

# Burden of cancer and role of traditional medicine in Burkina Faso

## Abstract

Today, cancer is considered a serious public health concern in the world. The burden of cancer in Burkina Faso is increasing every year. Efforts are being made by the government and researchers to deal with cancer rising in the country. With the high cost of anti-cancer drugs, several patients move towards traditional medicine for their healthcare, underscoring the importance of medicinal plants in cancer management in Burkina Faso. Here we provide a comprehensive review of cancer epidemiological studies, clinical research and medicinal plants-based treatments conducted in Burkina Faso. This review seeks to draw the attention of stakeholders on cancer management needs and to motivate researchers to continue looking for anti-cancer drugs from medicinal plants of Burkina Faso which will help to set a list of plants pharmacologically proven for cancer patient healthcare.

**Keywords:** burkina faso, cancer, medicinal plants, traditional medicine

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**Abbreviations:** GDP, gross domestic product; CHU-YO, centre hospitalier universitaire-Yalgado Ouedraogo; CHUP-CDG, centre hospitalier universitaire et pédiatrique-Charles De Gaulle; FCTC, Framework Convention on Tobacco Control; WHO, world health organization; GLOBOCAN, global cancer observatory; NCCP, national cancer control plan; HBV, hepatitis b virus; NGOs, non-governmental organizations; PSA, prostate-specific antigen; PCA3, prostate cancer antigen 3

## Introduction

Cancer remains one of the public health problems that has increased over the years worldwide and especially in Africa. The statistics of cancer in Africa are very alarming, as the continent recorded for only the year 2018 more than 1 million cases of cancer cases and more than 700,000 deaths.<sup>1</sup> Unfortunately, most of the statistics from African countries are likely under-estimated because of lack of functional cancer registry. This is notably true for countries where some communities do not have access to the correct healthcare. In Burkina Faso for example, statistics estimate around 11,643 incidences of cancer of which 9,221 deaths occurred.<sup>2</sup>

A comparison of cancer statistics between developed and developing countries reveals a higher incidence of cancer in developed countries, but developing countries have the highest mortality rates.<sup>1</sup> This disparity can be explained by the adoption of adapted programs in the fight against cancer in developed countries. Indeed, the high mortality from cancer cases observed in Burkina Faso can be linked to the lack of early diagnosis, low presence of health infrastructures and a lack of investment in cancer care.

In Burkina Faso, traditional medicine plays a very important role in the healthcare of the population.<sup>3</sup> Medicinal plants are used

by traditional healers to treat all kinds of diseases.<sup>4</sup> This form of medicine is accessible to all, unlike modern medicine.<sup>5</sup> However, the use of medicinal plants is not without risk because the properties and the pharmacological effects of many of these plants have not been scientifically proven.

In this work, we aim to highlight the impact of cancer in Burkina Faso and the efforts made by the government to counter this scourge. The potential of traditional medicine as a complementary treatment for cancer patients will also be discussed.

