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Ethnobotanical Survey of Medicinal Plants for Breast Cancer Management in Dambam, Nigeria

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ABSTRACT

Background: Cancer is the abnormal growth of cells, typically originating from a single mutated cell. The cells have lost normal control mechanisms and thus can multiply continuously, invade nearby tissues, migrate to distant parts of the body, and promote the growth of new blood vessels from which the cells derive nutrients. Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer death in men and women, respectively, both overall and in less developed countries. However, breast cancer is the most frequently diagnosed cancer among women.

Methods: Semi-structured questionnaires were used to assess the practice of traditional medicine using plants, and the collected data were input into a statistical package for social sciences for analysis.

Results: The results revealed that most respondents were married 89.2%, with a 60% age range between 30-50 years, and most of their tribes are Hausa/Fulani with 98%. The results revealed that 24 plants are used for managing breast cancer in the locality, with Taura, kriya, Ararrabi, Sabara, Janyaro, Majamfari, Danya, and Bindazugu are the most commonly used in the management of breast cancer, method of preservation was mostly shed drying with 58% and stored in the container, route of administration usually oral with 92% and 8% topical.

Conclusion: An ethnobotanical survey of medicinal plants used in managing breast cancer was conducted in Damabm LGA using a semi-structured questionnaire and it was discovered that most people depend on medicine to manage breast cancer.

Keywords*:* Breast Cancer; Cancer Management; Dambam LG (Nigeria), Medicinal plant; Survey,

1. INTRODUCTION

Cancer is an abnormal growth of cells (usually derived from a single abnormal cell). The cells have lost normal control mechanisms and thus can multiply continuously, invade nearby tissues, migrate to distant parts of the body, and promote the growth of new blood vessels from which the cells derive nutrients [1]. According to the National Cancer Institute (NCI), Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body. Cancer can start almost anywhere in the human body, which is made up of trillions of cells. Normally, human cells grow and multiply (through a process called cell division) to form new cells as the body needs them. When cells grow old or become damaged, they die, and new cells take their place. Breast cancer remains the most prevalent disease among women worldwide. The causes of breast cancer remain difficult to fully understand, with a few exceptions. About 70% of women diagnosed with breast cancer have no known risk factors. This implies that there are risks that have not yet been identified. Doctors are focusing on lifestyle choices that can influence cancer risk. These lifestyle choices include diet, exercise, smoking, alcohol, and other factors [2]. International Incidence: Worldwide, breast cancer is the most common cancer in women It is estimated that in 2012,

