

Review Article

Incidence of Adulteration of Herbal Preparations in Africa and Its Impacts on the Regional Health: A Review

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Article History

Received: 27.05.2026

Accepted: 20.07.2026

Published: 23.07.2026

Journal homepage:

<https://www.easpublisher.com>

Quick Response Code



Abstract: Herbal preparations have long been accepted in Africa as alternative or complementary medicine. However, the herbal preparations have been found to contain undeclared synthetic drugs known as adulterants. This review was intended to find out the incidence of adulteration of herbal preparations in Africa and its impacts on the regional health. A search strategy through multiple databases was conducted across PubMed, Google, Google Scholar, Science Direct, Cochrane databases, Scopus, and Google Scholar using appropriate search terms such as herbal medicines, herbal preparation, impacts of herbal medicines in Africa, health implications of herbal medicines in Africa. About 112 articles published from 1995 to 2026 were accessed and eligible articles data were extracted and analyzed. Adulteration of herbal preparation used in Africa has become healthcare setback instrument in hands of greedy manufacturers of these remedies. It was observed that this menace affect every part of African healthcare delivery system. The most commonly adulterated herbal preparations in Africa are those used for weight loss and weight gain, aphrodisiacs, anti-inflammatory, antidiabetics, antimicrobials, and antihypertensives. Glibenclamide and Metformin were the commonest adulterants in the antidiabetic herbal preparations. Trimethoprim, chloramphenicol, amoxicillin and ciprofloxacin were the commonest adulterants in herbal antibacterial preparations. Chloroquine was the commonest used adulterants in the herbal antimalarial preparations. The risks of the adulterations include meningitis, lead poisoning, nephrotoxicity, renal or liver failure, coma, and death. Establishment of stringent quality control and its enforcement should be employed in each African country in order to curb the menace.

Keywords: Adulteration, Herbal Preparation, Adulterants, Africa, Health Implications, Phytochemical Constituents, sub-Saharan Africa.

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INTRODUCTION

Herbal preparations play important role in healthcare delivery across African countries and the world at large (Abdulai *et al.*, 2025). Herbal preparations have been in use since ancient times, and based on historical records, have remained a primary source of therapy for humans and animals for over fifteen centuries until relatively recent centuries when synthetic drugs became dominant. The history of herbal medicine is

closely linked to the broader development of medicine from prehistoric times through the emergence of the germ theory of disease in the 19th century, developed by scientists such as Louis Pasteur, Robert Koch, and Joseph Lister (Susan, 2019). Since the 19th century, modern medicine has increasingly relied on scientific methods and evidence-based practice and as a result, many pharmaceutical drugs which are originally derived from medicinal plants have replaced traditional herbal remedies in mainstream healthcare (WHO, 2023).

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Traditional and alternative medical systems remain widely practiced in many parts of the Africa and continue to rely heavily on herbal components (Susan, 2019). In sub-Saharan Africa alone, the prevalence of consumption of herbal preparations (HPs) varies from 85% in Burkina Faso and Nigeria, 86% in Ghana, to 90% in Burundi, Ethiopia, and Sudan (Aina *et al.*, 2020). The high patronage could be due to cultural acceptance, accessibility, affordability, believe that they are natural and the perceived efficacy of these herbal preparations. However, many *in vivo* studies largely support the safety of herbal medicines while most *in vitro* studies on isolated single cells mostly with extracts other than aqueous ones show contrary results and thus continue the debate on herbal medicine safety (Merlin, *et al.*, 2019).