## Background

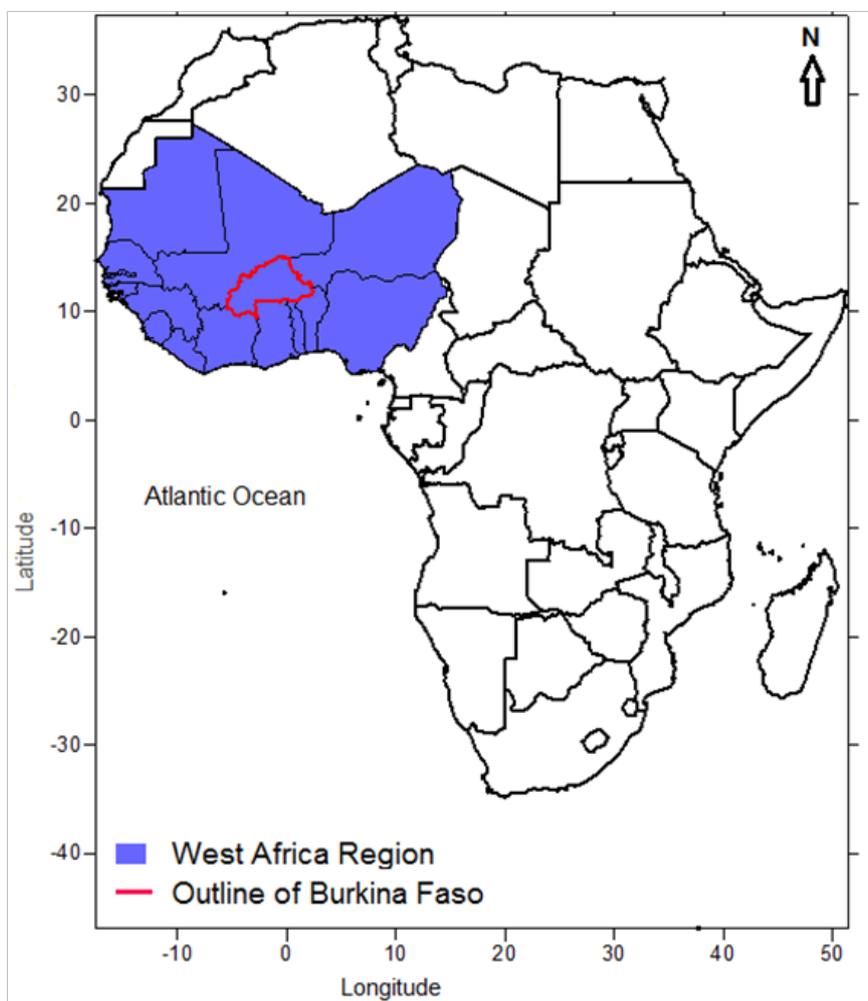
Burkina Faso is a landlocked country of spanning 274,200km<sup>2</sup> in the heart of West Africa and surrounded by six countries: Mali in the north, Niger in the east, Benin in the southeast, Togo and Ghana in the south and Ivory Coast in the southwest (Figure 1).

Like many other African countries, Burkina Faso is a multi-ethnic, multilingual and multi-faith country. The country has about 60 ethnolinguistic groups spread across the various climatic zones and three major religions that are animism (or traditional religion), Islamism and Christianity (Catholicism and Protestantism).<sup>6</sup> This ethnic and cultural diversity has an impact on the perception, treatment-seeking behavior and care for cancer and related illnesses.

According to World Bank statistics, the population of Burkina Faso is around 20million and the country is a low-income economy.<sup>7</sup> The real gross domestic product (GDP) growth in the country was estimated at 6.7% in 2017, up from 5.9% in 2016, and the economy is projected to stabilize at around 6% over the period between years 2018 to 2020.<sup>7</sup> However, the country faces persistent challenges including limited natural resources, high levels of poverty (around 40% of the population lives below the poverty line), and inadequate national

productive system, for instance, its heavy reliance on subsistence agriculture.<sup>8</sup> The socio-economic condition of about 80 percent of the country's population, whose livelihood depends on agriculture, is unstable due to engagement in unsustainable production practices

for subsistence and income-generating activities.<sup>8</sup> As such, there are ongoing social and economic changes leading to exaggerated urbanization with probably negative consequences that might have an effect on health within the short- or long-term.



**Figure 1** African map indicating the position of Burkina Faso in West Africa.

The healthcare workforce was increased in Burkina Faso between years 2006 and 2010, but this was not sufficient to meet the population overgrowing needs. The country faces huge difficulties due to the lack of qualified healthcare workers. Recent statistics on care givers indicate: 1 physician per 10,000 people, 3.57 nurses per 10,000 people, and 2.39 midwives per 10,000 people.<sup>9</sup> All these combined with the poverty level in the country have stricken primarily victims of cancer and other infectious diseases<sup>7</sup> and limited access of healthcare services. As a consequence, we are observing a doubling in the burden of both cancerous and infectious diseases in the country

### Cancer statistics in Burkina Faso

In Burkina Faso, the national statistics on cancer are not well known, but hospital data indicate their extent. Cancer, a public health concern, constitutes the third cause of mortality in Burkina Faso. It is classified among non-communicable diseases such as arterial hypertension and diabetes.<sup>10</sup>

