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PAMJ One Health

Research

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Received: 10 Sep 2024 - **Accepted:** 13 Oct 2024 - **Published:** 14 Oct 2024

Keywords: Clinical trials, regulation, herbal medicines, West African Economic and Monetary Union

Cite this article: Aboubacar Sangho et al. Regulation and practice of clinical trials of herbal medicines in French-speaking West African countries (WAEMU): current status and challenges. PAMJ-One Health. 2024;15(8). 10.11604/pamj-oh.2024.15.8.45309

Available online at: https://www.one-health.panafrican-med-journal.com/content/article/15/8/full

Regulation and practice of clinical trials of herbal medicines in French-speaking West African countries (WAEMU): current status and challenges

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Abstract

Introduction: *in developing countries, access to quality medicines is a challenge. Herbal medicines whose safety, efficacy and quality have been proven in clinical trials are a credible alternative in Africa. This work analyzes the regulations and clinical trial practices for herbal medicines in the West African Economic and Monetary Union (WAEMU) member countries.* ***Methods:*** *this descriptive cross-sectional study was conducted from June 2023 to March 2024. Data collection was carried out using online questionnaires sent to National Pharmaceutical Regulatory Authorities (NPRAs), National Ethics Committees (NECs), and traditional medicine directorates or programs in the eight WAEMU member countries.* ***Results:*** *there was a legal and institutional framework for the conduct of clinical trials for medicines in general in the various WAEMU countries. We also noted the existence of a harmonized and specific guideline for herbal medicines at the level of the Economic Community of West African States (ECOWAS), which also includes the WAEMU countries. In addition, very few applications for clinical trials of herbal medicines are received at NPRA (n=3) and NEC (n=16) levels. A very high rate of rejection of these dossiers (75%) has been reported by the Committees. Lastly, the site inspections prescribed by the texts were not generally carried out.* ***Conclusion:*** *harmonized regulation of clinical trials in the WAEMU region, considering socio-cultural realities and the specificity of herbal medicines, the mobilization of sustainable funding, and improved collaboration between regulatory and ethical authorities and herbal medicines promoters, have been identified as the main challenges to be met.*

Introduction

In developing countries, access to quality medicines is a major public health issue [1]. In Africa, around 80% of the population still relies on traditional medicine (TM) for their primary health needs [2]. In West Africa in particular, studies have shown a high prevalence of traditional medicine use by the population: 85% in Burkina Faso [3] and Nigeria, and 86% in Ghana [4]. Traditional medicine (TM) should therefore significantly contribute to achieving universal health coverage [5]. However, the inaccuracy of active ingredient dosages and the lack of valid scientific evidence are the main reasons for questioning the authenticity of traditional medical practice [6]. In addition, serious adverse effects and other health risks associated with the use of herbal medicines have been reported around the world, including adverse interactions with synthetic drugs, adulteration, and microbial or heavy metal contamination [7].

To reverse this trend and promote the formal integration of TM into African healthcare systems, scientific evidence of the efficacy and safety of medicinal plants and herbal medicines is essential. These are based in particular on clinical trials, which are therapeutic experiments carried out on humans under strictly controlled conditions [8] and are the best instrument for providing ultimate proof of the therapeutic usefulness of herbal medicines [9]. In addition, these trials facilitate their acceptance in different regions of the world and by people belonging to various cultural traditions, according to the World Health Organization (WHO) [10]. In this way, clinical trials will contribute to the WHO's goals for traditional and complementary medicine, namely, improving equitable access to safe, effective, and quality products to meet the needs of communities in sustainable and culturally appropriate health systems [11]. However, the lack of scientific data from clinical trials to justify their therapeutic contribution [12] and given the long use of some

herbal medicines, safety assessment is not always at the forefront of health concerns in Africa [10].