However, critics argue that herbal preparations often lack standardized dosing and may vary in potency. Herbal materials may include plant juices, gums, fatty oils, essential oils, and related substances (Shu *et al.*, 2019). Products combining plant materials with chemically defined or isolated compounds are generally not classified as herbal medicines (WHO, 2002). In some settings, herbal preparations may also include non-plant natural substances based on traditional practices. Although many users report perceived health benefits, concerns remain regarding safety, quality, and contamination. Studies have shown that some locally prepared herbal medicines may be contaminated with bacteria or fungi, posing potential health risk. However, the increased patronage of the herbal preparations has raised serious concerns about the authenticity, purity, and safety of these remedies (Abdulai *et al.*, 2025). Adulteration has become a serious threat to the quality and efficacy of traditional medicines. This phenomenon involves practices such as substitution with similar looking but pharmacologically inactive species, inclusion of exhausted plant materials, or contamination with non-plant matter including soil, sand, or synthetic drugs (Patwardhan *et al.*, 2005). Adulteration of these herbal preparations may occur during harvesting, processing, storage or distribution. In Sierra Leone, the absence of standardized protocols for quality assurance and the weak enforcement of existing herbal medicine regulations exacerbate the problem. Moreover, poor post-harvest handling practices such as drying plants under unhygienic conditions or storing them in humid environments further contribute to microbial growth and deterioration of active constituents (Ekor, 2014). These quality issues does not only reduce efficacy but may also pose direct health risks to consumers, such as toxicity or allergic reactions. Product quality and potency may also vary depending on environmental factors such as soil type, climate, harvesting methods, and storage conditions (Shu *et al.*, 2019).

METHOD

In this review, the most recent studies done with African herbal preparations were reviewed. A search strategy through multiple databases including articles

published from 1995 to 2026 was performed. About 112 articles were reviewed from PubMed, Google, Google Scholar, Science Direct, and Cochrane databases were searched using the terms like herbal medicines, herbal preparation, impacts of herbal medicines in Africa, health implications of herbal medicines in Africa, African herbal medicines and adulterants in African herbal preparations. Investigations involving research articles, meta-analyses, and observational study reviews were done. Data were retrieved and analyzed in line with the stated purpose of this review. Data from works done on African herbal preparations were accessed and analysed. The strength of evidences was evaluated and quality assessment was performed.

RESULTS

Prevalence and Justification for Consumption of Herbal Medicine in Africa

The different reasons for the uncontrolled use of herbal medicines for treatment of illnesses in Africa include cultural inclination, accessibility because it is natural and affordable. Other reasons include unavailability and high cost of allopathic medicines. Most cultures in Africa believe that the herbal preparations have spiritual impacts. Hence, patients who need holistic therapies are also managed with herbal preparations. The prevalence rates of the use of herbal preparation in Africa are rapidly increasing with high unprecedented levels of up to 90% (Ouoba *et al.*, 2025). Currently, there is a surge in the use of herbal preparations for treatment of different ailments. This has been associated to different factors such as inaccessibility to conventional healthcare due to the failure of healthcare system to provide adequate healthcare (Ogidi and Emaikwu, 2024; Ouoba, *et al.*, 2022). Limited financial and geographical accessibility to essential pharmaceutical products has led to increased inequalities in healthcare services (Ouoba, *et al.*, 2022; Mutombo *et al.*, 2022). Another factor is that the use of herbal preparations is deeply rooted in culture thereby making herbal preparations (HPs) accessible and affordable. This is one of the factors that make HPs constitute the main source of healthcare for a large part of the African populations (Ouoba, *et al.*, 2023). Hence, the patients believe that herbal preparations are harmless to health because they are natural has contributed to the increased patronage of the preparations.

Adulteration of Herbal Preparations

Herbal preparations involve the use of plants or plant-derived products in the treatment of diseases and in promoting general healthcare and wellbeing. Some medicinal plants contain highly potent bioactive compounds and therefore require the same level of caution as conventional pharmaceuticals (Shu *et al.*, 2019). In fact, several modern drugs are derived from naturally occurring plant compounds; for example, digitalis which is a group of drugs used to increase the strength contractility of the heart and slow the heart rate, is obtained from the foxglove plant. However, the

