International Journal of Medicinal Plants and Alternative Medicine Vol. 1(8), pp. 137-163, September 2013
Available online at http://academeresearchjournals.org/journal/ijmpam
ISSN 2327-560X ©2013 Academe Research Journals

Full Length Research Paper

Medicinal plants-based foods for breast cancer treatment: An ethnobotanical survey and digitization

Zacchaeus Oni Omogbadegun

Computer and Information Sciences Department, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria. E-mail: zacchaeus.omogbadegun@covenantuniversity.edu.ng. Tel: +2348035062887.

Accepted 23 September, 2013

One million new breast cancer (BC) cases diagnosed yearly yielded over 400,000 annual deaths. About 4.4 million women are living with BC worldwide, while 15 million new cases yearly are estimated by 2020. About 12.15% of women born today would be diagnosed with BC at some time during their lifetime. Nigerian women's BC lifetime risk of 10% accounted for about 16% of all cancer-related deaths. Nigeria was ill-equipped in dealing with BC complexities. This paper presented an ethnobotanical survey and digitization of Medicinal and Aromatic Plants (MAPs)-based foods for effective BC treatment. BC's risk factors were gathered from General Practitioners. Semi-structured questionnaires were randomly administered, in which 70 Physicians and 500 Complementary and Alternative Medicine (CAM) practitioners were interviewed. Internet searches were performed on the NCCAM, EBSCO, and PubMed databases using BC-related keywords. Specific ethnobotanical data of MAPs having anticancer properties were documented through guided fieldworks, local markets, and CAM practitioners' homes. A total of 10% of the studied MAPs yielded Adzuki bean, Asparagus, Broccoli, Burdock, Cabbage, Chinese yam, Dandelion, Tomato, Watercress, and Watermelon in effectively treating BC menace. A Populated Multimedia-based Medicinal Plants Sustainability Management System was used to address MAPs' extinction challenge with the BC-related MAPs. Orthodox BC treatments have devastating effects including temporary infertility. However, eating fruits and vegetables daily significantly reduces BC's risk.

Key words: Breast cancer, complementary and alternative medicine, fruits, medicinal plants, vegetables.

INTRODUCTION

Information and communication technology (ICT) has become the transformative tool for a new style of global development while playing an increasingly important role in addressing the global challenges of healthcare. Healthcare is an information intensive industry, in which reliable and timely information is a critical resource for the planning and monitoring of service provision at all levels of analysis: (i) organizational, (ii) regional, (iii) national and international. Healthcare Information Systems (HCISs) have been defined as powerful ICT-based tools able to make health care delivery more effective and efficient (Locatelli et al., 2012). Health and healthcare researches are needed in order to reduce the uncertainty associated with the diagnosis, treatment and delivery of health care to all of the people in our society who are in need of it (Dieppe, 2005). Healthcare aims to achieve the best health outcomes in the most efficient manner. Today's health delivery systems' challenge is to increase productivity and quality of care without increasing the economic costs (de Leiva et al., 2008). Complementary and Alternative Medicine (CAM), defined by the National Center for Complementary and Alternative Medicine (NCCAM), is a group of diverse medical and health care systems, practices and products that are not presently considered part of conventional medicine. NCCAM, part of the National Institutes of Health (NIH), designates five major domains of CAM practices: alternative medical systems, mind-body interventions, biologically-based treatments, manipulative and body-based methods, and energy therapies. Each domain comprises numerous individual systems and treatments for which the NIH provides research support (Heimall and Bielory, 2008;

Wisneski and Anderson, 2009; Kelvin and Tyson, 2011). Patients require treatment and care that work, good relationship with practitioner, provision of information, and remaining in control of treatment. CAM continually attracts patronage due to patients' dissatisfaction with conventional health care, a desire for greater control over one's health, and a desire for cultural and philosophical congruence with personal beliefs about health and illness (Omogbadegun et al., 2011).

Medicinal and aromatic plants (MAPs)

Medicinal and aromatic plants (MAPs) belong to the "biologically-based treatments" domain of CAM. Industrial uses of MAPs include galenicals, health, herbal teas, industrial / pharmaceutical auxiliary, intermediates for drug manufacture, new drugs, phyto-pharmaceuticals, and traditional medicines (Tewari, 2000). MAPs provide the raw materials for the pharmaceutical industry where drugs derived are made by isolating the active chemicals and concentrating them to the medication. Over 80% in each of the US public, people in developing countries, and Africa's population use nonconventional practices and complementary medicines adjunctive to conventional medical care (Kasirajan et al., 2007; Heimall and Bielory, 2008; Cho-Ngwa et al., 2010; Li et al., 2011).

MAPs are increasingly recognized worldwide as an alternative source of efficacious and inexpensive medications to synthetic chemo-therapeutic compound. MAPs are used in treatment and prevention of various health problems from simple to complex disease situations among rural populations globally, thereby improving the quality of life (Elufioye et al., 2012). In Nigeria, a country stepped in the use of and belief in traditional medicines, the CAM practitioners claim that MAPs' parts possess various phytochemicals which exhibit diverse pharmacological and biological responses and diversities (Idu and Onyibe, 2007; Kayode and Ogunleye, 2008; Ekanem and Udoh, 2010; Oladele et al., 2011).

