

Research Article

Simultaneous Use of Medicinal Plants and Anticancer and Antihypertensive Drugs in Cancer Patients and Hypertensive Patients: A Case Study from Point G Hospital

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Abstract

Cancer and hypertension are two of the leading causes of death worldwide. Earlier detection, treatment and better monitoring ensure effective management. The objective was to study the prevalence and identify the medicinal plants consumed by patients with cancer and high blood pressure. We conducted a descriptive cross-sectional study on the use of medicinal plants by patients undergoing chemotherapy and patients taking antihypertensive drugs, monitored respectively in the medical hematology-oncology department and the cardiology department of the Point-G University Hospital. The prevalence of medicinal plant use was 41.7% (n = 79) among patients undergoing chemotherapy and 59.2% (n = 61) among patients taking antihypertensive medication. Among these patients, women accounted for more than 62% in both cases. The main sources of information on the use of plants were traditional healers, followed by parents. A total of 37 plants species belonging to 22 families were recorded. The Fabaceae family was the most represented, followed by the Combretaceae family. The three most commonly used plants were *Guiera senegalensis*, *Combretum micranthum* and *Saba senegalensis* in patients undergoing chemotherapy and used in combination with carboplatin and ondansetron. Those of patients taking antihypertensive drugs were *Euphorbia hirta*, *Combretum micranthum* and *Moringa oleifera*, used in combination with Amlodipine, Furosemide and Bisoprolol. The risk of side effects was twice as high (relative risk = 2.07) in patients taking antihypertensive drugs who also consumed plants. The study revealed a high prevalence of medicinal plant use. There is a link between the occurrence of adverse effects and plant use.

Keywords

Euphorbia Hirta, *Guiera Senegalensis*, *Combretum Micranthum*, Anticancer, Antihypertensive, Interaction, Mali

1. Introduction

Cancer and hypertension are two of the leading causes of death worldwide [1]. Cancer affects between 30 and 40 per cent of people during their lifetime. However, because of improved follow-up care, more sophisticated treatment, and

earlier discovery, cancer survival is still improving [2]. An estimated 26% of adults worldwide suffer from hypertension, the most prevalent form of cardiovascular illness. Only one-third of people with hypertension receive pharmacologic-

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ical treatment, and one in ten people have their blood pressure controlled appropriately in low- and middle-income countries [3, 4]. Effective management of hypertension requires full patient adherence to medical staff recommendations [5].

In many developing countries, particularly in Africa, traditional medicine is sometimes the only option for healthcare that is both affordable and accessible. This traditional medicine mainly uses plant-based therapies. More than two-thirds of the Malian population uses medicinal plants for healthcare.

Plant extracts contain a variety of compounds that vary in concentration depending on the part of the plant used, its origin and how it is prepared. Traditional extraction methods such as infusion, decoction and aqueous maceration are capable of extracting polar compounds such as polysaccharides, saponins, tannins, flavonoids and polyphenols [6, 7].

A drug administered to an individual will be absorbed, distributed, metabolized and then eliminated by the body according to its physicochemical characteristics. The aforementioned compounds taken at the same time as the drug and acting on one of these pharmacokinetic phases can potentially cause a drug-plant interaction. These interactions can lead to a decrease in plasma concentrations of the drug, predisposing to therapeutic failure, or, conversely, to an increase in concentrations, causing an increased risk of toxicity, which can sometimes be very serious [8, 9]. The use of medicinal plants by hospitalized patients and/or patients undergoing chronic treatment creates uncertainty regarding the prognosis for treatment. Indeed, despite the widespread use of medicinal plants among the Malian population, no studies have been conducted on the consumption of medicinal plants by patients. To fill this gap, we initiated this first study, the objective of which was to investigate the prevalence of plant use and identify medicinal plants consumed by patients with cancer and high blood pressure.

2. Materials and Methods

The study was conducted at Point G University Hospital. We conducted a descriptive cross-sectional study on the use of medicinal plants by patients undergoing chemotherapy and patients taking antihypertensive drugs who were being monitored in the medical hematology-oncology department and cardiology department, respectively. Data were collected on a case report form that included sociodemographic data, prescribed molecules, plants used, patient impressions, and adverse effects only in hypertensive patients.

2.1. Inclusion Criteria

All patients who presented at both departments and gave their verbal consent to participate in the study.

2.2. Exclusion Criteria

Patients who refused to participate in the study and patients who were unable to complete the questionnaire.

2.3. Data Collection and Analysis

The data were collected in Excel and analyzed using GraphPad Prism 5.0 software. Chi-square (and Fisher's exact) tests were used.