consumption of these herbal preparations has health implications associated with the deliberate adulteration with synthetic substances, the intentional or accidental substitution of plant species, or simply the risk of mislabeling (Arwa *et al.*, 2025). Adulteration of herbal preparations generally involves the intentional addition of allopathic drugs, inorganic substances to herbal preparations, with the aim of achieving increased therapeutic or synergistic effects (Kaggwa *et al.*, 2022). It has also been reported that there are illegal synthetic substances being added to herbal preparations for weight loss and weight gain preparations, aphrodisiacs, treatments for rheumatic and inflammatory diseases, antidiabetic medications, and antihypertensive preparations (Sifuma *et al.*, 2022). It appears that the substitution of plant species occurs across various categories of herbal medicines (Nwodo *et al.*, 2026). Therefore, this review shows that there is intentional adulteration of herbal preparations with orthodox medicines and it is a growing public health issue across Africa. Again, it is usually because greed for financial gain that make the practitioners to secretly enhance the therapeutic effects of the herbal preparations with synthetic drugs. Adulteration of these herbal, sometimes, has been a persistent issue throughout history and it is usually driven by greed. It has been reported that the risks associated with the use of HPs include adverse effects, toxicity, microbial or heavy metal contamination and adulteration (Ahiabor *et al.*, 2024).

Adulteration of Herbal Preparations with Aphrodisiacs

The adulteration of herbal preparations with phosphodiesterase-5 inhibitors indicated for erectile dysfunction (ED) constitutes the most worrying risk of the use of herbal preparations in African (Ahiabor *et al.*, 2024). Erectile dysfunction patients are also subject to social stigma, thereby causing psychological negative impacts on those affected (Idung, 2012). The patients resort to natural products with aphrodisiac characteristics because they seem to be cheaper and more accessible than allopathic aphrodisiac drugs and because of the assumption by the population that the herbal preparations are safer for than allopathic medicines (Ouoba *et al.*, 2022). The work done by Keneth (2021) showed that sub-Saharan African herbalists and naturopaths are being motivated to adulterate their products by adding synthetic aphrodisiacs based on sildenafil or its analogues for economic reasons and due to the lack of no regulatory quality control. These adulterated products are then labelled '100% natural' with disregard for consumer health. In Nigeria, about 32% of the herbal preparation marketed as aphrodisiacs in Northwestern region was discovered to be adulterated with sildenafil (Aminu *et al.*, 2020). The notion that "manliness" is gauged by how sexually virile a man is, explains the increase in the demand and proliferation of sex enhancing drugs (Bello, 2009). The adulteration of herbal preparations with orthodox medicines indicated for erectile dysfunction (ED), phosphodiesterase-5

inhibitors, constitutes the most worrying risk group for public health in Africa. This pharmacological class is particularly affected by the adulteration of HPs due to the important prevalence of ED in African countries (Ouoba *et al.*, 2025). Surveys done with men between 34 and 70 years of age seeking primary medical care indicated that the age-adjusted prevalences of ED were 25.4% in Ethiopia, 57.4% in Nigeria and 63.6% in Egypt (Gebremedhin *et al.*, 2021). This has led to the explosion in the patronage of herbal aphrodisiacs and other herbal remedies in both developed and developing countries in recent years (Paul *et al.*, 2005; WHO, 2005). As a result, some herbal practitioners and manufacturers of herbal products fraudulently incorporate active pharmaceutical substances and/or their structural analogues in preparations without corroborated efficacy to gain fast money. There was a case that concerns the HPs adulteration and other "natural products" which were claimed by their manufacturers to be aphrodisiacs, identified in Côte d'Ivoire, West Africa (AIRP, 2025). The Ivorian Pharmaceutical Regulatory Authority (AIRP) suspended the import and marketing of eight of the so-called 100% natural aphrodisiac products on September 2, 2024, and they included 'Vitamax doubleshot Energy coffee box of 10 sachets'; 'Vitaplus Cacao power box of 12 sachets'; 'Vitamax kingsman energy candy box of 12 pastilles'; 'Bio herbs coffee powder box of 8 sachets'; 'Bio herbs royal king honey box of 10 sachets'; 'Maximen Bio Honey oral solution box of 10 sachets'; 'Cappuccino Maximen coffee box of 10 sachets' and 'Kopivitamin box of 8 sachets' (AIRP, 2025). This suspension was due to the discovery by Côte d'Ivoire's National Public Health Laboratory (LNSP), that these HPs were adulterated with Tadalafil which is indicated for the treatment of ED in adult men. Tadalafil is a prescription only medicine taken with caution by patients with cardiovascular risk factors (AIRP, 2025). This decision was also extended to National Drug Regulatory Authorities (NRAs) of Bénin and Burkina Faso where these products are widely marketed and consumed by the general population. Adulteration and contamination of HPs can cause serious adverse effects. Therefore, stringent quality control and its enforcement are necessary to reduce health risks.