Cancer morbidity

Cancer is a common disease with a devastating impact on the physical and psychological well being of patients. The diagnosis of cancer brings upon many clinical challenges and questions for which clear and simple answers are not always provided by modern medicine. To date, only limited therapeutic options are available for patients with advanced cancer. Cancer, an unrestrained proliferation and migration of cells, is a scourge that has afflicted mankind since time immemorial. In spite of the spectacular advances made by medical science during the past century, the treatment of cancer remains an enigma. Cancer represents the single largest cause of death in both men and women, and is a growing public health menace. Each year, about seven million new cases are diagnosed, and about five million people die as a result of cancer. Prevalence data indicate that currently, about 14 million people are suffering from cancer. Bearing in mind the level of morbidity that is often affiliated with this disease, comprehension of such a high incidence is horrifying. The recent shift toward targeted therapies has improved substantially patient's survival, however, relapses are frequent and cure remains rare. This led patients and many health care managers to shift attention to the holistic approach of traditional medicine particularly preparations from herbal products to manage and alleviate the disease (Baldi et al., 2007; Alaoui-Jamali, 2010). Cancer is a major public health problem worldwide with millions of new cancer patients diagnosed each year and many deaths resulting from this disease. Chemotherapy remains the principal mode of treatment for various cancers. Breast cancer is a cancer that starts in the tissue of the breast. The use of plants or plant products for cancer treatment could be due to several reasons such as availability of the materials, affordability, relatively cheap and little or no side effects. For these reasons, World Health Organization (WHO) supports the use of traditional medicines provided they are proven to be efficacious and non toxic. It is well established that plants have been a useful source of clinically relevant antitumor compounds. However, traditional Nigerian medicinal herbs have been used in the treatment of different diseases in the country for centuries. There have been claims that some traditional healers in Nigeria can successfully treat cancer using herbal preparations (Engel et al. 2011).

Cancer is obviously one of the most common areas where demand for alternative treatment is overwhelming (Leung, 2007). Cancer arises when cells become abnormal and start to multiply out of control. They are cells behaving badly. Cells are becoming abnormal all the time but in most cases are detected and destroyed by the body's immune system. Occasionally, our defences fail and a cancer results (Matthews et al., 2011).

LIST OF ABBREVIATIONS: AIs, Aromatase Inhibitors; **AT,** Alternative Therapy; **ATM,** Ataxia Telangiectasia Mutated; **BC,** Breast Cancer; **BSE,** Breast Self-Examination; **CAFs,** Cancer-associated Fibroblasts; **CAM,** Complementary and Alternative Medicine; **CBE,** Clinical Breast Examination; **CI,** Confidence interval; **CM,** Complementary Medicine; **HIV/AIDS,** Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome; **HRT,** Hormone Replacement Therapy; **ICT,** Information and Communications Technology; **MAPs,** Medicinal and Aromatic Plants; **MMPSMS,** Multimedia-based Medicinal Plants Sustainability Management System; **NCCAM,** National Center for Complementary and Alternative Medicine; **NIH,** National Institutes of Health; **OR,** Odds Ratio; **SERMs,** Selective Estrogen Receptor Modulators.

Cancer is the second leading cause of death worldwide. In recent years, efforts have been made to synthesize potential anticancer drugs; consequently, hundreds of chemical variants of known classes of anticancer therapeutic agents have been synthesized. It has been recognized that a successful anticancer drug should be one, which kills or incapacitates cancer cells without causing excessive damage to the normal cells. This criterion is difficult, or perhaps, impossible to attain, and that is why cancer patients suffer from unpleasant side effects while undergoing treatments. Although great advancements have been made in the treatment and control of cancer progression, significant deficiencies and room for improvement remain. A number of undesired side effects sometimes occur during chemotherapy. While vast amounts of synthetic chemistry have provided relatively small improvements over the prototype drugs, the synthesis of modified forms of known drugs continues as an important aspect of research. Natural therapies, such as the use of plant-derived products in cancer treatment, may reduce adverse side effects. Currently, a few plant products are being used to treat cancer. However, a myriad of many plant products exist that have shown very promising anti-cancer properties *in vitro*, but are yet to be evaluated in humans. There exists a need for new prototypes and new templates for use in the design of potential chemotherapeutic agents. Natural products are capable of providing such templates. Some of the well-recognized anticancer plants are listed in Table 1. Further study is required to determine the efficacy of these plant products in treating cancers in humans (Baldi et al., 2007; Desai et al., 2011).

BREAST CANCER MENACE

Breast cancer is the term used to describe the uncontrolled growth of abnormal cells in the breast tissue, most commonly in the lobules (milk producing glands) and ducts (the passages that carry milk to the nipples), leading to the formation of a solid lump or tumour. Breast cancer is a systemic disease in that cancer cells may start to be disseminated into blood and lymphatic systems even in early stages or when the tumor size is still small. Active angiogenesis may occur in breast tumor nodules as small as 2 mm in diameter. Cancers originating from ducts are known as ductal carcinomas and those originating from lobules are known as lobular carcinomas (Hayat, 2008; Ingelheim, 2011).