In general, several international provisions governing the conduct of clinical trials have gradually been incorporated into the legal systems of various countries [13]. In African countries, National Pharmaceutical Regulatory Authorities (NPRAs) and National Ethics Committees (NECs) are traditionally involved in the regulation of clinical trials [14]. The structures in charge of TM are also involved in research and/or the regulation of licensure in this field [15]. The design of clinical trials should be adapted to the particularities of herbal medicines and the socio-economic context of African countries [10]. This could be particularly true in countries belonging to sub-regional blocs such as the West African Economic and Monetary Union (WAEMU), where harmonization of national legislation is being promoted [16]. This study aimed to describe the regulations applicable to herbal medicines clinical trials in WAEMU member countries and to assess related practices to identify challenges and perspectives.

Methods

Type, framework, and period of study: it was a descriptive cross-sectional study that took place from June 2023 to March 2024. The study covered the eight WAEMU countries: Benin, Burkina Faso, Ivory Coast, Guinea-Bissau, Mali, Niger, Senegal and Togo. The WAEMU covers an area of 3,506,126 km^2 and has a population of 123.6 million. These coastal and Sahelian states are linked by a common currency and benefit from shared cultural traditions [17]. This study was conducted in the Laboratory for the Development of Medicines of the African Center of Excellence for Training, Research, and Expertise in Medicinal Sciences at the Joseph KI-ZERBO University in Ouagadougou, Burkina Faso.

Participants: the participating structures were the NPRAs, NECs, and TM directorates or programs.

Study size: the sample was exhaustive. Thus, the eight NPRAs, NECs and TM directorates or programs of WAEMU countries were included on the basis that they were involved in the regulation and practice of herbal medicines clinical trials and were able to provide information on the research question.

Data collection and analysis: a letter requesting data collection was sent to all heads of the structures concerned in WAEMU countries. Data collection was carried out using online questionnaires (created with Google Forms) specific to each category of interlocutor. For NPRAs and NECs, the questionnaire was structured in two parts: (i) the institutional and legal framework for clinical trials, and (ii) the functional aspects of regulating herbal medicines clinical trials. For national TM directorates or programs, the questionnaire concerned: (i) research activities, (ii) specific aspects of collaboration between TM practitioners and traditional health practitioners, and (iii) the structures' experiences of herbal medicines clinical trial practices. The questionnaires were specifically addressed to those in charge of clinical trial authorization files in the NPRAs, to the chairmen of the NECs, and to the heads of the TM Directorates. If they were unavailable, the questionnaires were answered by their representatives. To reduce bias, legislative and regulatory texts cited during the survey were provided by participants or searched on institutional websites. Microsoft Excel 2016 software was used to process data from the survey questionnaires. These data were then analyzed thematically, in line with the study's objectives.

Ethical considerations: this study was conducted per the principles of the Declaration of Helsinki. It was authorized by the heads of the structures in the WAEMU countries. In addition, the consent of the participants, after having read the general information sheet, was a prerequisite for their inclusion in the study. Anonymity and confidentiality of personal information were guaranteed during data collection and processing. The study protocol was also approved by the

Ethics Committee of the University of Science, Techniques and Technologies of Bamako of Mali under reference n°2020/275/CE/FMOS/FAPH of December 07, 2020, and by the Ethics Committee for Health Research of Burkina under reference n°2023-07-186 of July 11, 2023.

Results

Legal and institutional framework for herbal medicines clinical trials: the legal and institutional framework for clinical trials in WAEMU countries is based on legislative and regulatory provisions. These provisions include legislation on medicines and pharmacy, regulation of clinical trials, the code of ethics for health research, and the structures involved in the process of regulating clinical trials (Table 1, Table 1.1).

Implementation of clinical research regulations on herbal medicines: during the investigation, all those responsible for clinical trial applications stated that national laws and regulations provide for the authorization, suspension, and stopping of clinical studies. Benin, Burkina Faso, and Senegal have set up technical committees to evaluate the files submitted. However, these committees are not specific to herbal medicines. Inspection of clinical trials is provided for in the regulatory texts of all WAEMU countries (Table 1, Table 1.1). Participants also referred to other international standards, such as the Declaration of Helsinki, the Good Clinical Practices (GCP) of the International Council for Harmonization (ICH), and the Guidelines and Tools of the African Vaccine Regulatory Forum (AVAREF). Benin and Senegal have issued specific regulations for the formal application of ICH-GCP in their countries. On a practical level, investigation data indicate that inspection of clinical study sites was not carried out by NPRAs, except in Burkina Faso. Insufficient human, material, and financial resources were the main constraints mentioned.