2.4. Ethical Statement

The study protocol was approved by the decanate of the Faculty of Pharmacy at the University of Science, Technology and Technology of Bamako (USTTB) in Mali. Prior to the interview, individual verbal consent was obtained from each patient. A series of questions was then asked of the patients during their appointment. Participants were then thanked for their time. The anonymity and confidentiality of the information collected were preserved.

Table 1. Patients using plants by gender and age group.

Designation		Cancer patients		Hypertensive patients	
		n	%	n	%
Traditional treatment	YES	79	41.7	61	59.2
	NO	120	58.3	42	40.8
	Total	199	100	103	100
Gender	Male	30	37.97	20	32.8
	Female	49	62.03	41	67.2
Age group (years)	15 - 25	10	12.66	-	-
	25 - 45	31	39.24	12	19.67

Designation	Cancer patients		Hypertensive patients	
	n	%	n	%
45 - 55	38	48.10	20	32.79
Over 55	-	0	29	47.54

3. Results and Discussion

The prevalence of medicinal plant use was 41.7% (n = 79) among patients receiving chemotherapy and 59.2% (n = 61) among patients receiving antihypertensive medication. They used medicinal plants without informing their doctor. This result shows that hypertensive patients use plants much more than cancer patients. Other studies report 69.7% and 27% of medicinal plant users in an oncology department and a hepatobiliary surgery department, respectively [10, 11]. Furthermore, McCrea and Pritchard have shown that patients rarely inform their treating physician about their use of medicinal plants [12].

Among patients who used medicinal plants, females accounted for 62.03% of chemotherapy patients and 67.2% of hypertensive patients. Other authors found a lower result, with 53% (189) of patients being female [10]. The most represented age group was 45-55 years for patients undergoing chemotherapy and over 55 years for patients taking antihypertensive medication, with 38 (48.10%) and 29 (47.54%) patients respectively (Table 1).

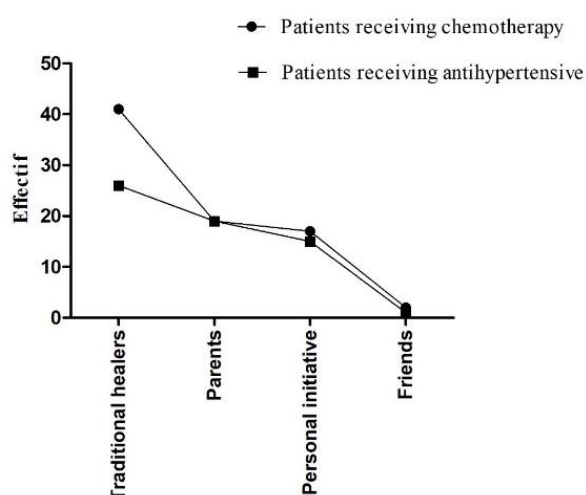


Figure 1. Sources of information on the use of medicinal plants.

The main sources of information on the use of plants were traditional health practitioners (n = 41; n = 26), followed by parents (n = 19; n = 19) and personal initiative (n = 17; n = 17)

for patients receiving chemotherapy and antihypertensive drugs, respectively (Figure 1). However, our findings contradict those reported in France among children, where only 29% of parents had not sought advice from a healthcare professional. The study by Bachev et al. showed that the main source of information on the use of plants was friends, accounting for 38% of patients [13, 14].

A total of 37 plant species belonging to 22 families were recorded during this study. The Fabaceae family was the most represented with 11 species, followed by the Combretaceae with 4 species. The Rubiaceae and Anacardiaceae families each had 2 species. Certain species of the Fabaceae and Solanaceae families are known to increase gastrointestinal motility and decrease the absorption of certain drugs [15]. Among the 37 plant species, 16 species were used by patients receiving chemotherapy and 28 by patients receiving antihypertensive drugs. This result is lower than the 42 plants consumed by patients receiving oral chemotherapy reported in the study by Delpech et al. [16]. Other authors have identified 60 plant species belonging to 34 botanical families in cancer patients [17].

Seven species were used by both types of patients. The three most commonly used plants were *Guiera senegalensis* (n = 13), *Combretum micranthum* (n = 7) and *Saba senegalensis* (n = 7) in patients receiving chemotherapy. Those used by patients receiving antihypertensive drugs were *Euphorbia hirta* (n = 14), *Combretum micranthum* (n = 9) and *Moringa oleifera* (n = 7) (Table 2). It has been reported that aqueous extracts of *Euphorbia hirta*, *Combretum micranthum* and *Guiera senegalensis* reduced the release of prostaglandins (PGI₂, PGE₂, PGD₂) [18]. This mechanism could be responsible for interactions with numerous drugs, especially antagonism with angiotensin-converting enzyme inhibitors such as captopril. Studies on the phytochemistry of these most commonly cited plants have shown that aqueous extracts contain tannins [6, 19, 20]. It has also been pointed out that the absorption of drugs could be altered by medicinal plants rich in tannins [21].

