and Clinical Spectrum of Hepatotoxicity

Across the reviewed literature, hepatotoxicity emerged as the most frequently reported form of organ-specific toxicity associated with herbal remedy use. The clinical spectrum ranged from asymptomatic elevation of liver enzymes (transaminitis) to acute hepatitis, cholestatic liver injury, mixed-pattern injury, and, in severe cases, acute liver failure [16-18]. Mild-to-moderate transaminitis was commonly reported in both community-based and hospital-based studies, often detected incidentally during routine biochemical evaluation [19].

In several West African clinical reports, patients presenting with jaundice, right upper quadrant pain, and elevated aminotransferases had a history of prolonged or recent herbal medicine use before hospital presentation, although such exposure was not always documented as a primary etiological factor [20,21,22]. This pattern aligns with local findings reported by Ibezim *et al.*, where a significant proportion of non-viral hepatitis cases were characterised by unexplained transaminitis, raising suspicion of toxic or xenobiotic-related liver injury [14].

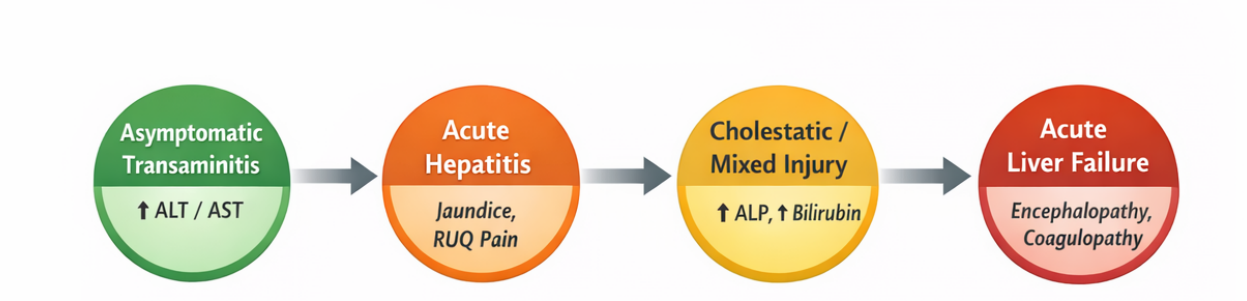

Figure 1: Clinical Spectrum of Herbal Remedy-Associated Hepatotoxicity

Types of Liver Injury Attributed to Herbal Remedies

Herbal medicine–induced liver injury (HILI) was reported to manifest predominantly as hepatocellular injury, characterised by marked elevations in alanine aminotransferase (ALT) and aspartate aminotransferase (AST), with relatively preserved alkaline phosphatase levels [3, 22-26]. Cholestatic and mixed-pattern injuries were also observed, particularly with polyherbal formulations and prolonged exposure [3,22-27].

Experimental studies have demonstrated histopathological features, including hepatocellular necrosis, sinusoidal congestion, fatty degeneration, and inflammatory infiltration, which support a direct toxic effect of certain herbal constituents [10,13,31]. These findings provide biological plausibility for clinical observations of liver enzyme derangements among herbal medicine users.

Mechanisms of Herbal Remedy–Induced Hepatotoxicity

Multiple mechanistic pathways were implicated in herbal remedy–associated hepatotoxicity. Key mechanisms involved the bioactivation of phytochemicals via cytochrome P450 enzymes, leading to the formation of reactive metabolites capable of inducing oxidative stress and hepatocellular injury [24, 71]. Mitochondrial dysfunction, glutathione depletion, and immune-mediated hepatotoxic reactions were also frequently reported [28,29,30].

Additionally, contamination of herbal products with heavy metals such as lead, mercury, and arsenic was identified as a significant contributor to hepatotoxic risk [11]. Studies from Nigeria and other parts of West Africa demonstrated heavy metal concentrations exceeding recommended safety thresholds in commonly consumed herbal preparations [11,31,32]