Breast cancer (BC) constitutes a major public health issue globally with over 1 million new cases diagnosed annually, resulting in over 400,000 annual deaths and about 4.4 million women living with the disease. BC remains the most feared disease of all women worldwide. The causes of breast cancer remain a mystery, with a few exceptions. About 70% of women diagnosed with breast cancer have no known risk factors. This implies that there are risk factors that have not yet been identified. Doctors are beginning to identify lifestyle choices that can influence our cancer risk. These lifestyle choices include diet, exercise, smoking, alcohol, and many other factors (Tabor, 2009). BC affects 12.5% of women during their lives. In Nigeria, BC and hypertension are two of the commonest 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 (Gunduz and Gunduz, 2011; Omolara, 2011). BC accounts for 12.5% of deaths worldwide, more than HIV/AIDS, tuberculosis and malaria deaths combined. Estimated 207,090 women were diagnosed with and 39,840 women died of BC in 2010. By 2020, 15 million new BC cases are expected yearly, and 70% of new BC cases (~10.5 million) will occur in developing countries. A total of 1 million BC cases is expected yearly in African countries by 2020 with 500,000 cases expected in Nigeria alone. Late presentation of patients at advanced stages when little or no benefit can be derived from any form of therapy is the hallmark of BC and other cancers among African adults resulting in ineffective treatment. 5-year cancer survival rate is 10% for Africa against 70% in developed countries. In Nigeria alone, average life expectancy for women is 48 years and death rate is 16.31/1,000 deaths (6th highest in the world). Strong dependence on traditional medicine is partly due to ethics but mainly due to poverty (70% of population live below poverty guidelines) (Okobia et al., 2006; Courage-to-dare-foundation, 2012). In Okobia et al.'s (2006) study of one thousand community-dwelling women from a semi-urban neighborhood in Nigeria recruited in January and February 2000 using interviewer-administered questionnaires designed to elicit sociodemographic information and knowledge, attitude and practices of these women towards breast cancer, results showed that study participants had poor knowledge of breast cancer. Mean knowledge score was 42.3% and only 214 participants (21.4%) knew that breast cancer presents commonly as a painless breast lump. Practice of breast self-examination (BSE) was low; only 432 participants (43.2%) admitted to carrying out the procedure in the past year. Only 91 study participants (9.1%) had clinical breast examination (CBE) in the past year. Women with higher level of education ($X2 = 80.66$, $p < 0.0001$) and those employed in professional jobs ($X2 = 47.11$, $p < 0.0001$) were significantly more knowledgeable about breast cancer. Participants with higher level of education were 3.6 times more likely to practice BSE (Odds ratio [OR] = 3.56, 95% Confidence interval [CI] 2.58-4.92) (Okobia et al., 2006).

Epidemiology of BC in Nigeria

- Lifetime risk for all women for developing this cancer is 10%.
- Annual number of new cases is 33.6 out of every

Table 1. The anticancer plants and their active constituents (Baldi et al., 2007).