In this study, all types of adverse events were reported to NPRAs in Burkina Faso, Guinea-Bissau, Senegal, and Togo. But only serious and/or unexpected cases were compulsorily reported in Benin, Ivory Coast, and Mali, according to the participants. The regulations applicable to clinical trials were generally the same for both conventional and category 3 and 4 herbal medicines in WAEMU countries. Herbal medicines of the 2nd category, on the other hand, were exempt from clinical trials, by national provisions. As far as current regulatory frameworks are concerned, some of those in charge of clinical trial applications claim that they do not discriminate against herbal medicines, but that the number of clinical trial applications submitted to them remains limited. Indeed, only three applications were received at the NPRA level, mainly in Burkina Faso (n=3) from 2018 to 2022. In addition, other methods of validating herbal medicines that do not include clinical trials have been reported, namely: ethnomedical evidence, ethnobotanical surveys, and long experience of product use in the community with evidence of efficacy and safety from preclinical trials.

Ethical regulation of herbal medicines clinical trials: in this study, ethical approval was granted by NECs in all countries. In Burkina Faso and Mali, the institutional ethics committees (IECs) where the trials take place are also involved in the process. This approval was a prerequisite for regulatory authorization of trials in most countries. Although national legislation provided for studies to be monitored by the NECs (Table 1, Table 1.1), there was no regular monitoring of trials by the NECs, but only in the event of serious and/or unexpected adverse reactions being reported by the research centers. The low number of herbal medicines clinical trial application files received and insufficient financial resources were mainly cited as reasons for this lack of regular follow-up. Also, there are no ethical provisions specific to herbal medicines clinical trials at the committee level. Figure 1 summarizes the number of clinical trial application dossiers received by NECs in WAEMU countries (n=16), from 2018 to 2022. One of the two submissions received by the

Benin NEC was accepted, and of the 14 submissions received by the Senegal NEC, 11 submissions, or 78.6%, were rejected. The main reasons for rejection cited by the NECs were the existence of a conflict of interest between the sponsor and the investigator (close to the sponsor and unjustified qualification), the non-compliance of the files submitted, the proposal of an incorrect methodology for conducting the study, the inadequacy of the preclinical data provided and the characteristics of the plants used, and the non-registration of an investigator with the order of physicians. The experience of using herbal medicines in the community was cited as further evidence that could allow them to be registered outside clinical trials.

Research practices in TM departments or programs: traditional medicine and pharmacopoeia departments or programs are organized differently in the WAEMU countries. Despite this organizational diversity, all structures were under the supervision of the Ministry of Health, except in Mali (Table 2). The activities of these structures are essentially focused on the research and valorization of TM products, the development of databases on traditional medicine and pharmacopoeia, technical support for the compilation of marketing authorization files in line with regulatory requirements for research centers and producers, advisory support for TM practitioners in matters relating to intellectual property rights, the authorization, organization, and control of TM practice, and the coordination of activities to promote traditional medicine and pharmacopoeia. The investigation also revealed effective collaboration between TM and conventional practitioners in half the countries surveyed: Burkina Faso, Ivory Coast, Mali and Niger. This collaboration focused on the involvement of healthcare professionals in the ethnomedical evaluation for the authorization of TM practitioners to practice, and meetings to exchange and orient practitioners on the procedures for valuing and registering herbal medicines. Regarding the practice of clinical trials, the directorates or programs in charge of TM in Burkina Faso, Ivory Coast, Mali, and Senegal affirmed that they had experience in this field. Their roles in conducting trials included supervising studies, monitoring the ongoing availability of experimental products, liaising between traditional health practitioners and research centers, and preparing and administering experimental products.