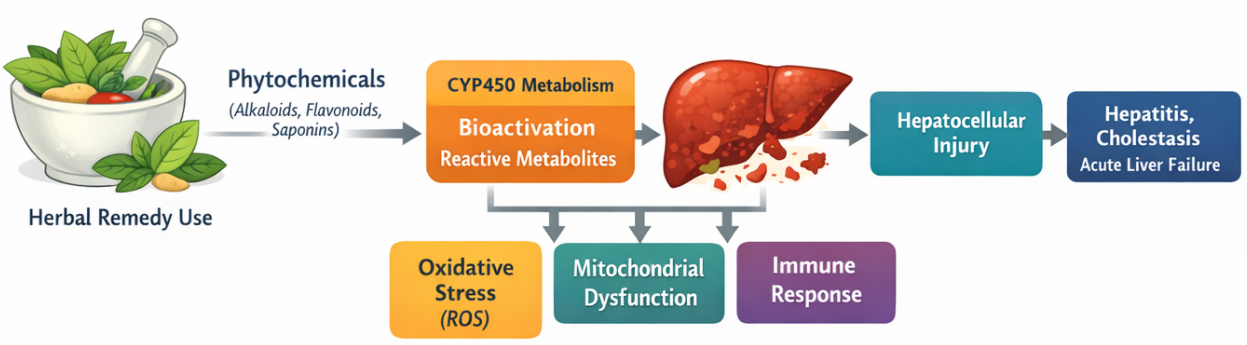

Figure 2: Schematic Representation of the Mechanism of Herbal Remedy-Associated Hepatotoxicity

Polyherbal Formulations and Dose-Related Toxicity

Polyherbal formulations, which constitute a substantial proportion of traditional remedies in West Africa, were consistently associated with greater hepatotoxic risk compared to single-plant preparations [13]. The absence of standardised dosing, variability in preparation methods, and lack of labelling contribute to unpredictable exposure levels and cumulative toxicity.

Dose–response relationships were rarely defined in clinical studies, limiting causal inference. However, experimental data suggest that repeated or chronic exposure, even at ostensibly "therapeutic" doses, may result in progressive liver injury [33].

Diagnostic and Attribution Challenges

A recurring theme across studies was the difficulty in attributing liver injury directly to herbal remedies. In settings with high prevalence of viral hepatitis, alcohol use, and metabolic liver disease, herbal medicine exposure was often overlooked or documented late in the clinical course [34]. Furthermore, the lack of validated biomarkers specific to herbal-induced liver injury complicates diagnosis.

Under-reporting was exacerbated by limited pharmacovigilance systems and the absence of mandatory adverse event reporting frameworks for herbal products in most West African countries [35]. Consequently, the true burden of herbal remedy–associated hepatotoxicity is likely substantially underestimated.

Public Health Implications

The findings highlight herbal remedy–associated hepatotoxicity as a significant but under-recognised public health issue. Given the high prevalence of herbal medicine use and the central role of the liver in xenobiotic metabolism, undetected liver injury may contribute to avoidable morbidity, delayed presentation, and poor clinical outcomes [36]. Strengthening clinician awareness, routine inquiry into herbal medicine use, and integration of toxicological screening into clinical practice are essential steps toward mitigating this risk.

2. Herbal Remedy-Associated Nephrotoxicity

Patterns and Clinical Spectrum of Nephrotoxicity

Herbal remedy–associated nephrotoxicity was identified as a significant but less frequently recognised form of organ-specific toxicity in the reviewed literature. Clinical manifestations ranged from asymptomatic biochemical abnormalities to acute kidney injury (AKI), tubulointerstitial nephritis, and progression to chronic kidney disease (CKD) following prolonged exposure [37-39]. In many reports, renal injury was detected late, often after substantial loss of renal function had already occurred.

Hospital-based studies from Sub-Saharan Africa have documented a notable proportion of AKI cases linked to prior herbal medicine use, particularly among patients presenting with volume depletion, sepsis, or pre-existing renal disease [40]. However, similar to hepatotoxicity, herbal exposure was frequently under-documented, contributing to diagnostic uncertainty and delayed intervention [41].