Frequently administered molecules are co-used with one of the plants most commonly cited by both types of patients. Carboplatin and Ondansetron were co-used with the three plants most commonly cited by patients receiving chemotherapy. Amlodipine, furosemide, and bisoprolol were co-used with the three plants most frequently cited by patients receiving antihypertensive drugs. In addition, *Allium sativum* was co-used with antihypertensive drugs (Table 3). Previous

studies have shown that *Allium sativum* increases the bioavailability of cisplatin by reducing the expression of the P-glycoprotein expression and inhibiting CYP3A4 activity, leading to a decrease in the biotransformation of amlodipine, can result in a significant increase in plasma amlodipine concentration, leading to an increased risk of hypotension [9, 22]. It has been reported that *Allium sativum* may reduce platelet aggregation and, consequently, increase the risk of hemorrhage.

Figure 2 shows patients' impressions of the co-use of medicines with medicinal plants. Among the 61 patients taking antihypertensive drugs who used medicinal plants, 46 (75.41%) reported an improvement in their health. In contrast, the majority of patients receiving chemotherapy, 57 (72.15%), said they had not experienced any improvement. This latter finding is in disagreement with the 88% of parents who believed that the plants were effective for their child undergoing chemotherapy and perceived an improvement [13].

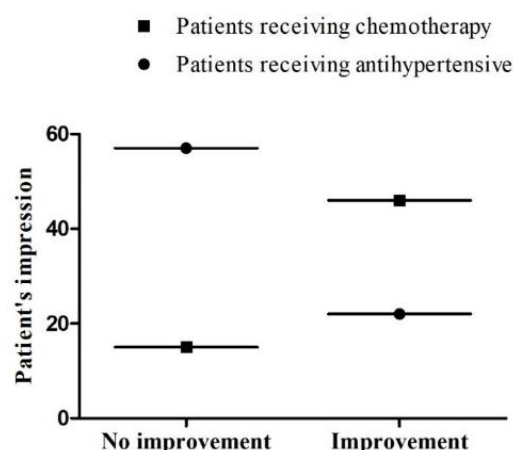


Figure 2. Patients' impressions of their improvement when using medicines and medicinal plants concomitantly.

Table 2. Plants recorded.

Family	Scientific Name	Cancer patients	Hypertensive patients
Euphorbiaceae	<i>Euphorbia hirta</i>	-	14
	<i>Guiera senegalensis</i>	13	2
Combretaceae	<i>Combretum micranthum</i>	7	9
	<i>Combretum molle</i>	-	1
	<i>Pteleopsis suberosa</i>	3	-
	<i>piliostigma thonningii</i>	-	4
	<i>Stylosanthes erecta</i>	-	3
	<i>Tamarindus Indica</i>	5	3
	<i>Bauhinia reticulata</i>	5	-
	<i>Parkia biglobosa</i>	4	1
Fabaceae	<i>Acacia Nitolica</i>	-	2
	<i>Afrormosia laxiflora</i>	-	2
	<i>Entada africana</i>	-	2
	<i>Cassia alata</i>	-	1
	<i>Acacia albila</i>	-	1
	<i>Cassia occidentalis</i>	-	1
	<i>Feretia apodanthera</i>	5	-
Rubiaceae	<i>Mitragyna inermis</i>		2
	<i>Mangifera indica</i>	3	1
Anacardiaceae	<i>Sclerocarya birrea</i>	4	-
Moringaceae; Olacaceae; Amaryllidaceae; Lamiaceae	<i>Moringa oleifera</i> ; <i>Ximenia americana</i> ; <i>Allium sativum</i> ; <i>Ocimum basilicum</i>	-; 5; -; -	7; 4; 6; 3
Annonaceae; Apocynaceae; Solanaceae; Lauraceae	<i>Annona senegalensis</i> ; <i>Saba senegalensis</i> ; <i>Solanum incanum</i> ; <i>Cassytha filiformis</i>	5; 7; 4; 3	-; -; -; -

Family	Scientific Name	Cancer patients	Hypertensive patients
Meliaceae; Asphodelaceae	<i>Khaya senegalensis</i> ; <i>Aloe barteri</i>	4; 4	2; -
Moraceae; Rhamnaceae; Rutaceae	<i>Ficus gnaphalocarpa</i> ; <i>Ziziphus mauritiana</i> ; <i>Citrus aurantiifolia</i>	-; -; -	2; 2; 2
Verbenaceae; Caricaceae; Lamiaceae; Sapotaceae	<i>Lippia chevalierii</i> ; <i>Carica papaya</i> ; <i>Mentha spicata</i> ; <i>Vitellaria paradoxa</i>	-; -; -	1; 1; 1; 1

Table 3. Co-use of anticancer drugs, antihypertensive drugs and the most commonly cited plants.