These studies had generally received ethical approval without being monitored on an ongoing basis by ethics committees. In addition, the facilities specified that regulatory authorization had not been sought. The TM players highlighted certain difficulties inherent in the conduct of clinical trials in their facilities. These include a lack of financial and technical resources, the difficulty of accepting clinical trials as part of national culture, a lack of confidence in the preliminary results of clinical trials, the pejorative connotations of the products involved in clinical trials, patients' refusal to be included in studies, and a lack of understanding or adaptation of the psychological and sociological aspects of clinical trials in their countries.

Discussion

In the various WAEMU countries, the legislative and regulatory texts governing clinical trials establish the legal framework and create the institutions involved in the regulatory process. In countries such as Benin, Burkina Faso, Ivory Coast, Mali and Senegal, there was a legal framework governing clinical trials or biomedical research. But in Guinea-Bissau, Niger and Togo, it was the institutional framework that determined the functional aspects of clinical trials and the structures responsible. An analysis of these texts reveals that they cover the authorization, suspension, and termination of studies, as well as aspects relating to the supervision or monitoring of clinical trials by regulatory and ethical structures. There was no specific framework for the regulation of herbal medicines clinical trials in

Burkina Faso, Ivory Coast, Guinea-Bissau, Mali, Niger and Togo. In Benin and Senegal, on the other hand, the legislator has laid down certain provisions for TM research on human beings in terms of investigator profiles, conditions required for conduct, data before clinical trials, and mandatory ethical approval by the NECs. Indeed, article 41 of Law No. 2010-40 of December 08, 2010, on the Code of Ethics and Deontology for Health Research in the Republic of Benin and article 36 of Law No. 2009-17 of March 09, 2009, on the Code of Ethics of Health Research in Senegal stipulate that *"All research on human beings using traditional medicine must be based on an ethnomedical study ... and require the prior approval of the National Ethics Committee for Health Research"*[18,19].

On the other hand, there is no harmonized regulatory framework for clinical trials, so each country applies its own national legislative and regulatory provisions. However, several regulatory functions, including registration, manufacture, import and distribution, and drug advertising, have already benefited from community harmonization in the WAEMU region [16]. There are, however, guidelines for the regulatory supervision of herbal medicines clinical trials by the competent authorities of the member states of the Economic Community of West African States (ECOWAS), to which the WAEMU countries belong. These guidelines do not require immediate transposition or application in national legislation [20]. Future harmonization of trials by WAEMU should avoid these shortcomings by drawing inspiration, for example, from Europe, where Regulation No. 536/2014 sets out the Community regulatory framework for clinical trials [21]. Throughout the world, the beginning of clinical trials follows the authorization issued by the competent authorities of the host country [22]. To provide a better framework for this process, Benin, Burkina Faso and Senegal have set up technical committees to assess the files submitted. These technical committees were not specific to herbal medicines and did not include specialists in the field, as recommended by the West African Health Organization (WAHO) guidelines [12], apart from Senegal, where a member with a phytochemical profile is included in the technical committee. However, it must be acknowledged that its technical committees mirror those advocated by the European Union's Regulation No. 536/2014 on clinical trials of medicinal products for human use [21]. Indeed, this regulation advocates the evaluation of clinical trial applications by a reasonable number of people who collectively possess the necessary qualifications and experience and have no financial or personal interests that could undermine their impartiality. These individuals must be independent of the sponsor and investigators, and free from any other undue influence. In Africa, this type of initiative could significantly limit the influence and/or pressure exerted by investigators and sponsors on the clinical trial authorization process in general, and on the staff in charge of application files in particular, as some studies have reported [23,24].