Plant	Family	Active constituent(s)
Acer negundo	Aceraceae	Acer saponin P (Saponin)
Acnistus arborescens	Solanaceae	Withalerin A (Withanolide)
Acronychia baueri	Rutaceae	Acronycine (Acrlaone alkaloid)
Allamanda cathartica	Apocynaceae	Allarnandin (Monoterpene)
Baccharis megapotamica	Asteraceae	Baccharin (Sesquiterpene)
Baileya multiradiata	Asteraceae	Pseudoguaianolide
Bersama abyssinica	Melianthaceae	Hellebrigenin acetate (Buladienullde)
Bouvardia temifolia	Rubiaceae	Bourvardin (Peptide)
Brucea antidysenterica	Simaroubaceae	Broceanlin (Simaroubolide)
Caesalpinia gilliesii	Fabaceae	Cesalin
Camptotheca acuminata	Nyssaceae	Camptothecin (Pyrraloquinolille alkaloid)
Catharanthus roseus	Apocynaceae	Vinblastine, Vincristine (Bis-indole alkaloid)
Cephalis acuminata	Rubiaceae	Emetine (Isoquinoline alkaloid)
C. ipeccacuanha	Rubiaceae	Emetine (Isoquinoline alkaloid)
Cephalotaxus harringtonia	Cephalotaxaceae	Harringtonine (Cephalotaxine alkaloid)
Cocculus sp.	Menispennaceae	Gocculine, Cocculidine (Bisclaurine alkaloid)
Colchicum autumnale	Liliaceae	Colchicine (alkaloid)
C. speciosum	Liliaceae	Colchicine (alkaloid)
Crocosmia crocosmiiflora	Iridaceae	Medicagenic acid (Saponin)
Crotalaria assamica	Leguminosae	Monocrotaline (Pyrrolizidine alkaloid)
C. spectabilis	Leguminosae	Monocrotaline (Pyrrolizidine alkaloid)
Croton macrostachys	Euphorbiaceae	Crotepoxide
C. tiglium	Euphorbiaceae	Phorbol derivatives (Terpenoid)
Cyclea peltata	Menisperrnaceae	Tetrandrine (Isoquinoline alkaloid)
Daphne mezereum	Thymelaeaccae	Mezerein (Diterpene)
Elephantopus elatus	Asteraceae	Elephantopin (Sesquiterpene)
E. mollis Asteraceae	Molephantinin	(Sesquiterpene)
Eupatorium hyssopifolium	Asteraceae	Eupahyssopin (Sesquiterpene)
Euphorbia escula	Euphorbiaceae	Ingenal dibenzoate
Fagara macrophylla	Rutaceae	Nilidine (Benzophenanthridine alkaloid)
F. zanthoxyloides	Rutaceae	Fagaronine (Benzophenanthridine alkaloid)
Gnidia lamprantha	Thymelaceaceae	Guidin (Diterpene)
Gossypium sp.	Malvaccae	Gossypol (Sesquiterpene dimer)
Helenium autumnale	Asteraceae	Helevalin (Sesquiterpene)
H. microcephaiam	Asteraceae	Microlenin (Sesquiterpene dimer)
Heliotropium indicum	Boraginaceae	Indicine-N-oxide (Pyrrolizidine alkaloid)
Holacantha emoryi	Simaroubaceae	Holacanthone (Sirnaroubalide)
Hymenoclea salsola	Asteraceae	Ambrosin (Sesquiterpene)
Ipomoea batatas C	onvovulaceae	4-Ipomeanal (Monoterpene)
Jacaranda caucana	Bignoniaceae	Jacaranone (Quinone)
Jatropha gossypiifolia	Euphorbiaceae	Jatrophone (Diterpene)
Juniperus chinensis	Cupressaceae	Podophyllotoxin (Lignan)
Liatris chapmanii	Asteraceae	Liatrin (Sesquiterpene)
Linum album	Linaceae	Podophyllotoxin (Lignan)
Linum flavum	Linaceae	5-Methoxypodophyllotoxin (Lignan)
Mappia foetida	Olinaceae	Camptothecin (Pyrroloquinoline alkaloid)
Marah omganus	Cucurbitaceae	Cucurbitacin E
Maytenus buchananii	Celaslraceae	Maytansine (Ansa macrolide)
M. ovatus	Celastraceae	Maytansine (Ansa macrolide)
M. serrata	Celastraceae	Maytansine (Ansa macrolide)
Montezuma speciasissima	Malvaceae	Gossypol (Sesquiterpene dimer)

Table 1. Contd.

Ochrosia elliptica	Apocynaceae	Ellipticine (Pyridocarbazole alkaloid)
O. maculata	Apocynaceae	9-Methoxyellipticine (Pyridocarbazole alkaloid)
O. moorei	Apocynaceae	Ellipticine (Pyridocarbazole alkaloid)
Parquetina nigrescens	Asclepiadaceae	Strophanthidin (Cardenolide)
Penstemon deutus	Scrophulariaceae	Penstimide (Monoterpene)
Phyllanthus acuminatus	Euphorbiaceae	Phyllathoside
Pierreodendron kerstingii	Sapotaceae	Glaucarbuinone (Simaroubolide)
Piper futokadzura	Piperaceae	Crotepoxide
Podtxatpus gracilori	Podocarpaceae	Podolide (Dilactone)
Podophyllum hexandrum	Podophyllaceae	Podophyllotoxin, Peltatin (Lignan)
P. peltatum	Podophyllaceae	Podophyllotoxin, (Lignan)
Putterlickia verrucosa	Celastraceae	Maytansine (Ansa macrolide)
Simarouba glauka	Simaroubaceae	Glaucarubinone (Simaroubolide)
Steganotaenia araliaceae	Umbelliferae	Liatrin (Sesquiterpene)
Stereospermum suaveolens	Bignoniaceae	Lapachol (Quinone)
Strophanthus sp.	Apocynaceae	Strophanthidin (Cardenolide)
Taxodium distichum	Taxodiaceae	Taxodione (Diterpene)
Taxus baccata	Taxaceae	Paclitaxel (Diterpene)
T. brevifolia	Taxaceae	Paclitaxel (Diterpene)
Thalictrum dasycatpum	Ranunculaceae	Thalicarpine (Isoquinoline alkaloid)
T. minus	Ranunculaceae	Thalicarpine (Isoquinoline alkaloid)
Tripterygium wilfordii	Celastraceae	Tripdiolide, Triptolide (Diterpene)
Tylophora asthmatica	Asclepiadaceae	Tylophorine
T. cerbiflora	Asclepiadaceae	Tylocrebine (Phenanthroidolizidine alkaloid)
Vernonia guineensis	Asteraceae	Vemolepin (Sequiterpene lactone)
V. hymenolepis	Asteraceae	Vemolepin (Sequiterpene lactone)
Withania somnifera	Solanaceae	Withaferin A, B (Withanolides)
Zaulzainia sp.	Rubiaceae	Zaluzonic C (Ridoid)
Zanthoxylum sp.	Rutaceae	Nitidine (Benzoohenathridine)

100,000 women.
- Affects at least 116 out of every 100,000 women yearly.
- 500,000 new diagnoses would be made here by the end of 2010.
- 15% of the cases occur in women under 30 years.
- Most women present in advanced stages.
- With late presentation, many die within a short period**.**

Causes of BC

Risk factors include:

- Age: occurrence increases with age (peak is 35-50 years).
- Starting menstruation early, that is, before the age of 10 years.
- Reaching menopause late, that is, after the age of 55 years.
- Having one first child late, that is, after the age of 30 years.
- Breast feeding for very short periods.
- Having close family members who have had BC.
- Genetics' predispositions.
- Never had any children.
- Female with less than 3 pregnancies (LASG-MOH, 2009).