All types of cancer are present in Burkina Faso. According to Global Cancer Observatory (GLOBOCAN),<sup>11</sup> the number of cancer new cases is estimated at around 10,000 each year. In 2010, the national hospital structures notified 1,669 cases of cancer.<sup>10</sup> According to World Health Organization (WHO), approximately 30% of cancers are principally due to the following behavioral and food factors: high body mass index, lack of physical exercise, low consumption of fruit and vegetables, consumption of alcohol and tobacco.<sup>12</sup>

A study in the year 2006 showed higher cases of cancer among women (54.9%). The most frequent cancers are breast (13.39%) and cervical (12.46%) cancers.<sup>10</sup> A retrospective study between years 1991 and 1994 held within the Digestive and General Surgery Unit of the Yalgado Ouedraogo Hospital (CHU-YO) in Burkina Faso reported 39 breast cancer cases.<sup>13</sup> During the same period, the authors recorded 120 patients with mammary tumor pathologies from 3,788 patients hospitalized. Another retrospective descriptive study on children's ongoing health care at the Yalgado Ouedraogo Hospital (CHU-YO)

and the Pediatric Hospital (CHUP CDG) between years 2008 and 2011 found a hospital frequency of 321 cases of cancer patients aged from 0 to 15-year-old. 89.23% of these patients are from Burkina Faso.<sup>14</sup> The study of Zongo et al.<sup>15</sup> showed that primary gastrointestinal cancers in elderly patients represented 45.9%. Another study has reported 2,187 cancer cases in women of which 396 cases were gynecological cancers. In this study, among the gynecological cancers, cervical cancer was the most frequent with 222 cases followed by the cancer of the uterus (79 cases), ovarian cancer (74 cases) and the cancer of the vulva (21 cases).<sup>16</sup>

## Government actions against cancer

A survey conducted in the country shows that tobacco use was high (23.3%) in the people of ages 15 to 59 years, with a high smoking rate among young men aged 25 to 34 years.<sup>17</sup> It is therefore imperative to put in place strict tobacco control strategies including: reinforcement of anti-smoking legislation, sensitization of the population especially of young people of the dangers of tobacco abuse, protection of the population against exposure to the smoke of tobacco products, a ban on all forms of advertising on tobacco products in Burkina Faso and monitoring of tobacco consumption. The government of Burkina Faso is one of the numerous African governments who have ratified the Framework Convention on Tobacco Control (FCTC) of WHO adopted in 2003. After ratifying the FCTC, the country has implemented a national strategic plan against tobacco for years 2009 to 2013. Thereafter, some tobacco control policies have been voted including smoke-free legislations and presence of shocking images or warning statements on tobacco packages. Although efforts have been made in the fight against tobacco, we note that there is a problem in the implementation of the law and their follow-up in the country.

The negative impact of environmental waste on population health is well known.<sup>18,19</sup> Burkina Faso's environmental policy entails, firstly, the sustainable management of natural resources and, secondly, the need to guarantee a better living environment for the population. In this regard, the country has ratified international conventions for the management of hazardous wastes and environment sanitation.

The prevalence rate of Hepatitis B Virus (HBV) is estimated at 9.1% in Burkina Faso,<sup>20</sup> making HBV infection one of the high prevalence diseases in the country. The HBV infection is linked to liver cancer incidence in the country.<sup>21</sup> To overcome the HBV burden, vaccination policies were adopted by the Ministry of Health of Burkina Faso especially to prevent HBV infection in children. Indeed, since year 2006, Burkina Faso has started HBV universal vaccination as part of the expanded program on immunization, which recommends anti-HBV vaccination for all children at 8 weeks after birth without prior testing for HBV infection markers. Following the WHO recommendations; the government has adopted a strategic plan to control HBV over the period between years 2017 and 2021.

Women are the first to be affected by cancer in Burkina Faso: they account for 64.5% of new cases detected and 62.8% of deaths.<sup>2</sup> The government avails a policy of free care for women and children, which, since year 2016, integrates free examination to detect the most common cancers, of cervical and breast, and free treatment for precancerous cervical lesions.