Ensuring that clinical trials run smoothly is often linked to the effectiveness of regular regulatory inspection, as provided for in the regulatory texts of various countries. Inspection aims to ensure that the protocol is respected and that participants' rights are protected by GCP principles [25]. Participants in the study stated that inspection stems from the application of certain international guidelines, including the ethical principles of the Declaration of Helsinki [26], the ICH-GCP, which stipulates that the sponsor and investigator must receive and facilitate the work of NPRAs inspectors at clinical trial sites [22], and the guidelines and tools of the AVAREF [27]. To make international standards more enforceable against clinical trial sponsors and investigators at the national level, the obligation to comply with ICH-GCP has been incorporated into the regulations of Benin and Senegal [28,29]. Only the NPRA in Burkina Faso carried out inspections of clinical trial sites. The absence of inspections by other NPRAs has already been reported in a recent study in Mali [24]. The

reporting of both serious and unexpected adverse reactions related to investigational products is a requirement of ICH-GCP [22]. The results indicate that only serious and/or unexpected cases were compulsorily reported in Benin, Ivory Coast, and Mali. In contrast, this reporting covered all types of adverse events in other countries. This finding agrees with that of Phillips *et al*. who highlighted the spontaneous reporting of different types of adverse reactions encountered by more than half of the study sites in their review [30].

Clinical trial regulations were generally the same for category 3 and 4 conventional and herbal medicines in WAEMU countries. Category 3 herbal medicines are standardized extracts produced in a semi-industrial or industrial way and whose efficacy and safety have been proved by preclinical and clinical trials conducted according to standard protocols, whereas category 4 corresponds to purified molecules that can be assimilated to conventional drugs [12,31]. In line with standard clinical trial regulations, three applications have been received by Burkina Faso's NPRA from 2018 to 2022. However, the exemption from clinical trials was often applied to Category 2 herbal medicines, which are raw materials produced in a semi-industrial or industrial way, and whose efficacy and safety are generally guaranteed by the ethnomedical evidence of long experience of use in the community. This is also true in other parts of the world. Indeed, a study carried out in India in 2012 reported that standardization of interventions or practices by herbalists and the collection of prospective data within an appropriate regulatory framework could compensate for conventional clinical trials that do not consider the intrinsic differences between herbal medicines and conventional products [32]. The same is true in China, where some authors emphasize case reports by analogy with pharmacogenetics, all centered on the patient and his or her medication and stress the particularity of Chinese TM where several diseases can be treated with the same herbal formula, while the same disease may present several treatment options [33,34]. These different approaches could be capitalized on in the search for a specific regulation adapted to herbal medicines clinical trials in the WAEMU region.

Prior ethical approval of clinical trials is an essential condition for their implementation, in line with the Declaration of Helsinki [26]. Thus, the ethics committee that has approved a protocol must have the right to monitor the research in progress. In addition, the researcher must provide the committee with information on internal monitoring, in this case concerning serious adverse events [26]. This monitoring involves, in particular, reviewing study progress, annual reports, protocol deviations/violations, and monitoring the welfare of research subjects [35]. In our study, however, no monitoring was carried out by the NECs. The reason given for this is the small number of clinical trials involving herbal medicines and the lack of financial resources. However, rare cases of follow-up are commissioned for clinical trials when research centers report serious and/or unexpected adverse reactions. This situation is not specific to NECs in the WAEMU region, since in a study carried out in China by Fan *et al*. in 2022, the absence of monitoring of clinical trials by ethics committees was similarly reported [36]. In India, recent regulatory changes require active (on-site) monitoring of clinical trials, in addition to analysis of documents, notifications, and other reports submitted by research centers [25]. Also, there were no specific ethical provisions for the supervision of herbal medicines clinical trials. From 2018 to 2022, the NECs of Benin and Senegal received a high number (16) of applications for herbal medicines clinical trials, with a very high rejection rate (75%). As we did not receive the estimates from the National Health Research Ethics Committees of Niger and Burkina Faso, the data from Benin and Senegal may not reflect the actual situation in all WAEMU countries. The high rejection rate is probably the result of insufficient collaboration between experienced clinical research investigators and TM practitioners. In

China, Han *et al*. (2019) stated that a better understanding of TM and clinical trial methodology was needed to determine the most appropriate modality for herbal medicines trials and their phases [37].