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1.7 million new cases of breast cancer, or 25% of all female cancers were diagnosed. In general, developed countries have higher rates of breast cancer than developing countries, which may be due to certain lifestyle and reproductive factors more common in developed countries. The difference is likely relatively exaggerated. In Africa, breast cancer is responsible for 28% of all cancers and 20% of all cancer deaths in women. (16% & 11% both sexes) Incidence rates are increasing in Africa, estimated higher 35 per 100,000 women in most countries (compared to over 90–120 per 100,000 in Europe or North America). Precise incidence figures in Africa are lacking given the absence of cancer registration in most countries [3]. In Nigeria, breast cancer and hypertension are the two most common degenerative diseases responsible for about 16% of all cancer-related deaths. Out of 89,000 cancer deaths in 2005; 54,000 of these were younger than 70 years [4]. Plants have been used for medicinal purposes long before recorded history. Medicinal plants have been an integral part of the African healthcare system since time immemorial. The interest in traditional medicine can be attributed to its integral role in the culture of the people who use it, as well as due to the economic challenge: on one side, pharmaceutical drugs are not accessible to the poor and on the other side, the richness and diversity of the fauna and flora of Africa are an inexhaustible source of therapies for panoply of ailments [5]. Medicinal plants in African societies were not being fully utilized compared to other traditional societies across the globe e.g. China, India, and Greece [6]. However, recent researches show that about 7500 different species were screened for anti-cancer activities in South Africa between 1999-2006, and 68% were found to contain active compounds. Local healers from Nigeria play an important role in the management and control of the deadliest diseases such as cancer, diabetes, and sickle cell anemia. The Nigerian government contributed a huge sum of money to the development of traditional medicine, to encourage people to use natural herbs and not to use costly imported drugs within the country [7]. Most conventional therapies have been used and were believed to treat a variety of diseases. However, its high prices and side effects encourage people from many developing countries to return to herbal medicine as an alternative source of therapy for diseases. For decades the three most populous cancer therapies are; Surgical, Radiotherapy, and chemotherapy which are used for cancer treatment [8]. Medicinal plants are a good alternative since they are believed to contain millions of phytochemicals with various pharmacological properties that are easy to access. The uses of medicinal plants as anticancer agents have been recognized since the 1950s, but scientific research started in the 1960s with the discovery of the first anticancer agent called *Podophyllotoxin*. A naturally occurring ligand with its derivatives *Ectoposide and Teniposide* isolated from *podophyllumpeltatumn* [9]. The above investigation initiated the program of plant collection in the U.S. by the National Cancer Institute (NCI) which led to the contribution to the existence of some more natural anticancer agents including Taxol or Paclitaxel. The National Cancer Institute (NCI) [10] regarded Taxol as the best anticancer agent, other anticancer agents include Camptothecin, a naturally occurring alkaloid with its derivatives *Hycamtin (Topotecan)* and*Campotosar (Irinotecan),* discovered from the stem wood of Chinese ornamental tree *Camptothecaacuminata* commonly known as tree of joy or tree of love. Vinca alkaloids (Vinblastine and Vincristine) and their analogs Vinorelbine and Vindesine isolated from *Catharanthusroseus* commonly known as Madagascar periwinkle [11]. It is important to note that currently, no single plant-derived anticancer agent has reached the stage of general use; rather, they are all at the preclinical development level Many traditional herbalists from Nigeria and many developing countries have been managing cancer and other diseases for years back using medicinal plants, but most of this knowledge is not being fully investigated. Despite the rapid rate of deforestation and loss of biodiversity, this knowledge needs to be documented accurately for future use [12].

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Biological Materials

Roots, Bark, Whole plant, Seeds, Fruits, Stem, Leaves, Plant extracts

2.1.2 Equipment, Chemicals and Reagent

Equipment: Mortar and pestle, clay pot, wooden spoon.

Chemicals and Reagent: Water, honey, shea butter, pawpaw leaves, alcohol, palm oil.

2.2 Methods

2.2.1 Study location

Dambam Local Government Area is located in Bauchi State, within the Northeast geopolitical zone of Nigeria. The LGA's headquarters are situated in the town of Dambam, which includes several towns and villages such as Dagauda, Dambam, Jalam, and Yamai. The population of Dambam LGA is estimated at 121,067 inhabitants with

the majority tribe being the Hausa. The religion of Islam is widely practiced in the area while the Hausa and English languages are spoken in the LGA.

2.2.2 Topography and vegetation

The topography within 2 miles of Bauchi contains only modest variation in elevation, with a maximum elevation change of 463 feet and an average above-sea level of 2,025 feet. Within 10 miles contain only modest variation in elevation (2,247 feet). Within 50 miles there are large variations in elevation (3,850). Dambam LGA is in the northern part of Nigeria and spans two distinctive vegetation zones, namely the Sudan savannah and the Sahel Savannah.

2.2.3 Study Design

Verbal informed consent was first obtained from respondents. Information on medicinal plants was collected through semi-structured questionnaires and oral interviews with traditional medical practitioners. The interview was conducted in the local language of the respondents or in Hausa, the common language of the region. It was divided into different sections, including consent, demographics, cancer overview, breast cancer, epidemiology, plants, and treatments.