## National cancer control

The notion of cancer control appeared in the 1900s with the aim of early detection and surgical treatment of cancer. 50 years later, with

the development of the Pap smear and the discovery that tobacco can cause lung cancer occurrence, it became a purely scientific discipline. Nowadays, cancer control is seen as the set of activities implemented to reduce the impact of cancer that can be summarized in prevention, early detection, and treatment.<sup>22</sup>

National cancer control plan (NCCP) is defined by WHO as "public health programs designed to reduce cancer impact and ameliorate the quality of life of cancer patients, through the systematic and equitable implementation of evidence-based strategies for prevention, early detection, diagnosis, treatment and palliation, making the best use of available resources".<sup>23</sup> Since the year 2000, WHO began to draw the attention of all his member countries to the establishment of an NCCP. At its 70<sup>th</sup> session of the general assembly in year 2005, the resolution WHA58.22 was adopted which encourages each country to urgently implement an NCCP that will help in the fighting against cancer.<sup>24</sup> In the year 2015, WHO estimated that 87% of his member countries had implemented an NCCP compared to 48% in year 2000.<sup>25</sup> This increase in the number of cancer control plans shows the importance of an NCCP and highlights the recognition of cancer as a public health concern.

The prevalence of cancer in Burkina Faso is not known for reasons such as the lack of a functional cancer registry. However, some specialists and few non-governmental organizations (NGOs) occasionally organize sporadic and uncoordinated screening campaigns,<sup>26</sup> which results in a lack of synergistic efforts towards prevention, screening, and care of cancer patients in the country. In spite of the efforts made for awareness of cancer at the population level, the coverage of cancer screening country-wide remains very low. This situation has compelled the government to implement the NCCP.

In October 2012, the Ministry of Health set up a strategic national program for the years 2013 to 2017, aimed at fighting cancer or at least reducing the impact of cancer in the country. In this program, a situational analysis of cancer in the country was made and the main problems were highlighted. Priority objectives involved the prevention of cancer, diagnosis, and treatment of cancer cases, development of cancer research and mobilization of resources.

Since the implementation of the national plan for cancer-fighting in the year 2012, the cancer burden in Burkina Faso remains unchanged. The government announced the intention to create a center for cancer treatment and palliative care for cancer patients but this has not yet been affected. In the Ministry of Health, a directorate for prevention and control of non-communicable diseases was created it lacks the necessary funding and qualified personnel required to function as needed.

To achieve the objectives stated on the NCCP, the government of Burkina Faso needs to fully empower the cancer control department and endow the department with enough funds for its functionality. The department will be essentially focused on four areas of intervention: research capacity building, pathology and cancer registries, cancer awareness and education, and health system strengthening.

## Clinical cancer study efforts

Many efforts have been made in the clinical study of cancer in Burkina Faso (Table 1). In this section, we highlight some important findings that will highlight the situation at hand. A retrospective study based on 620 patients by Kirakoya et al.,<sup>27</sup> reported 82 cases

of prostate cancer managed in the Urology Department of Yalgado Ouedraogo Hospital. All patients in the study were diagnosed during a routine consultation. Most of the patients were diagnosed at an advanced stage of the cancer and for some patients, at the metastasis stage. The average age of the patients was 68years; this shows that prostate cancer in Burkina Faso mainly affects the elderly men. In this study, the researchers used digital rectal examination, prostate-specific antigen (PSA) level determination and biopsy for the diagnosis of patients. This combination is recommended as a diagnosis method for prostate cancer. However, the results of PSA screening were unreliable. The prostate cancer antigen 3 (PCA3) level determination would be appropriate instead of PSA because it is more sensitive and specific to prostate cancer.<sup>28-30</sup> In a prospective descriptive study, Nikiema et al.<sup>31</sup> reported 58 cases of hepatocellular cancer, where the majority of patients were male (75%) with an average age of 45years.

Bambara et al.<sup>32</sup> conducted a cross-sectional study from January 2015 to February 2016. During this study, 80 cases of breast cancer were reported from which 87.5% of patients came from urban areas and 12.25% reported a family history of breast cancer. Clinical and molecular characteristics indicate that the majority of breast cancer (93.7%) was infiltrated ductal carcinoma. The average age of breast cancer patients was 48years. Another retrospective study by Zongo et al.<sup>33</sup> reported 51 cases of male breast cancer. This kind of cancer accounts approximately for 2.6% of all breast cancers. The average age reported for breast cancer patients in men was 61years. In a screening study conducted from 2001 to 2002, Millogo et al.<sup>34</sup> found a 4.2% prevalence of precancerous cervical lesions; in which cervical cancer lesions represented 2.5% of the sampling and inflammatory lesions for 13.4%.