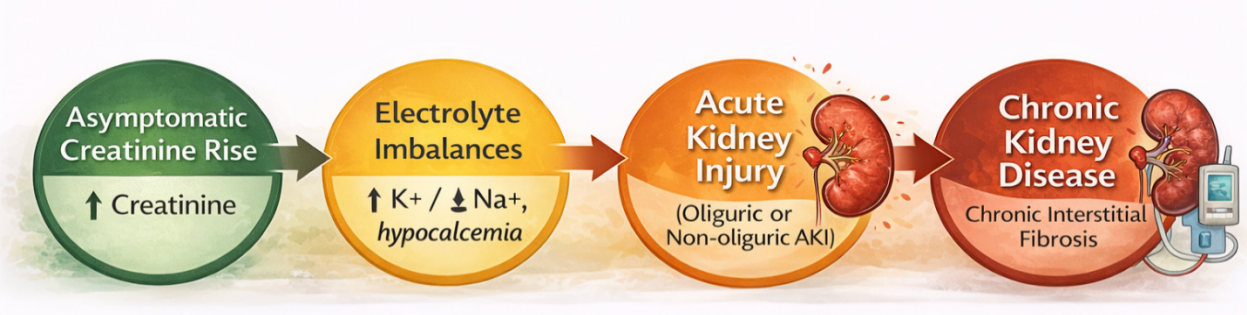

Figure 3: Clinical Spectrum of Herbal Remedy-Associated Nephrotoxicity

Types of Renal Injury Attributed to Herbal Remedies

The predominant patterns of renal injury associated with herbal remedies included acute tubular necrosis, acute interstitial nephritis, and chronic interstitial fibrosis, depending on the nature and duration of exposure [42]. Acute tubular injury was most commonly associated with direct nephrotoxic effects of phytochemicals and heavy metal contaminants, whereas interstitial nephritis appeared more consistent with immune-mediated mechanisms [43].

Several case reports and observational studies also described crystal-induced nephropathy and glomerular injury, particularly in association with herbs containing oxalates or aristolochic acid–like compounds [44]. These patterns underscore the heterogeneity of renal pathology linked to herbal remedy consumption.

Mechanisms of Herbal Remedy–Induced Nephrotoxicity

Multiple mechanistic pathways were implicated in herbal remedy–associated nephrotoxicity. These included direct cytotoxic injury to renal tubular epithelial cells, oxidative stress, mitochondrial

dysfunction, and inflammatory responses within the renal interstitium [45]. Impaired renal perfusion due to volume depletion, commonly seen in patients using herbal purgatives or diuretics, further exacerbated renal injury [46].

Heavy metal contamination emerged as a major contributor to nephrotoxic risk. Lead, mercury, cadmium, and arsenic, frequently detected in unregulated herbal products are known to accumulate in renal tissue, inducing both acute and chronic renal damage [47,48]. Experimental models demonstrated dose-dependent tubular injury and glomerular sclerosis following exposure to these metals [49].

Polyherbal Formulations and Chronic Kidney Injury

Polyherbal preparations were disproportionately represented among cases of chronic kidney injury. The cumulative nephrotoxic effects of multiple bioactive compounds, combined with prolonged unsupervised use, created conditions conducive to progressive renal damage [13]. Unlike acute nephrotoxicity, which may be reversible with early detection, chronic herbal-related nephropathy often resulted in irreversible structural damage and long-term renal impairment.

The absence of standardised dosing and labelling further complicated risk assessment, particularly among elderly patients and those with underlying hypertension or diabetes, conditions highly prevalent in West African populations [50].

Diagnostic and Attribution Challenges

Attribution of renal injury to herbal remedies was particularly challenging due to overlapping clinical presentations with common causes of kidney disease, such as hypertensive nephrosclerosis, diabetic nephropathy, and infectious etiologies [51]. In many settings, limited access to renal biopsy, toxicological assays, and detailed exposure histories hindered definitive diagnosis.

Furthermore, the lack of validated biomarkers specific for herbal-induced nephrotoxicity and weak pharmacovigilance systems contributed to systematic under-reporting [52]. As a result, herbal remedy–associated nephrotoxicity remains largely invisible within official renal disease statistics in the region.

Public Health Implications

The reviewed evidence highlights herbal remedy–associated nephrotoxicity as an important but under-recognised contributor to kidney disease burden in West Africa. Given the central role of the kidneys in xenobiotic excretion, unregulated herbal medicine use poses a substantial risk for preventable renal injury, particularly among vulnerable populations [53]. Strengthening clinician awareness, improving patient education, and integrating routine inquiry into herbal medicine use during renal evaluation are critical public health priorities.

DISCUSSION

Under-reporting of Herbal Remedy–Associated Toxicity in West Africa

Under-reporting represents a fundamental barrier to understanding the true burden of herbal remedy–associated hepatotoxicity and nephrotoxicity in West Africa. Despite the widespread use of herbal medicines across socioeconomic strata, adverse organ effects related to these products are rarely documented within formal health information systems [30]. This discrepancy reflects a convergence of patient, clinician, and system-level factors that collectively obscure the epidemiology of herbal medicine toxicity.