2.2.4 Data Collection Method

This work was conducted in Dambam LG, Bauchi State Nigeria, and includes the collection of data on native herbal plants. The information was collected through a questionnaire, interviews in their local language using the snowball method; such information includes the local names of the plants, useful plant parts, and methods of herbal preparation, and some locations of the plants within the area. Snowball techniques are used to find the informants. The first person contacted within the community and begged to indicate the specialist informants, who indicated other experts, who in turn indicated others until no new specialist informants were identified and the cycle terminated. Contact with the interviewees was made at their homes, using the non-probabilistic sampling design which by definition is a subset of the population in which the choice of elements does not depend on chance, but on the characteristic of the research.

2.2.5 Study Populations

The total number of traditional medical practitioners who were interviewed was 400.

2.2.6 Sample Size Determinations

The sampled size was determined using the formulae $N=z^2pq/d^2$ Equation which referenced the total number of respondents included in a study, the number is often broken down into sub-groups by demographics such as age, gender, and location so that the total sample achieved represents the entire population.

To determine the sample calculation, we used: $N= Z^2pq/d^2$ as the formula.
Where; N= Sample size, Z= Z score = confidence value (95%= 1.96), P= Standard deviation = (50%= 0.5), q= 1- p
d= confidence interval = 0.05.

$$.'. N= (1.96)^2 \times 0.5 (1- 0.5)/ (0.05)^2 = =250$$

The number of questionnaires is rounded up to the nearest hundred purposely to correct for non-responses during the fieldwork and wasted samples, improve the accuracy of the study, and allow for adequate presentation.

2.2.7 Ethical Approval

All required approvals for conducting the research were secured. The Deanship of Scientific Research Ethics Committee at the Sa'ad Zungur University Gadau (formerly called Bauchi State University Gadau) approved the study protocols. In addition, each questionnaire included a written informed consent form demonstrating the researchers' names and explaining the objectives and protocol of the research. All participants signed the informed consent form. Privacy and confidentiality were maintained throughout the study. Participants were free to withdraw from the research at any time, and their responses were treated as invalid and discarded.

2.3 Data Analysis

All valid questionnaires were schematically recorded using SPSS (Statistical Package for Social Sciences) and data were analyzed using descriptive analysis.

3. RESULTS

According to the results displayed in Table 1.0, the majority of respondents were married (223, 89.2%), while only a few were divorced (4, 1.6%). Additionally, 60% of respondents were within the age range of 35-50 years, and 88.4% (221) were male. The majority of them were Hausa/Fulani (245, 98%) and were Muslims (248, 99.2%) respectively.

Table 1: Demographic Status

	Frequency Number	Percentage
Marital Status		
Single	17	6.8%
Married	223	89.2%
Divorced	4	1.6%
Widow	6	2.4%
AGE RANGE		
20-30	23	9.2%
35-50	150	60.0%
55 above	77	30.8%
GENDER		
Male	221	88.4%
Female	29	11.6%
RELIGION		
Islam	248	99.2%
Christianity	2	0.8%
TRIBE		
Hausa/Fulani	245	98.0%
Yoruba	4	1.6%
Igbo	1	0.4 %

According to the result displayed in Figure 1.0 below, Traditional Medicine Practitioners (TMPs) have confirmed that the majority of people aged 18-35 are the most people at risk of breast cancer.

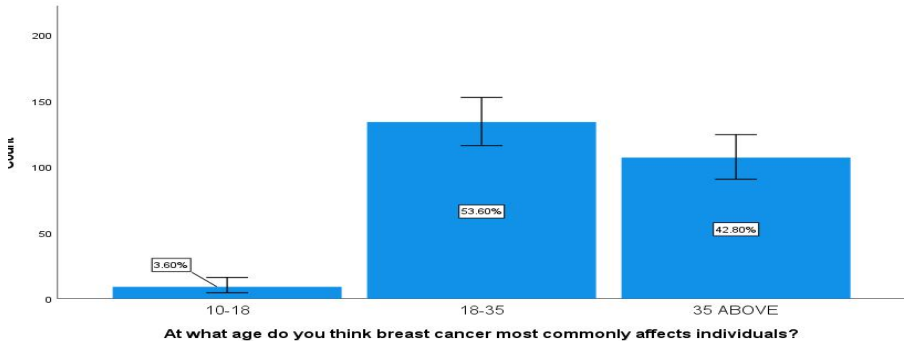

Figure 1: At what age do you think breast cancer most commonly affects individuals

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Table 2: Are you familiar with any plant used for the treatment of breast cancer?