Also, NPRA clinical trial managers and NEC members affirmed that the experience of using herbal medicines in the community can be an alternative to clinical trials. This facility is already provided for in Africa in the WHO and WAHO guidelines for category 2 herbal medicines [20], but also in Europe through Directive No. 2004/24/EC of March 31, amending, as regards traditional herbal medicinal products, Directive No. 2001/83/EC [38]. Notwithstanding this European legislation, Fung's study in 2024 reports that the unlimited therapeutic value of Chinese TM is overlooked in the European Union, as only a limited number of traditional Chinese medicines meet the seniority requirement of at least 10 to 15 years' of experience on their territory [39]. The Traditional Medicine and Pharmacopoeia Departments and Programs were responsible for researching and developing TM products, and for providing technical support to research centers and producers in preparing marketing authorization documentation. They report to the Ministry of Health, except for Mali, where NIRTMP reports to the Ministry of Higher Education and Research. NIRTMP's main activity is the research, development, and production of phytomedicines based on a long process of ethnobotanical surveys and preclinical and clinical studies [40]. Our results also reveal good collaboration between TM practitioners and those of conventional medicine in Burkina Faso, Ivory Coast, Mali, and Niger within the framework of the licensure of TM practitioners. Despite this, most traditional practitioners were not authorized in Burkina Faso [41], and the relevant regulatory provisions were not respected in Niger [42]. In addition, ignorance of national TM regulatory frameworks and mistrust of health professionals by TM practitioners are obstacles to successful collaboration [43].

As far as the practice of clinical trials was concerned, only the MT Directorates or Programs in Burkina Faso, Ivory Coast, Mali, and Senegal had any experience in this field. Although the trials carried out were not subject to regulatory authorization, they generally benefited from ethical approval. This situation probably explains the low number of clinical trial applications received by NPRAs (n=3) compared with NECs (n=16). Lack of financial and technical resources, and the difficulty of cultural acceptance of clinical trials, are the main difficulties limiting the conduct of clinical trials according to TM Directorates or Programs. They are among those already mentioned by Willcox *et al*. in 2012 [44]. According to Kasilo *et al*. (2019), financial resources are indeed needed for the development of phytomedicines standardized by randomized controlled trials [45].

Conclusion

Although national legislative and regulatory provisions and ethical and regulatory approval processes for research protocols relating to clinical trials exist in most countries, it must be acknowledged that they do not take sufficient account of the specific features of herbal medicines. Also, the non-binding nature of the specific legal framework for the conduct of clinical trials on herbal medicines of the WAHO of ECOWAS, and the absence of specific, harmonized and binding community regulations in the WAEMU region, are not likely to promote the optimal practice of clinical trials on herbal medicines. Other difficulties identified are the inadequacy and unsustainability of domestic or external funding capable of ensuring in-depth research (including the conduct of clinical trials) in the TM Directorates or programs and research centers of the various countries, the unsuitability of clinical trial practice to the socio-cultural realities of the countries, and the inadequacy of collaboration between TM practitioners and health professionals. Resolving these difficulties through bold policies should increase clinical research on

herbal medicines and improve their integration and contribution to the healthcare systems of WAEMU countries.

What is known about this topic

- *There has been a regulatory framework proposed by West African Health Organization (WAHO) since 2013 to promote the practice of clinical trials of herbal medicines in West Africa;*
- *However, insufficient scientific data from clinical trials to justify the use of herbal medicines is still reported.*

What this study adds

- *Our study highlights that the non-binding nature of the WAHO regulatory framework is an obstacle to its integration into the domestic legislation of West African Economic and Monetary Union (WAEMU) countries and its application by regulatory bodies;*
- *It points out that there was no harmonized framework for clinical trials of herbal medicines in the WAEMU area, nor a specific legal and institutional framework for clinical trials of herbal medicines in the countries, so that the national regulatory authorities applied the general regulations for clinical trials of medicines for human use;*
- *It reveals that regulatory constraints are particularly responsible for the low number of herbal medicines clinical trial applications submitted in the countries and the high rate of rejection of these applications.*

Competing interests

The authors declare no competing interests.

Funding

This work was supported by the training program for trainers at Mali's universities.

Authors' contributions

All the authors read and approved the final version of this manuscript.