At the patient level, herbal remedies are often regarded as culturally normative and inherently safe, leading to nondisclosure during clinical encounters. Many individuals only report herbal use when directly questioned, and even then may minimise duration or dosage due to fear of disapproval or stigmatisation [5,54]. At the clinician level, limited training in toxicology and herbal medicine safety results in a low index of suspicion, particularly when laboratory abnormalities such as transaminitis or mild creatinine elevation are encountered in the absence of obvious triggers [55].

Health system factors further exacerbate under-reporting. Existing pharmacovigilance structures in West Africa are predominantly configured to

capture adverse drug reactions related to conventional pharmaceuticals, leaving herbal medicines largely invisible within surveillance frameworks [52]. The absence of standardised nomenclature for herbal products, frequent polyherbal combinations, and lack of batch identification make causal attribution challenging. Consequently, herbal remedy–associated organ toxicity is often misclassified as idiopathic, viral, or metabolic disease, perpetuating a cycle of diagnostic obscurity.

Regulatory and Policy Failures in Herbal Medicine Governance

This review highlights profound regulatory and policy gaps governing herbal medicines in West Africa, which directly contribute to preventable organ toxicity. Unlike synthetic pharmaceuticals, herbal remedies are rarely subjected to systematic preclinical toxicity testing, dose standardisation, or contaminant analysis before commercialisation [13]. Regulatory agencies, including Nigeria's National Agency for Food and Drug Administration and Control (NAFDAC) and Ghana's Food and Drugs Authority, often lack the laboratory capacity and toxicological expertise required to evaluate the safety profiles of complex herbal formulations. Regulatory oversight of herbal medicines remains fragmented as these agencies, having established frameworks for herbal product registration, lag in consistent and continuous enforcement, particularly for informal and locally produced remedies. Regional coordination through ECOWAS and the West African Health Organization (WAHO) is still evolving, limiting cross-border harmonisation of herbal medicine regulation. [56-58]

The informal and decentralised nature of herbal medicine production further undermines regulatory oversight. Many products are prepared under non-standardised conditions, with variable plant species, harvesting methods, and preparation techniques, resulting in unpredictable phytochemical concentrations [59]. Cross-border trade within the ECOWAS region compounds these challenges, allowing unregistered and untested products to circulate freely across national boundaries with minimal enforcement.

Heavy metal contamination remains a particularly concerning regulatory failure. Multiple studies have documented unsafe levels of lead, mercury, arsenic, and cadmium in herbal remedies sold across West Africa, reflecting poor quality control and environmental contamination [11]. The lack of mandatory post-marketing surveillance means such products often remain in circulation long after adverse health effects have occurred.

Clinical Implications for Hepatic Disease Recognition and Management

From a clinical perspective, herbal remedy–associated hepatotoxicity poses substantial diagnostic and therapeutic challenges. The clinical spectrum ranges from asymptomatic elevations in aminotransferases to acute hepatitis, cholestatic injury, and fulminant liver failure [60]. In routine practice, early biochemical abnormalities are frequently overlooked, especially when viral hepatitis markers are negative, and alcohol misuse is denied.

Evidence from southern Nigeria supports this diagnostic gap. In a rural tertiary hospital setting, Ibezim *et al.* demonstrated a high prevalence of transaminitis among patients with non-viral hepatitis, with a broad and heterogeneous aetiological spectrum [14]. Although herbal medicine exposure was not always explicitly documented, the findings strongly suggest an underappreciated contribution of non-pharmaceutical hepatotoxins, including herbal remedies. This underscores the need for systematic inclusion of herbal medicine history in the evaluation of abnormal liver function tests.

Failure to recognise herbal-related hepatotoxicity can lead to inappropriate management, including unnecessary antiviral therapy, delayed withdrawal of the offending agent, or progression to irreversible liver injury. From a clinical biochemistry standpoint, dynamic monitoring of liver enzymes, bilirubin fractions, and synthetic function is essential for early detection and prognostication.

Clinical Implications for Renal Disease Recognition and Outcomes

Herbal remedy–associated nephrotoxicity, while less frequently reported than hepatotoxicity, carries equally devastating consequences. Renal injury may occur through multiple mechanisms, including direct tubular toxicity, oxidative stress, immune-mediated interstitial nephritis, hemodynamic alterations, and accumulation of nephrotoxic heavy metals [61]. As illustrated in this review, the clinical spectrum spans from subtle biochemical derangements to acute kidney injury and progressive chronic kidney disease.