	FREQUENCY NUMBER (N)	FREQUENCY NUMBER (N)
Yes	247	98.8%
No	3	1.2%

The result displayed in Figure 2.0 below, shows the percentage of different respondents on plants used in breast cancer management including about 24 plants as it shows below, where Taure (13.6%) takes the higher percentage followed by Ararrabi and Kirya with 12% respectively in Dambam LGA.

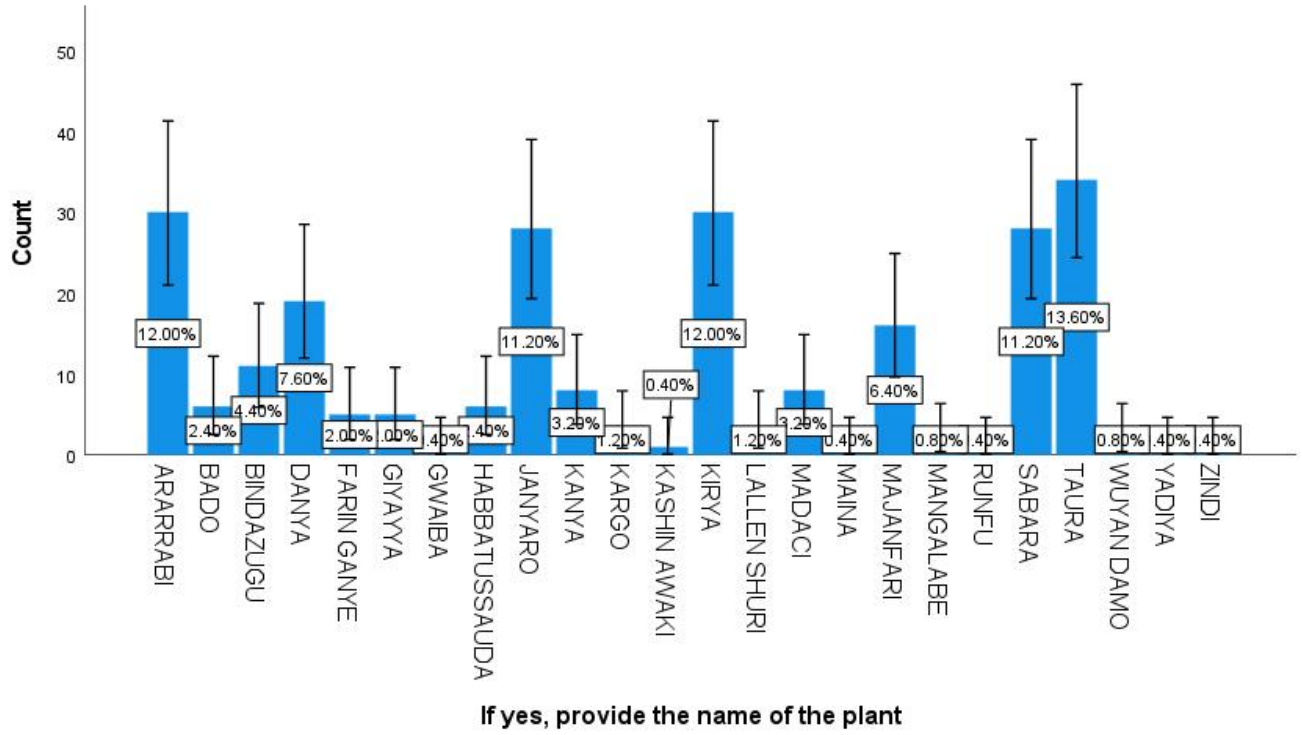

Figure 2: Name of the plants

The result below shows that shade drying is the most common preserving method of the plant with 58% while powdered drying is the lowest with just 0.4% respectively.