Adulteration of Herbal Preparations with Antidiabetics

Studies showed that Glibenclamide and Metformin were the commonest used adulterants detected in the antidiabetic herbal preparations in Hong Kong in market (Bukhupe, *et al.*, 2023). Serious adverse events were also reported following the use of adulterated herbal products. In Kampala Uganda, original study showed that three out of the eighteen products were found to be adulterated with synthetic antihyperglycemics (Bukhupe, *et al.*, 2023). The adulterated herbal preparations contained approximately 0.11 mg of glibenclamide, 6.14 mg and 20.7 mg of metformin for every 1 gram of the product. There could be interactions between herbal preparations and

allopathic medicines which may increase or decrease the pharmacological or toxicological effects of either component. The synergistic therapeutic effects may complicate treatment or management of chronic diseases like diabetes. Antidiabetic herbal preparations used to treat diabetes could theoretically lead to hypoglycemia adulterated with conventional antihyperglycaemic drugs (Woolston, 2017). Hence, there is need for more product registration and notification with the regulatory agency to ensure better monitoring and regulation of product quality and safe use of these locally made herbal antidiabetic products.

Adulteration of Herba Preparations with Synthetic Antimicrobial Agents

In Ghana, most of the herbal preparations are also prone to adulterations with trimethoprim, chloramphenicol, amoxicillin and ciprofloxacin. 21 samples made up of 5 liquid samples, 6 capsule samples, 3 powdered samples and 7 creams were analysed using HPLC at the Aflatoxin Laboratory, Kwame Nkrumah University of Science and Technology and it was shown that 71.43% of the herbal creams were contaminated with at least one of selected antibiotics (trimethoprim, chloramphenicol, amoxicillin and ciprofloxacin) (Boahemaah 2019). This is evidence that most herbal preparations marketed in Ghanaian market were adulterated with antibiotics. These data suggest that there are reasons for concerns with regards to the quality of HPs used for treatment of different illnesses in Africa.

Adulteration of Herbal Preparations with Antimalaria

Again, another work done by Nwodo *et al.*, (2026) showed that 80% of the antimalarial herbal preparations marketed in Eastern part of Nigeria are adulterated. This is evidence that adulteration of herbal preparations is a serious global health menace and must be given equal global attention. In Ghana, it was also discovered that there is intentional addition of chloroquine to the herbal preparations in order to enhance their effectiveness (Wilmot *et al.*, 2017). However, chloroquine may induce cross resistance to amodiaquine which is one of the partner drugs in the recommended ACT regimen. Herbal collection from the wild can be plagued by adulterations either intentionally or unintentionally (Santhosh *et al.*, 2015). Species substitution may adversely affect consumer health as it could cause severe allergies and will not have the intended effect (Srirama *et al.*, 2017). Therefore, herbal preparations in Africa cause serious significant health risk to consumers due to the high prevalence of diverse antimicrobial contaminants. This still points to the need for stricter regulations and quality control measures in the production, sale and use of herbal preparations.

Adulteration of Medicinal Botanicals

Foods, spices, and medicinal botanicals are also being persistently adulterated throughout history due to greed. These adulterants may not be toxic but they can

dilute active ingredients and reduce effectiveness. Typical example is that the most adulterated ginkgo samples contained added flavonoids from cheaper plant sources, which are mostly not harmful but are not as effective as the ginkgo ingredient (Orhan *et al.*, 2024). On the hand, it has been uncovered that some herbal preparations are adulterated with toxic substances which include lead, (which is toxicity to both adults and children) and is added as lead chromate to turmeric powder and marigold powder (Orhan *et al.*, 2024). As commercial demand continues to increase, harvesting from wild-growing stocks becomes increasingly unsustainable, heightening the risk of adulteration (Allen *et al.*, 2014).