In many West African settings, patients present late, often after weeks or months of continued herbal remedy use, by which time renal damage may be advanced and irreversible [50]. Early warning signs such as mild creatinine elevation or electrolyte imbalance are frequently missed, particularly in primary care and rural facilities with limited laboratory capacity. The progression to end-stage renal disease represents a catastrophic outcome in regions where access to dialysis and transplantation is severely constrained.

These realities highlight the critical role of early biochemical screening, clinician awareness, and timely referral. Incorporating routine renal function testing and herbal exposure assessment into standard care pathways could significantly reduce morbidity associated with herbal nephrotoxicity.

Public Health and Health System Consequences

Beyond individual patient outcomes, herbal remedy–associated organ toxicity imposes a substantial public health burden. Preventable cases of liver failure and chronic kidney disease place additional strain on already overburdened health systems and divert limited resources from other priority conditions [59]. The economic consequences are particularly severe in settings where healthcare costs are largely borne out-of-pocket, leading to catastrophic health expenditure and loss of productivity.

The pervasive belief that herbal remedies are safe because they are “natural” continues to undermine public health messaging and risk communication efforts [1]. Without targeted education campaigns and regulatory reform, herbal medicine toxicity will remain a silent contributor to morbidity and mortality statistics, particularly among populations with chronic illnesses who are more likely to seek alternative therapies.

Implications for Toxicological Research, Practice, and Ethics

This review underscores the urgent need to strengthen toxicological research capacity related to herbal medicines in West Africa. Priority areas include identification of hepatotoxic and nephrotoxic phytochemicals, assessment of dose–response relationships, evaluation of herb–drug interactions, and routine screening for heavy metal contamination [4]. Establishing regional toxicology laboratories and collaborative research networks would provide the evidence base necessary for effective regulation and policy development.

Ethically, balancing respect for traditional medicine with the imperative to protect public health presents a complex challenge. Herbal medicine remains an integral component of healthcare for many communities, and outright dismissal risks alienating patients and practitioners. Instead, integrating traditional medicine into regulated frameworks that emphasise safety, standardisation, and accountability offers a more sustainable path forward.

CONCLUSION

Herbal medicine–associated organ toxicity represents a significant yet under-recognised public health challenge, particularly in low- and middle-income countries where herbal remedies are widely used alongside or in place of conventional medical therapies. This critical review demonstrates that herbal products can induce a broad spectrum of hepatic and renal injuries, ranging from asymptomatic biochemical derangements to fulminant organ failure, with mechanisms involving direct cytotoxicity, oxidative stress, immune-mediated injury, mitochondrial dysfunction, and harmful herb–drug interactions.

The burden of herbal hepatotoxicity and nephrotoxicity is likely underestimated due to pervasive under-reporting, limited diagnostic capacity, sociocultural beliefs that frame herbal remedies as inherently safe, and the absence of robust pharmacovigilance systems for traditional medicines. The informal and decentralised nature of herbal medicine production further compounds these risks, resulting in inconsistent phytochemical composition, contamination, adulteration, and unpredictable toxicity profiles.

Clinically, the findings underscore the need for heightened vigilance among healthcare providers, particularly in patients presenting with unexplained liver enzyme abnormalities or acute kidney injury. Routine clinical history-taking should deliberately include herbal medicine use, and clinicians must maintain a high index of suspicion for herbal-induced organ injury, especially in settings where regulation is weak and self-medication is common. Early recognition and prompt discontinuation of offending agents remain critical to improving patient outcomes.

From a policy perspective, strengthening regulatory oversight of herbal medicines, enforcing quality assurance standards, and integrating traditional medicine into national pharmacovigilance frameworks are essential steps toward mitigating harm. Public health education aimed at dispelling misconceptions regarding the safety of herbal products is equally important, as is fostering collaboration between traditional medicine practitioners and orthodox healthcare systems.

In conclusion, while herbal medicines continue to play a culturally significant role in healthcare delivery, their potential for serious hepatic and renal toxicity cannot be ignored. Addressing this challenge requires a multidisciplinary approach encompassing clinical awareness, regulatory reform, pharmacovigilance strengthening, and public engagement. Failure to act risks perpetuating preventable morbidity and mortality associated with unregulated herbal medicine use.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

ETHICAL CONFORMITY

As the work involved the review and analysis of previously published literature without direct involvement of human participants or animals, formal ethical approval and informed consent were not required.

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