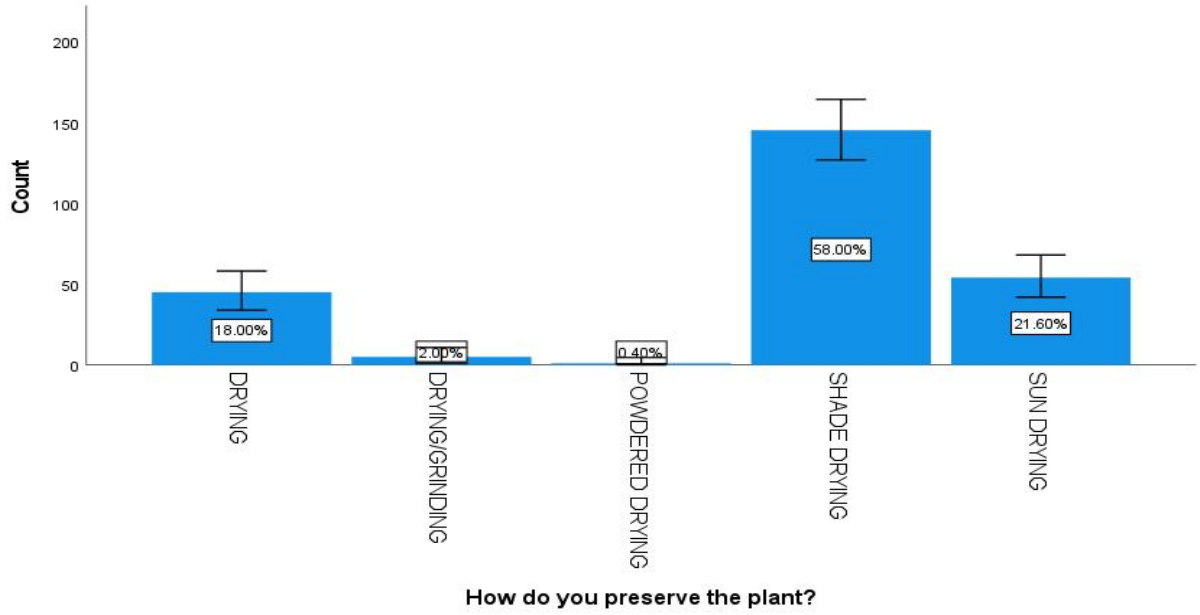

Figure 3.: Plant Preservation.

Base on the result displayed in Figure 4.0 below, reveals the different seasons by which the respondents collect their plants, whereby the rainy season takes 6.8%, the dry season takes 1.2%, and those that are been collected during both seasons take the major part of 92%.

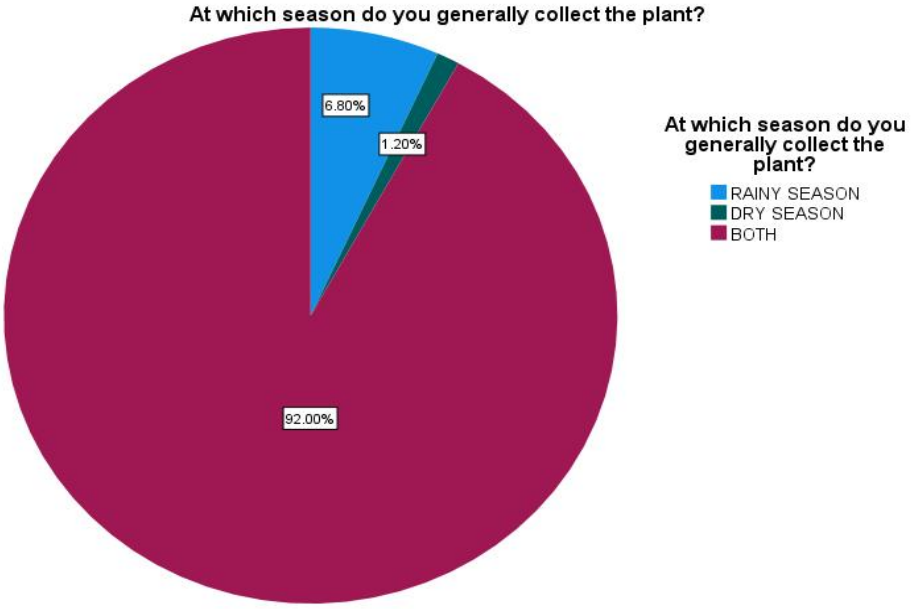

Figure 4.: At which season do you generally collect plants?