Adulteration of HPs with Inflammatory and Blood Pressure Lowering Drugs

Rheumatic disease is another condition in which people often use herbal preparations. There is also adulteration of antirheumatic herbal preparations with synthetic substances. These antirheumatic adulterants usually cause adverse reactions such as gastrointestinal hemorrhages (Tjaša and Samo, 2019). Adulteration of herbal medicines with conventional anti-rheumatic and anti-inflammatory drugs is a severe public health issue. Unscrupulous manufacturers deliberately spike "all-natural" remedies with cheap, potent synthetic pharmaceuticals to ensure immediate pain relief and trick consumers into thinking the herbs are highly effective (Pratiwi *et al.*, 2021). It has also been reported that there is intentional addition of synthetic drug such as amlodipine, indapamide, valsartan, clonidine and hydrochlorothiazide in antimalarial herbal preparations used to regulate blood pressure (Vaclavik *et al.*, 2014).

Health Implications of Adulteration of Herbal Preparations in Africa

There may be occurrence of drug interactions between commonly used allopathic medicines and herbal preparations. This interaction may worsen when herbal preparations are adulterated with Western orthodox drugs. The main adulterants were metals, especially mercury, lead, arsenic, and copper or pharmaceuticals. These adulterants have been shown to induce hepatic, renal, and neurotoxic effects (Abt and Oh, 1995). These adulterations could be due to unabated increase in number of consumers thereby enhancing their use for treatment of everyday complaints and making them seemed indispensable. The most severe adverse effects caused by these adulterations in Africa were agranulocytosis, meningitis, multi-organ failure, perinatal stroke, arsenic, lead or mercury poisoning, malignancies or carcinomas, hepatic encephalopathy, hepatorenal syndrome, nephrotoxicity, rhabdomyolysis, metabolic acidosis, renal or liver failure, cerebral edema, coma, intracerebral haemorrhage, and death (Posadzki *et al.*, 2013). Adulteration of herbal preparations in Africa has been discovered to be trans-continental as there have been reports of adulteration of Asian herbal remedies with Western synthetic drugs in South African health

system (Snyman *et al.*, 2005). The authors described 2 cases from South Africa in which herbal remedies administered to patients who were admitted to hospital, were found to be adulterated with commercially available Western medicines (Snyman *et al.*, 2005).

DISCUSSION

The use of herbal preparations for the treatment of disease is as old as mankind though its history is closely linked to the broader development of medicine from prehistoric times through the emergence of the germ theory of disease in the 19th century (Susan, 2019). Herbalism remains widely practiced in many parts of the Africa and continue to rely heavily on herbal components (Susan, 2019). This review showed that the high patronage of herbal preparations could be due to cultural acceptance, accessibility, affordability; believe that they are natural and the perceived efficacy of these herbal preparations. World Health Organization also noted that herbal preparation that contain plant materials with chemically defined or isolated compounds are generally not classified as herbal medicines (WHO, 2002). Therefore, once any herbal preparation contains non-herbal contaminants or purified chemicals, it's no longer herbal preparation. However, the increased patronage of the herbal preparations has raised serious concerns about the authenticity, purity, and safety of these remedies (Abdulai *et al.*, 2025). This could be due to the increased therapeutic effects caused by the synergism between the phytochemicals and the contaminants or adulterants. Adulteration has become a serious threat to the quality and efficacy of traditional medicines.

The adulterants in these herbal preparations have health implications associated with synthetic substances (Arwa *et al.*, 2025). The review showed that adulterants include diverse synthetic drugs used to treat different ailments. These include drugs used for weight loss and weight gain, aphrodisiacs, antirheumatic and antiinflammatory, antidiabetic medications, and antihypertensive (Sifuma *et al.*, 2022). Therefore, this review shows that there is intentional adulteration of herbal preparations with orthodox medicines across Africa. Adulteration of this herbal, sometimes, has been a persistent issue throughout history and it is usually driven by greed.