**Table 1** Clinical studies on cancer done in Burkina Faso

Cancers	Patients	Clinical aspects	Diagnostic method	Study period	References
Anorectal tumors	61	Adenocarcinoma, Carcinoma, Adenoma tubular	Endoscopy, Biopsy	09/1999 -10/2008	35
Hepatocellular carcinoma	58	Nodule, Thrombosis, Carcinoma	Echography, $\alpha$ -Fetoprotein dosage, Biopsy	01/2008 - 12/2009	31
Retinoblastoma	3	suprasellar tumor, exophthalmia tumor	Computed tomography imaging	2009	36
Acute lymphoblastic leukemia	9	Bone marrow failure, Tumor syndrome	Hemogram	11/2009–10/2011	37
Melanoma	19	Hyperpigmented macule lesions, Ulceroburg tumor lesions, Acro-lentiginous melanoma	Biopsy and histological examination	01/2009–12/2012 and 01/2013–12/2013	38
Dermatofibrosarcoma	1	-	Computed tomography imaging, Biopsy	2017	39
Prostate cancer	82	Adenocarcinoma, Gleason score < 7, T3-T4 stages	Digital rectal examination, PSA dosage, Biopsy	03/2012–05/2013	27
Prostate cancer	166	Adenocarcinoma, Gleason score $\geq$ 7, T3-T4 stages	Digital rectal examination, PSA dosage, Transrectal prostate Biopsy	01/2009–06/2010	40
Breast cancer	80	Infiltrating ductal carcinoma	Biopsy	01/2015–02/2016	32
Breast cancer	58	Nodules, Axillary adenopathies	Physical examination, Breast ultrasound, Mammography	08/2014–02/2016	41
Breast cancer	81	Infiltrating ductal carcinoma	Biopsy and histological examination	03/2013–12/2013	42
Vulvar cancer	21	Ulcers-granulating tumor, squamous cell carcinoma	Physical examination, Biopsy and histological examination	01/2013–06/2015	16
Bladder cancer	7	Infiltrating squamous cell carcinoma	Biopsy and histological examination	2010	43
Digestive cancers	352	Ulcerative colitis, Colon adenoma, Hepatic cirrhosis	Scanner, MRI, Endoscopy, Biopsy and histological examination	01/2013–12/2017	44

In general, cancer diagnostic methods in Burkina Faso comply with international standards. However, diagnostic centers are concentrated in large cities like Ouagadougou and Bobo Dioulasso making screening centers inaccessible for the diagnosis of various cancers. Also, it should be noted that there is a lack of knowledge about cancer in the population. The vast majority of the population does not know that cancers can be prevented. Despite the increasing risks, many people are still not aware of the cancer screenings including breast,

cervical and prostate cancer. This prevents the diagnosis of cancer at an early stage and, rather, facilitates late diagnosis with patients at advanced cancer stages.

### Limits of cancer treatment in Burkina Faso

Many challenges can be highlighted in the cancer treatment approaches in Burkina Faso. One of the important barriers to improved

cancer care in Africa, particularly in Burkina Faso, is the limited access to treatments.<sup>42</sup> Management of cancer in resource-limited countries is extremely complex and requires multiple modalities of diagnosis and treatment.

Cancer treatment follows three main phases which are: the phase of surgery (depending on the progress of cancer), the phase of chemotherapy (treatment with drugs) and the phase of radiotherapy (treatment with radiation). Surgery and chemotherapy are available in Burkina Faso but these treatments are not accessible to everyone due to its high cost.