It was observed that the result shows that most of the plant preparations where taken orally with 92% and topically 8% as shown in Figure 5.0 respectively.

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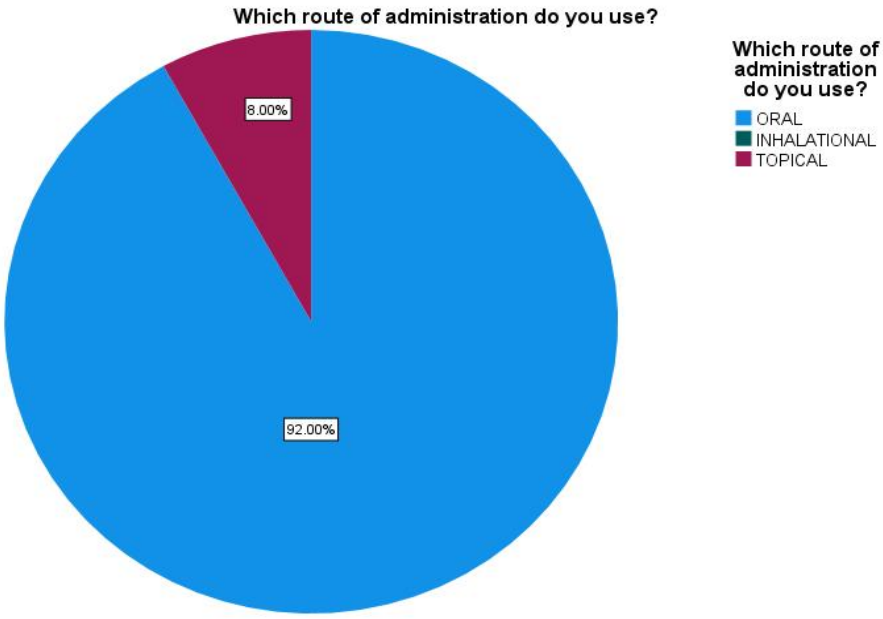

Figure 5: Route of administration

4. DISCUSSION

According to the results collected from the respondents, the majority of them were married (223, 89.2%), with 60% being within the age range of 35-50 and 88.4% (221) of the respondents were male. The majority of them were Hausa/Fulani (245, 98%) and were Muslims (248, 99.2%) respectively. As Dambam, the site of this study, is a majority Hausa village, individuals from other ethnic groups are most likely immigrants from other areas. This precludes us from generalizing our conclusions to the general Yoruba or Ibo populations, as there may be differences between minor Communities who immigrated to Dambam and those who stayed in their hometown. In addition, when income is included in the regression model, the significance of ethnicity decreases, suggesting that income differences among the ethnicities may account for some of the differences in TM usage. It is important to note that ethnicity continued to have a significant impact, even after accounting for factors like education, income, and occupation. A recent study found that belief in supernatural causes of illness is linked to higher use of Traditional Medicine [13]. It is possible that health beliefs vary across ethnic groups, influencing their attitudes toward and use of traditional medicine. Since ethnicity has been identified as a key factor, further research is needed to explore the underlying reasons for these differences. Further studies revealed that the Traditional Medicine Practitioners (TMPs) have confirmed that the majority of the people aged 18-35 are the most people at risk of breast cancer. Although thought to be a relatively uncommon condition, potentially one third of all breast cancers are diagnosed among premenopausal women. Breast cancers diagnosed at a younger age harbor aggressive clinicopathologic features and, more recently, have been recognized as a unique biologic entity. Special considerations, including infertility, pregnancy, bone health, genetic syndromes, and psychosocial issues must be addressed when developing treatment algorithms, including local therapies and adjuvant chemotherapeutic/endocrine strategies, among young women diagnosed with breast cancer. Finally, younger age at breast cancer diagnosis confers an inferior prognosis when compared to older women, illustrating the need for biologically driven clinical trials devoted specifically to the former population, with the overall goal of improving outcomes [14]. Research shows that the prevention and management of several diseases such as breast cancer in humans have long benefited from the use of medicinal plants. Numerous studies have highlighted the success of herbal therapies due to their affordability, easy accessibility, and often lower toxicity compared to other treatments. Although many of the herbalists reported that there are some that were found to be more effective when used singularly. It also shows that herbal mixtures with several plant species have synergism in the management of disease. In this study, a total number of twenty-four plants were mentioned for the treatment of breast cancer, with various means used for the preparation of the recipes. The Data obtained from the study showed that *TAURA, ARARRABI, AND KIRYA* were the most commonly used plants in the management of breast cancer in Dambam LGA. Furthermore, the result below shows that shade drying is the most common preserving method of the plant