Plants	Most commonly prescribed anticancer drugs							
	Carboplatin	Ondasetron	Vincristine	Paclitaxel	fluorouracil	Doxorubicin	Vinblastine	Cisplatin
<i>Guiera senegalensis</i>	+	+	+	+	+	+	+	
<i>Combretum micranthum</i>	+	+	+	+	+			
<i>Saba senegalensis</i>	+	+						+
	Most commonly prescribed antihypertensive drugs							
	Amlodipine	Furosemide	Bisoprolol	Captopril	Captopril / HCT	Amlodipine / Perindopril	Perindopril	Atenolol
<i>Euphorbia hirta</i>	+	+	+	+		+	+	+
<i>Combretum micranthum</i>	+	+	+		+			+
<i>Moringa oleifera</i>	+	+	+	+		+		

55.74% (n = 34) of patients receiving antihypertensive therapy took the drugs first, and 16.39% (n = 10) took the drugs and medicinal plants at the same time. In contrast, 94.94% (n = 75) took medicinal plants after chemotherapy (Figure 3). These methods of using medicinal plants were not guided by scientific knowledge or medical advice. This result was consistent with other studies [11, 13, 15].

With regard to the use of medicinal plants by hypertensive

patients, the relative risk was 2.07 (Table 4). This means that the risk of side effects is twice as high in hypertensive patients who used medicinal plants than in patients who did not use medicinal plants. According to several authors, the concomitant use of medicinal plants with prescribed drugs increases the risk of adverse effects. Others have mentioned that adverse effects could occur due to the adulteration of the plant products.

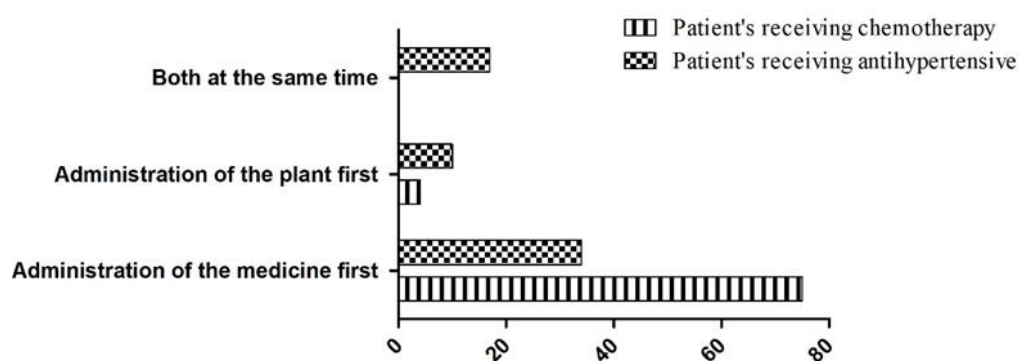


Figure 3. Time of administration of medicinal plants and conventional medicines.

The underestimation of the risk of adverse effects due to interactions between plant products and conventional medicines has also been highlighted by the fact that plant extracts contain numerous chemical substances with varied pharmacological properties and by the lack of data on their interaction mechanisms [13, 23, 24].

Table 4. Side effects in hypertensive patient.

Co-use of medicinal plants	Occurrence of side effects		
	Yes	No	Total
Yes	18	43	61
No	6	36	42
Total	24	79	103

P= 0.097; 95% confidence interval = 0.895 to 4.767;
 $\alpha < 5\%$; Relative risk (RR) = 2.07

4. Conclusions

This is the first study in Mali to document the simultaneous use of medicinal plants and conventional medicines. The study revealed a significant prevalence of medicinal plant use by patients receiving antihypertensive drugs and those receiving chemotherapy. The main sources of information for the use of plants were traditional health practitioners. It should be borne in mind that self-medication with plant extracts is common and not reported to clinicians, and therefore doctors should consider all patients as potential users of medicinal plants. Indeed, plant extracts contain numerous chemical compounds that could interact with conventional medicines, with uncertain outcomes. Finally, in this study, the risk of adverse effects was twice as high when medicinal plants were used concomitantly with antihypertensive drugs.

Abbreviations

USTTB	University of Science, Technology and Technology of Bamako
HCT	Hydrochlorothiazide
RR	Relative Risk

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Author Contributions

Mahamadou Ballo: Conceptualization, Formal Analysis, Writing - original draft, Writing - review & editing

Hamidou Kassogue: Methodology, Investigation, Data curation, Writing - review & editing

Abdoulaye Traore: Methodology, Investigation, Data curation, Writing - review & editing

Sekou Bah: Supervision, Validation, Writing - review & editing

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Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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