It was also uncovered that adulteration of herbal preparations with phosphodiesterase-5 inhibitors indicated for erectile dysfunction (ED) is rampant Africa (Ahiabor *et al.*, 2024). Patients patronize these contaminated HPs because of social stigma and the resultant psychological negative impacts on the patients (Idung, 2012). The patients also resort to the adulterated aphrodisiac because they seem to be cheaper and more accessible than allopathic aphrodisiac drugs and because of the assumption by the population that the herbal preparations are safer than allopathic medicines (Ouoba *et al.*, 2022). African herbalists and naturopaths adulterate the aphrodisiac HPs with the synthetic

phosphodiesterase-5 inhibitors, sildenafil or its analogues. It was revealed that about 32% of the aphrodisiac herbal preparations in Northwestern region were discovered to be adulterated with sildenafil (Aminu *et al.*, 2020). The rush for this adulterated herbal preparation is because people believe that sexual virility a man explains his manliness (Bello, 2009). This undercores the explosion in the patronage of herbal aphrodisiacs (Paul *et al.*, 2005; WHO, 2005). Some herbal manufacturers fraudulently incorporate orthodox therapeutic substances and/or their structural analogues in preparations without considering efficacy of the adulterated samples. In Ivorian Pharmaceutical Regulatory Authority (AIRP) suspended the importation and marketing of eight of the so-called 100% natural aphrodisiac products on September 2, 2024, due to the discovery by Côte d'Ivoire's National Public Health Laboratory (LNSP), that certain HPs marketed as aphrodisiacs were adulterated with Tadalafil which is indicated for the treatment of ED in adult men. Tadalafil is a prescription only medicine contraindicated in patients with cardiovascular risk factors (AIRP, 2025). The health authorities of Bénin and Burkina Faso because the same preparations were also marketed and consumed by these countries. Adulterants of HPs can cause serious adverse effects. Hence, stringent quality control and its enforcement curb the menace.

Glibenclamide and Metformin were the commonest used adulterants detected in the antidiabetic herbal preparations. In Kampala Uganda, research showed that three out of the eighteen products were found to be adulterated with synthetic antihyperglycemics (Bukhupe, *et al.*, 2023). The adulterated herbal preparations contained approximately 0.11 mg of glibenclamide, 6.14 mg and 20.7 mg of metformin for every 1 gram of the product. This is why these antidiabetic herbal preparations could cause hypoglycemia (Woolston, 2017). Hence, there should be establishment of regulatory agency to ensure better monitoring and regulation of product quality and safety. Research done in Ghana showed that most of the antibacteria herbal preparations in the country are adulterated with trimethoprim, chloramphenicol, amoxicillin and ciprofloxacin (Boahemaah 2019). These necessitate reasons for concerns with regards to the quality of HPs used in Africa. Nwodo *et al.*, (2026) showed that 80% of the antimalarial herbal preparations marketed in Eastern part of Nigeria are adulterated. This requires is a serious global attention. In Ghana, it was also shown that chloroquine is the adulterant in the herbal antimalarial preparations (Wilmot *et al.*, 2017). Though chloroquine may produce synergistic effects the phytochemicals, it can also induce cross resistance to amodiaquine which is a member of ACT antimalaria synthetic drugs. This review showed that herbal preparations in Africa may cause serious significant health risk to consumers due to the high prevalence of diverse antimicrobial adulterants. Hence, stricter regulations and quality control measures in the

production, sale and use of herbal preparations is promptly required. Foods, spices, and medicinal botanicals are also being persistently adulterated due to greed. These adulterants may not be toxic but they can dilute active ingredients and reduce effectiveness. Typical example is that the most adulterated ginkgo samples contained added flavonoids from cheaper plant sources, which are mostly not harmful but are not as effective as the ginkgo ingredient (Orhan *et al.*, 2024). Adulteration of herbal medicines with conventional anti-rheumatic and anti-inflammatory drugs is a severe public health issue. Greedy and ill-spirited manufacturers deliberately contaminate HPs with cheap and potent synthetic drugs to ensure exacerbated pain making patients believe that the herbs are highly effective (Pratiwi *et al.*, 2021). It was also reported that there is intentional contamination of herbal hypotensive preparations with synthetic drugs such as amlodipine, indapamide, valsartan, clonidine and hydrochlorothiazide (Vaclavik *et al.*, 2014).