Figure 1 summarizes the unavoidable (inherited) and modifiable risk factors that can ultimately lead to tumorigenesis. Genes/pathways/risk factors are shown in red; inherited or unmodifiable factors are shown in green; modifiable variables are shown in blue; life events are represented by gray boxes; increased/positive effects are denoted by solid arrows; and reduced/negative effects are denoted by dashed arrows; AIs, aromatase inhibitors; *ATM*, ataxia telangiectasia mutated; *BRCA1* and *BRCA2* (genes in which deleterious germline mutations increase the risk of cancer); CAFs, cancer-associated fibroblasts; *CHEK2*, CHK2, checkpoint homolog; HRT, hormone replacement therapy; and SERMs, selective estrogen receptor modulators (Howell et al., 2005). BRCA1 and BRCA2 are tumor suppressor genes that are involved in

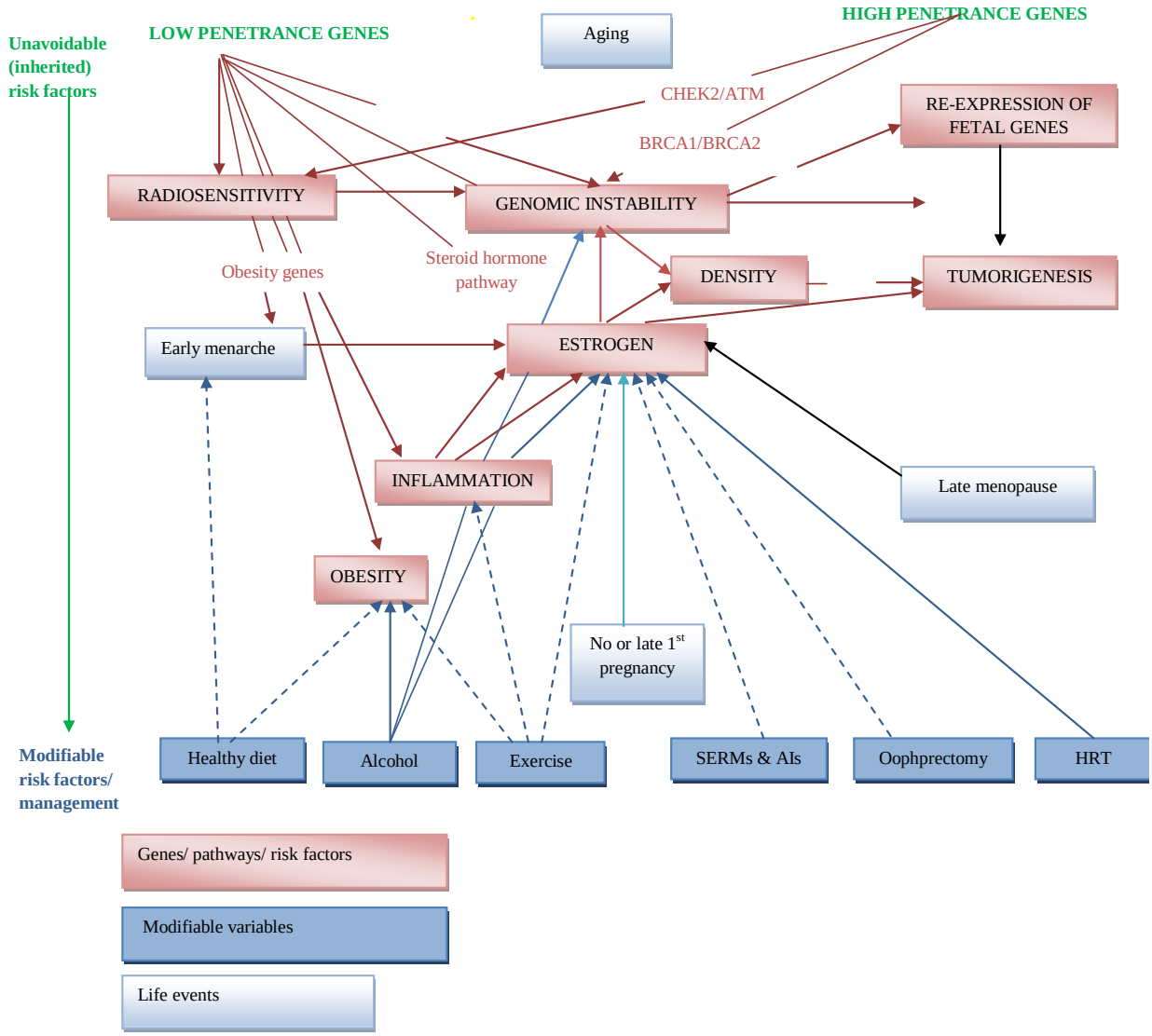

Figure 1. Overview of risk factors associated with breast cancer (Howell et al., 2005).

multiple cellular processes including DNA repair and transcriptional regulation in response to DNA damage, chromosomal stability and cell-cycle regulation (Bafford et al., 2008).