Acknowledgments

The authors would like to thank all the participants who responded to the survey. They also thank the Training program for trainers at Mali's universities and Laboratory of Drug Development of the Joseph KI-ZERBO University (Burkina Faso).

Tables and figures

Table 1: legal and institutional framework for clinical trials in WAEMU countries, with some key areas covered

Table 1.1: legal and institutional framework for clinical trials in WAEMU countries, with some key areas covered

Table 2: designation and institutional anchoring of structures in charge of traditional medicine in WAEMU countries

Figure 1: distribution of the number of herbal medicines clinical trial application files received by the NECs, from 2018 to 2022

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Table 1: legal and institutional framework for clinical trials in WAEMU countries, with some key areas covered			
Country	**Laws/Decrees/Orders**	**Authorization, suspension, withdrawal**	**Inspection/ Monitoring**
Benin	Law No. 2021-03 of February 1, 2021, on the organization of pharmaceutical activities	X	X
	Law No. 2010-40 of December 08, 2010, on the code of ethics and professional conduct for health research in the Republic of Benin	X	
	Decree No. 2023-422 of July 26, 2023, approving the amended statutes of the Benin Agency for Pharmaceutical Regulation, now called the "Benin Agency for Medicines and Other Health Products".	X	X
	Decree No. 2013-48 of February 11, 2013, on the composition, attribution, and functioning of the National Ethics Committee for Health Research	X	X
	Decision No. 005/ABMed/CJC/SA of December 22, 2023, adopting guidelines and procedures for the authorization and supervision of clinical trials	X	X
Burkina Faso	Decree No. 2018-0861/PRES/PM/MINEFID/MS of October 05, 2018, establishing the National Agency for Pharmaceutical Regulation abbreviated NAPR.		
	Decree No. 2018-0911/PRES/PM/MS/MINEFID of October 11, 2018, adopting the Statutes of the National Agency for Pharmaceutical Regulation (NAPR).	X	X
	Decree No. 2010-243/PRES/PM/MS of May 20, 2010, regulating clinical trials	X	
	Decree No. 2002-536/PRES/PM/MS/MESSRS on the creation of an Ethics Committee for Health Research in Burkina Faso	X	X
	Order No. 2010-292/MS/CAB of October 01, 2010, on the conditions for granting clinical trial authorizations	X	X
Ivory Coast	Law No. 2017-541 of August 3, 2017, relating to the regulation of the pharmaceutical sector.	X	
	Decree No. 2020-407 of April 22, 2020, regulating clinical trials	X	X
	Decree No. 2018-926 of December 12, 2018, on the organization and operation of the Ivorian Pharmaceutical Regulatory Authority		
	Order No. 0087/MSHP of May 17, 2018, on the organization and operation of the National Ethics Committee for Life Sciences and Health	X	X
Guinea-Bissau	Decree No. 13/2023 of March 30, 2023, creating the Pharmacy Regulatory Authority and appended statutes	X	X

Table 1.1: legal and institutional framework for clinical trials in WAEMU countries, with some key areas covered			
Mali	Law No. 09-059 of December 28, 2009, governing biomedical research on human beings	X	
	Decree No. 2017-0245/P-RM of March 13, 2017, setting the terms of application of Law No. 09-059		X
	Decree No. 2011-753/P-RM of November 17, 2011, establishing the organization and functioning of the Department of Pharmacy and Medicines	X	X
	Decree No. 02-200/P-RM of April 22, 2002, creating the National Ethics Committee for Health and Life Sciences	X	
Niger	Decree No. 2022-539/PRN/MSP/P/AS of June 29, 2022, creating a public administrative institution called the Nigerian Pharmaceutical Regulatory Authority (NPRA).	X	X
	Decree No. 2022-915/PRN/MSP/P/AS of November 30, 2022, approving the statutes of the NPRA		X
	Decree No. 2016-644/PRN/MSP of December 1, 2016, on the creation, missions, composition, and functioning of the National Ethics Committee for Health Research (NECHR)	X	X
Senegal	Law No. 06-2023 of June 13, 2023, on medicines, other health products and pharmacy	X	
	Law No. 2009-17 of March 09, 2009, on the Code of Ethics for Health Research		
	Decree No. 2023-2422 of December 27, 2023, on clinical trials	X	X
	Decree No. 2022-824 of April 07, 2022, establishing the Senegalese Pharmaceutical Regulatory Agency (SPRA) and laying down its organizational and operational rules		X
	Decree No. 2009-729 of August 3, 2009, on the creation, organization, and operation of the National Ethics Committee for Health Research (NECHR)	X	X
Togo	Order No. 125/2014/MS/CAG/SG of September 30, 2014, on the charter of the bioethics committee for health research		
	Order No. 0021/2013/MS/CAB/SG of February 27, 2013, on the organization of the services of the Ministry of Health	X	X
	Order No. 0120/2008/MS/CAB/DGS of June 20, 2008, establishing, attributions, composition, and organization of the Bioethics Committee for Health Research	X	X