There may be occurrence of drug interactions between commonly used allopathic medicines and herbal preparations. This interaction may worsen when herbal preparations are adulterated with Western orthodox drugs. Adulteration has been documented in Chinese (Koh and Woo 2000) Indian (Ernst, 2002) and South American herbal preparations. The main adulterants were metals, especially mercury, lead, arsenic, and copper or pharmaceuticals. These adulterants have been shown to induce hepatic, renal, and neurotoxic effects (Abt and Oh, 1995). These adulterations could be due to unabated increase in number of consumers thereby enhancing their use for treatment of everyday complaints and making them seemed indispensable. The most severe adverse effects caused by these adulterations were agranulocytosis, meningitis, multi-organ failure, perinatal stroke, arsenic, lead or mercury poisoning, malignancies or carcinomas, hepatic encephalopathy, hepatorenal syndrome, nephrotoxicity, rhabdomyolysis, metabolic acidosis, renal or liver failure, cerebral edema, coma, intracerebral haemorrhage, and death (Posadzki *et al.*, 2013). Adulteration of herbal preparations in Africa has been discovered to be trans-continental as there have been reports of adulteration of Asian herbal remedies with Western synthetic drugs in South African health system (Snyman *et al.*, 2005). The authors described 2 cases from South Africa in which herbal remedies administered to patients who were admitted to hospital, were found to be adulterated with commercially available Western medicines (Snyman *et al.*, 2005).

CONCLUSIONS

This review showed that the high patronage of herbal preparations could be due to cultural acceptance, accessibility, affordability, and believe that they are natural and the perceived efficacy of these herbal preparations. The adulterants include diverse synthetic drugs used to treat different ailments in Africa. These include drugs used for weight loss and weight gain,

aphrodisiacs, antirheumatic and antiinflammatory, antidiabetics, antimicrobials, and antihypertensives.

Glibenclamide and Metformin were the commonest used adulterants detected in the antidiabetic herbal preparations in Africa. Herbal antibacterial preparations in Africa are adulterated with trimethoprim, chloramphenicol, amoxicillin and ciprofloxacin. Herbal antimalarial preparations used in Africa are mainly adulterated with chloroquine though chloroquine may produce synergistic effects with the phytochemicals, and induce cross resistance to amodiaquine which is an ACT antimalarial synthetic drug. Adulteration of herbal medicines is also extended to herbal anti-rheumatic and anti-inflammatory drugs. Herbal hypotensive preparations adulterants include amlodipine, indapamide, valsartan, clonidine and hydrochlorothiazide. The herbal preparations in Africa may cause serious significant health risk to consumers due to the high prevalence of diverse adulterants. These risks include meningitis, perinatal stroke, arsenic, lead or mercury poisoning, malignancies or carcinomas, hepatic encephalopathy, hepatorenal syndrome, nephrotoxicity, renal or liver failure, cerebral edema, coma, and death. There may be occurrence of drug interactions between commonly used allopathic medicines and herbal preparations. Hence, establishment of stringent quality control and its enforcement should be employed in Africa in order to curb the menace. It is recommended that further studies should be done to ascertain if the therapeutic effects of the adulterated Herbal preparations are due to the adulterants alone or in combination with the inherent phytochemical constituents of the herbs.

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Cite This Article: Emmanuel Sunday Nwodo, Anthony Uche Mbah, Irene Shuneba, Augustine Chijioke Nwuko, Elvis Neba Shu (2026). Incidence of Adulteration of Herbal Preparations in Africa and Its Impacts on the Regional Health: A Review. *EAS J Pharm Pharmacol*, 8(4), 56-63.