Over the course of the last decade, the treatment of breast cancer has evolved quite rapidly. New scientific and clinical advances have modified the standard of care and led to improved patient outcomes. At the same time, the treatment of breast cancer has become increasingly complex, requiring the comprehensive review and assessment of multiple issues, genetics, radiology, surgery, reconstruction, fertility radiation, chemotherapy, and more. As a result, the harmony and open communication between these specialties facilitated by a multidisciplinary team approach are crucial in providing the best care to patients and ensuring successful treatment (Taghian et al., 2009).

Complementary therapies

Complementary therapies are increasingly sought by cancer patients to control treatment-related symptoms. Unproven methods that do not actually treat cancer are often promoted falsely as cancer cures. These are termed “alternative therapies.” Typically expensive and potentially harmful, they can interact with chemotherapy drugs and other medication. Complementary therapies such as music, massage, acupuncture and meditation are noninvasive, gentle techniques applied to control physical and emotional symptoms commonly experienced by cancer patients. Plants are the most exclusive source of drugs for the majority of the world’s

Table 2. Concentrations of antitumor compounds present in higher plants (Baldi et al., 2007).

No.	Antitumor compound	Concn. [dry wt. %]
1	Baccharin	2.0×10–2
2	Bruceantin	1.0×10–2
3	Camptothecin	5.0×10–3
4	Ellipticine	3.2×10–5
5	Homoharringtonine	1.8×10–5
6	Maytansine	2.0×10–5
7	Podophyllotoxin	6.4×10–1
8	Taxol	5.0×10–1
9	Tripdiolide	1.0×10–3
10	Vinblastine, Vincristine	5.0×10–3

population, and plant products constitute about 25% of prescribed medicines. The impact of natural products upon anticancer drug discovery and design can be gauged by the fact that approximately 60% of all drugs, now in clinical trials for the treatment of cancer, are either natural products, compounds derived from natural products, or contain pharmacophores derived from natural products. These therapies are used as adjuncts to mainstream cancer treatment. Some important antitumor compounds isolated from different parts of higher plants are listed in Table 2. Patients and physicians should be aware of the distinction between questionable methods that are not helpful, and complementary therapies that successfully reduce symptoms and enhance quality of life. Easy access to information and misinformation about these therapies via the Internet and print media compounds this problem (Baldi et al., 2007; Cassileth et al., 2007).

As shown in Table 3, biologically-based practices were noted as the types of CAM most used by women with breast cancer, followed by mind-body medicine, whole medical systems, and energy medicine. Sources of information about CAM use for women with breast cancer vary widely, including family, friends, mass media, healthcare providers, CAM providers, and self-help groups. Sociodemographic factors that appear to be related to CAM use were younger age, higher education, higher income, married status, involvement in a support group, and health insurance. The reasons for CAM use reported by women with breast cancer were to help healing, to promote emotional health, and to cure cancer. Oncology nurses should obtain detailed information about CAM use by their patients and explore why women with breast cancer do not discuss the use of CAM with healthcare providers (Wanchai et al., 2010).

Diagnosis and treatment

One of the main causes of failure in the treatment of breast cancer is the intrinsic presence of, or development of, drug resistance by the cancer cells. Recent studies on the mechanisms of cancer drug resistance have yielded important information highlighting both how tumour cells may escape these therapeutic constraints and how drug resistance may further impinge on tumour cell functions that may ultimately promote an adverse cell phenotype. New targets have been identified with potential therapeutic applications in resistant breast cancer leading to the subsequent evaluation of inhibitors of these targets in preclinical studies. Importantly, there is increasing evidence from such studies demonstrating the benefit of novel combination strategies as potential avenues for future drug regimens (Hiscox et al., 2009).

Cancer can be treated in a number of ways:

(i) By surgery, to remove the tumor, sometimes with surrounding tissue and local lymph nodes. Surgery can also be done to remove part of a tumor or to relieve symptoms caused by the tumor.
(ii) By chemotherapy, treatment with drugs that destroy cancer cells or stop them from growing.
(iii) By biologic therapy, treatment with immune substances that destroy cancer cells or strengthen the ability of the immune system to destroy cancer cells.
(iv) By hormonal therapy, treatment that alters specific hormone levels in the body by stopping the production of the hormone, blocking the hormone, or adding hormone, thereby slowing or stopping the growth of cancer cells.
(v) By radiation therapy, the use of high-energy radiation to destroy cancer cells.