Cancer treatment is very expensive in general<sup>45</sup> and in Burkina Faso too. According to a report from an oncologist, the full diagnosis of cancer can cost about 105 US\$. The cost of the surgery varies between 344 US\$ and 1,722 US\$ depending on the place chosen for treatment (public or private institution). The cost of chemotherapy varies depending on the drugs used. The pace of treatment is every three weeks. It also depends on the type of chemotherapy protocol used. The price range is 172 to 689 US\$ every three weeks, performed 6 times, with the possibility of further treatment. Radiotherapy, the third phase of treatment is more complex because it is not yet available in Burkina Faso. The patient is therefore obliged to go for treatment abroad, either by medical evacuation or by his own means. Radiotherapy costs on average 4,000 US\$ in West African countries, around 9,000 US\$ in sub-Saharan Africa<sup>46</sup> and even more in high-income countries.<sup>47,48</sup> In short, cancer treatment requires a large budget for the population.

With a minimal monthly salary of less than 85 US\$, most people in Burkina Faso must devote many years of salary to buy anticancer drugs for a chemotherapy procedure. This is not bearable for the population. Also, the government has suspended medical evacuation of its citizens to developed countries since the year 2015 because of the costs. Due to these reasons, the rate of cancer mortality has increased by 79% in the country.<sup>2</sup>

In Burkina Faso, as in many countries in Africa, cancer is detected mostly at an advanced stage because of the lack of awareness on cancer screening,<sup>49,50</sup> this makes treatment more challenging. The country has a serious insufficiency of cancer treatment facilities making patients encounter difficulties in accessing healthcare.<sup>51</sup> We also noted a relatively low number of oncologists making patients be firstly attended to by health workers who are non-specialists in cancer. In this case cancer symptom misattribution or misdiagnosis could happen leading to a delay in cancer diagnosis.

Cancer can be managed effectively when detected at an early stage. Unfortunately, patients come to consult at an advanced stage. Besides, many people do not have access to information about cancer screening in developing countries. Improved oncology care, wide coverage, costs control, quality management, and health insurance are essential to facilitate people's access to anticancer drugs.

## Ethno-search for cancer therapy in Burkina Faso

Nadembega et al.<sup>52</sup> have recorded around 190 plant species used by traditional healers in Burkina Faso. Considerable efforts are currently being made by scientists of Burkina Faso to evaluate the contribution of some medicinal plants in the fight against cancer. Indeed, studies done on medicinal plants from Burkina Faso showed anticancer potential in several plants.

The roots of *Acacia macrostachya* are traditionally used to treat cancer and inflammation diseases in Burkina Faso. Sawadogo et al.<sup>53</sup> showed that extracts from the roots of this plant display strong inhibition effect against the cancer cell lines (KB, Vero, and MCR-5) at the concentration of 10 $\mu$ g ml<sup>-1</sup>.

The Essential oil from *Ageratum conyzoides* has shown to be active against prostate cancer (LNCaP; PC-3) and glioblastoma (SF-767; SF-763) cells.<sup>54</sup> Precocene has been highlighted as the main bioactive compound of the plants' essential oil. Also, hexamethoxyflavones isolated from *A. conyzoides* leaves significantly reduced the cell viability of human leukemia-immortalized T lymphocyte (Jurkat) cells.<sup>55</sup> Other authors also showed that ethyl acetate extract from leaves of the plant exhibited strong cytotoxic activity on human non-small cell lung carcinoma (A-549) and mouse leukemia (P-388) cell lines with IC<sub>50</sub> values of 0.68 and 0.0003 $\mu$ g ml<sup>-1</sup>, respectively.<sup>56</sup> The extract and various fractions of *A. conyzoides* leaves were found to be cytotoxic against human lung cancer cell lines (SK-MES 1 cells) with IC<sub>50</sub> ranging from 10-38.5 $\mu$ g ml<sup>-1</sup>.<sup>57</sup>

*Balanites aegyptiaca* is commonly grown in the arid regions of Africa like Burkina Faso. The balanitin-6 and balanitin-7 mixture isolated from the plant has demonstrated appreciable anti-cancer effects in human cancer cell lines *in vitro*.<sup>58</sup> The anticancer potential of the plant was also reported in other countries. *B. aegyptiaca* aqueous extracts of fruits have remarkable cytotoxic activity against stomach cancer cell SGC7901.<sup>59</sup> Al-Malki et al.<sup>60</sup> showed that organic solvent extracts of *B. aegyptiaca* fruits have potential cytotoxicity activity on Hep-2, MCF-7, HCV29T, and HL-60 cell lines. Different extracts of *B. aegyptiaca* stem bark showed various anticancer properties on leukemia and breast cancer cell lines.<sup>61</sup> The balanitoside isolated from the extract of *B. aegyptiaca* fruit possesses significant antitumor activity *in vivo*.<sup>62</sup> Also, balanitin-2 and balanitin-4-purified fractions from *B. aegyptiaca* fruit have shown to be a promising agent against both colon cancer and hepatocellular carcinoma.<sup>63</sup>