with 58%. Shade drying is another herb-drying method that utilizes solar energy as a heating source. The process is conducted in almost the same way as sun drying, except that the herbs are placed under the shade in a room with good ventilation, low humidity (e.g. 22-27% for *Lippia citriodora* [15] and with no direct exposure to sunlight. During the shade-drying process, the air is heated using solar energy before being ventilated passing through the herbs [16]. This drying method offers advantages over sun drying, as it helps preserve light-sensitive compounds and reduces light-induced chemical reactions like oxidation. However, shade drying takes longer than sun drying, which is already considered an excessively long time process [17]. Research has demonstrated that shade drying is superior in preserving the essential oil content and color of dried products compared to other methods like hot-air drying, sun drying, microwave drying, and freeze drying for many types of herbs [18]. Conclusively, the result shows that most of the plant preparations were taken orally at 92% and topically at 8% which is in accordance with similar research carried out by some researchers on routes of administration. However, the most common route of administration was oral (77%) followed by a combination of oral and topical routes (10%) whereas the least used routes were nasal (1%) and rectal (2%). The fact that the oral route of administration of the herbals was most common was not a surprise as this has been previously reported [19, 20]. However, a recent study in [21] found frequent use of herbal enemas (rectal) in Western African traditional medicine. The method of administering herbal medicines may be linked to the bioactive compounds present in the plant extracts [20]. For instance, herbal medicines containing alkaloids as their bioactive agents are readily absorbed when taken orally while terpenoids, especially essential oils, are best administered through dermal and/or nasal routes. Both decoctions and infusions were mostly administered orally, 45% and 17%, respectively. Only infusions were administered via the rectal and nasal routes.

5. CONCLUSION

The ethnobotanical survey of breast cancer conducted in DAMBAM local government reveals the data on native herbal plants which were collected from 400 traditional medical practitioners. The respondents were between 35 to 90 years of age, and 88.4% of the TMPS were males. The information was collected smoothly through questionnaires, and interviews in their local language. Such information includes the local plant's names, useful plant parts, methods of preparation, dosage, route of administration, and other medicinal uses. Based on the research, all 24 plants studied were documented within Dambam LGA, with the most common being Arrabi, Sabara, and Bindazugu. This result shows that most of the people living within the Dambam area depend on medicinal plants for breast cancer treatment but only a few were documented. The plants in nature should be properly conserved and re-planted after each harvest to have easy access to the plants within the area. The ethno-medicinal claim should be validated by experts and the plants should be subjected to toxicity study.

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Conflicts of Interest

The authors declare no conflicts of interest

Contribution of Authors

T.A.S. conceived and designed the study. A.D., K.D., and M.O.O. collected and analyzed the data. E.O.E. and O.T.O. contributed to the literature review and manuscript drafting. I.O.O. assisted with data interpretation and manuscript editing. All authors reviewed and approved the final manuscript.

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