The mode of action of some promising chemo-therapeutics from natural origin and their derivatives is indicated in Table 4 (Baldi et al., 2007).

Surgery and radiation therapy are local treatments, directed to a particular part of the body. Chemotherapy, biologic therapy, and hormonal therapy are systemic treatments, which travel through the bloodstream to all parts of the body. Cancer treatments are constantly evolving as doctors better understand the biology of how cancers start and grow and as they develop new ways to perform less invasive surgery and to more precisely deliver radiation therapy. For many cancers, doctors use combined modality therapy, that is, a combination of treatments. Oncologists, doctors who specialize in the treatment of cancer, can recommend the type of treatment that is best for you. The treatment depends on the type of cancer, the stage of disease, and your general state of health. Depending on your situation, the goal of the treatment may be to cure the disease, to control the growth of the cancer, or to relieve symptoms and improve quality of life (that is, palliation) (Hiscox et al., 2009). Surgery, radiation treatment, and new advanced therapies available in the developed world contribute to good prognosis.

Nigeria remains ill-equipped to deal with the complexities of BC. Public health messaging is scheduled

Table 3. Complementary and Alternative Medicine use among women with breast cancer (Wanchai et al., 2010).

Study	Sample	Method	Types of CAM used	Sources of CAM Information	Sociodemographic Factors Related to CAM Use	Reasons for CAM Use
Abdullah et al., 2003	352 patients with breast cancer in Hong Kong, China	Self-administered questionnaires	Lingzhi (45%), shark cartilage (44%), fungi (29%), ginseng (14%), Qi gong (14%), and others such as herbs and vegetables, natural therapy, animal or animal extracts, or Chinese medical practitioners (35%)	Friends, family members or relatives, mass media, self-help groups, posters, brochures, and pamphlets	Younger age and higher education	Many believed CAM could serve as a supplement to orthodox treatment.
Alferi et al., 2001	231 African American, Hispanic American, and Caucasian women with early-stage breast cancer	Self-administered questionnaires	Meditation or imagery (29%), support groups (23%), psychotherapy (22%), spiritual healing (21%), herbal medications (14%), massage or body therapy (11%), and acupuncture (1%)	Not specified	Younger age and higher education	Not specified
Ashikaga et al., 2002	148 patients with breast cancer in Vermont	Face-to-face interviews	Vitamins (63%), herbal treatments (21%), meditation (21%), traditional massage (20%), yoga (12%), chiropractic (7%), homeopathy (7%), naturopathy (5%), acupuncture (5%), hypnosis (3%), and other (16%)	Not specified	Higher education, higher income, and younger age	Patients believed that CAM was helpful to recovery.
Balneaves et al., 1999	52 women with all stages of breast cancer in an urban center in central Canada	Face-to-face interviews	Meditation or relaxation (64%), vitamins or tonics (58%), spiritual or faith healing (54%), herbal remedies (50%), special food or diets (27%), immune therapies (23%), massage (19%), detoxification (17%), and shark cartilage (8%)	Not specified	Higher education	Patients believed that CAM assisted the body's natural ability to heal.
Balneaves et al., 2006	334 patients with breast cancer from central Canada who were chosen from a cancer registry	Self-administered questionnaires	Vitamin or mineral supplements (68%), herbal or plant (42%), spiritual therapies (35%), physical or movement therapies (32%), psychological or expressive therapies (24%), alternative medical systems (17%), energy therapies (16%), pharmacologic or biologic supplements (15%), diet therapies (10%), and others (3%)	Not specified	Higher education and younger age	Not specified

Table 3. Contd.

Burstein et al., 1999	480 women with early-stage breast cancer in Massachusetts	Telephone interviews	Psychological therapies such as relaxation, spiritual healing, and imagery (29%) and healing therapies such as megavitamin, herbs, massage, and acupuncture (28%)	Not specified	Higher education and younger age	Not specified
Chen et al., 2008	5,046 women with primary breast cancer in Shanghai, China	Face-to-face interviews	Supplements such as sporophyte, vitamins, fish oil, or ginseng (77%) and traditional Chinese medicine such as herbal medicine and acupuncture (71%)	Not specified	Higher education, higher income, being married, and younger age	To treat cancer, boost the immune system, and decrease menopausal symptoms
Chou et al., 2000	45 patients with breast cancer being treated at the University of California, Los Angeles, Medical Center	Face-to-face interviews	Vitamins, dietary changes, herbs, and spiritual healing	Family, friends, and media	Being married and younger age	To improve health, follow the physician's recommendations for vitamin intake, and decrease side effects of adjuvant treatments
Crocetti et al., 1998	242 patients with breast cancer in Italy	Self-administered questionnaires	Homeopathy, manual healing, herbs, and acupuncture	Not specified	Higher education and younger age	Physical distress
Cui et al., 2004	1,065 patients with breast cancer in Shanghai, China	Face-to-face interviews	Traditional Chinese medicine (87%); Chinese herb medicine (86%); supplements (85%); physical exercises such as Qi gong, tai chi, and gong fu (66%); support groups (17%); and acupuncture (5%)	Not specified	Higher education, having a younger age, being married, and higher income	Patients believed it would treat their cancer, enhance their immune system, prevent metastasis or manage other discomforts, and lessen menopausal symptoms.
Fasching et al., 2007	796 patients with breast cancer and 234 patients with gynecologic cancer in Duesseldorf, Germany	Face-to-face interviews	Dietary supplements (77%), mistletoe therapy (74%), enzymatic therapy (59%), immunoaugmentative therapy (55%), physical therapy (51%), traditional Chinese medicine (43%), biologic treatment (29%), cancer diets (20%), and psychological therapy (20%)	Physician, friends, family members, and a health insurance company	Not specified	Not specified

Table 3. Contd.