The family of Poaceae represented by *Cymbopogon citratus* and *Cymbopogon giganteus* possesses anticancer potential. The essential oils from these plants shown to be active against prostate cancer cell lines (LNCaP, PC-3) and glioblastoma cell lines (SF-767, SF-763).<sup>64</sup> Other studies demonstrated that a polysaccharide (CCPS) from *C. citratus*, exhibited antitumor activity *in vivo*.<sup>65</sup> Thangam et al.<sup>66</sup> also showed that *C. citratus* polysaccharide fractions exhibited potential cytotoxic and apoptotic effects on cancer cells. The 50% ethanol extract of *C. citratus* leaves showed a more potent effect on breast cancer MCF-7 cell line and 90% ethanol extract on both the ovarian (COAV) and breast (MCF-7) cancer cell lines.<sup>67</sup>

Some Verbenaceae species such as *Lantana ukambensis* and *Lippia multiflora* have demonstrated anticancer potential. Extracts from stems and leaves of *L. ukambensis* contain saponins, tannins, triterpenoids/steroids, flavonoids and have highlighted strong inhibition of the cancer cells (KB) proliferation at the concentration of 10 $\mu$ g ml<sup>-1</sup>.<sup>53</sup> Pentamethoxyflavone isolated from the plant has shown to be active against some cancer cell lines.<sup>68</sup> The Essential oil from *Lippia multiflora* mainly constituted by p-cymene (25.27%), b-caryophyllene (12.70%), thymol (11.88), c-terpinene (9.17%) and thymyle acetate (7.64%) showed potent cytotoxicity against prostate cancer (LNCaP; PC-3) and glioblastoma (SF-767; SF-763) cell lines.<sup>54</sup>

The Essential oil from *Ocimum basilicum* which contains  $\alpha$ -terpineol (59.78%) and  $\beta$ -caryophyllene (10.54%) has been proved to be active against prostate cancer cells (LNCaP; PC-3) and glioblastoma cells

(SF-763; SF-767).<sup>54</sup> Zarlaha et al.<sup>69</sup> showed that rosmarinic, caffeic acid, eugenol and isoeugenol, the main constituents of *O. basilicum* essential oil, have significant cytotoxic activity against the human cervix adenocarcinoma cells, human melanoma cells, human chronic leukemia cells and particularly against human ovarian cancer cells. The oil also presented potent cytotoxicity activities against the HeLa and HEP-2 cancer cell lines.<sup>70</sup> Extract from the seeds of *O. basilicum* showed a cytotoxic effect on human osteosarcoma MG63 cell lines.<sup>71</sup>

The Essential oil from *Zingiber officinale* constituted of arcurcumene (16.67%), camphene (12.70%), zingiberene (8.40%),  $\beta$ -bisabolene (7.83%) and  $\beta$ -sesquiphellandrene (5.34%) presented inhibitory effect against Prostate cancer (LNCaP; PC-3) and glioblastoma (SF-767; SF-763) cell lines.<sup>54</sup> *Z. officinale* extract also highlighted antiproliferation activity on colon cancer cells.<sup>72</sup> Habib et al.<sup>73</sup> also showed that the extract *Z. officinale* may have a chemotherapeutic effect in the treatment of liver cancer.

## Conclusion

In this paper, we highlighted the situation of cancer in Burkina Faso, especially the impact and the efforts by the government to fight against cancer in the country. We also highlighted some prevailing challenges such as the question of accessibility to treatment for cancer patients. Finally, we discussed the clinical studies undertaken in Burkina Faso which contribute to the better understanding of cancer biology in the country and the potential of traditional medicine that can be used as an alternative treatment of cancer in Burkina Faso.

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None.

## Conflicts of interest

The authors declare there are no conflicts of interest related to the article.

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