Table 2: designation and institutional anchoring of structures in charge of traditional medicine in WAEMU countries		
Country	**Structures**	**Tutorship**
Benin	National Program for the Promotion of Traditional Medicine	Ministry of Health
Ivory Coast		
Burkina Faso	Traditional and Alternative Medicine Division	
Guinea-Bissau	Community Health Services and Medical Promotion Department	
Niger	Traditional Medicine and Pharmacopoeia Division/Department of Pharmacy, Medicines and Laboratories	
Togo		
Senegal	Traditional Medicine unit	
Mali	National Institute for Research on Traditional Medicine and Pharmacopoeia	Ministry of Higher Education and Scientific Research

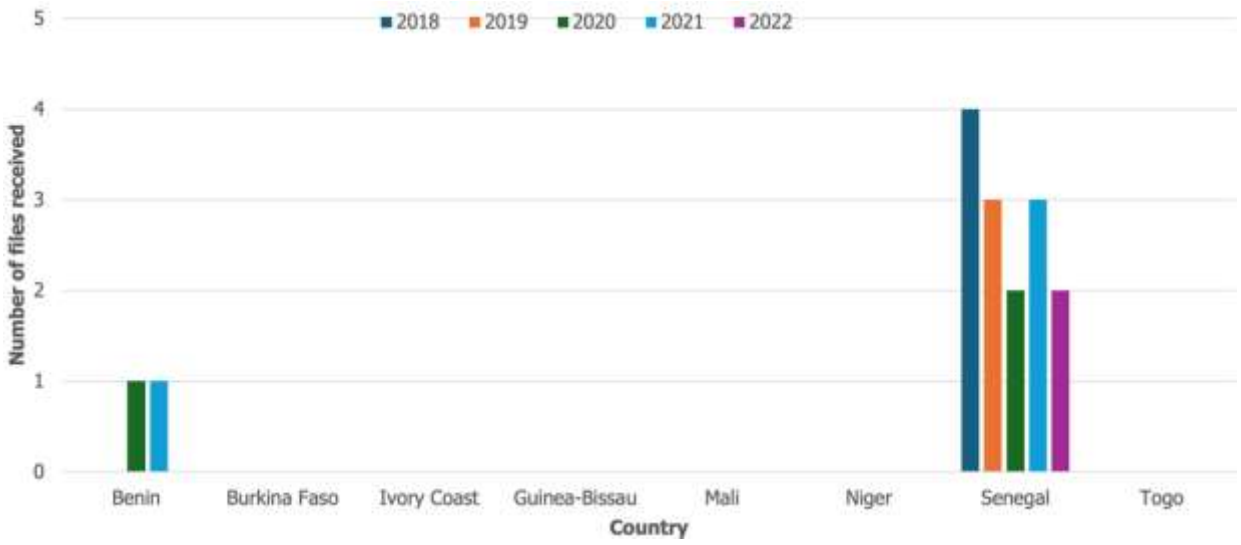

Figure 1: distribution of the number of herbal medicines clinical trial application files received by the NECs, from 2018 to 2022