Gulluoglu et al., 2008	129 patients with breast cancer in North-Western Turkey	Self-administered questionnaires	Herbal medicine (67%) spiritual healing (24%), nutritional support (22%), dietary regulation (11%), physical exercise (11%), musical therapy (4%), massage (2%), acupuncture (2%), and meditation (2%)	Friends and relatives	Younger age and being married	To improve health status
Hann et al., 2006	166 women diagnosed with early-stage breast cancer in the North-Eastern United States	Telephone interviews	Dietary (54%), vitamins (44%), herbal methods (44%), physical method such as massage or acupuncture (44%), meditation (11%), and prayer (6%)	Not specified	Younger age, higher education, higher income, and attendance in a support group	Not specified
Helyer et al., 2006	32 women with locally advanced breast cancer in Toronto, Canada	Self-administered questionnaires	Dietary such as vitamins, minerals, and vegetarian or low-fat diets; herbal or homeopathy; psychological methods such as meditation, imagery, hypnosis, or faith; physical methods such as massage, acupuncture, yoga, or tai chi; and alternative providers such as chiropractor, naturopathic doctor, acupuncturist, or traditional Chinese medicine doctor	Not specified	Younger age, higher income, being married, Asian ethnicity, having private health insurance, and involvement in cancer support groups	Patients believed that CAM would assist body healing, boost the immune system, and give them a feeling of control.
Henderson & Donatelle, 2003	551 women diagnosed with breast cancer in Portland, OR	Telephone interviews	Relaxation or meditation (28%), herbs (26%), spiritual healing (26%), megavitamins or nutrient therapies (23%), massage (19%), imagery (13%), chiropractor (13%), naturopathy (13%), support groups (13%), lifestyle and diet (9%), immune therapy (5%), acupuncture (5%), energy healing (2%), biofeedback (2%), and hypnosis (1%)	Not specified	Higher education, younger age, and having private health insurance	To enhance overall quality of life, give feelings of control, strengthen the immune system, and reduce stress
Kremser et al., 2008	367 patients with breast cancer in Australia	Self-administered questionnaires	Vitamin supplements (54%), support groups (50%), massage (41%), meditation (39%), diets (24%), yoga (22%), herbal remedies (19%), juices (16%), Reiki (15%), acupuncture (14%), exercise (10%), reflexology (8%), homeopathy (8%), art therapy (5%), tai chi (5%), Chinese medicine (5%), dragon boating (5%), bach	Media such as Internet, magazines, newspapers, television, and radio; doctor; friends; other patients; family; support groups; naturopath practitioner; nurse; Chinese	Higher education and younger age	Patients believed CAM improved their physical and emotional well-being, boosted the immune system, reduced side effects of treatment, prevented the

Table 3. Contd.

			flowers (4%), naturopathy (4%), and shark cartilage (4%)	medicine practitioner; pharmacist; and homeopath		recurrence of cancer, treated cancer, and reduced symptoms associated with breast cancer.
Lee et al., 2000	379 women with breast cancer in San Francisco, CA	Telephone interviews	Mental methods (30%), dietary therapies (27%), physical methods (14%), herbal or homeopathy (14%), and others (1%)	Not specified	Younger age, higher education, having private insurance, higher income, and use of support groups	Not specified
Lengacher et al., 2006	105 patients with breast cancer in Florida	Self-administered questionnaires	Diet and nutritional supplements such as vitamins or minerals, macrobiotics, herbs, and antioxidants (68%); stress-reducing techniques such as art therapy, music therapy, humor, imagery, prayer or spiritual healing, yoga, or meditation (66%); and traditional and ethnic medicines such as massage, chiropractic, reflexology, therapeutic touch, and aromatherapy (11%)	Not specified	Higher education	Patients believed that CAM reduced physical symptoms or side effects, reduced psychological stress, addressed their dissatisfaction with traditional medical care, and helped them gain a sense of control.
Molassiotis et al., 2006	282 patients with breast cancer from 11 countries in Europe	Self-administered questionnaires	Herbal medicine (46%), spiritual therapies (21%), relaxation (21%), teas (20%), homeopathy (19%), vitamins or minerals (15%), massage (15%), visualization (10%), acupuncture (10%), animal extracts (9%), and support groups 8%)	Friends, family, media, CAM practitioners, Internet, nurses, physicians, and religious groups	Higher education and younger age	To fight cancer, improve physical and emotional well-being, increase hope and optimism, and counter ill effects
Montazeri et al., 2005	177 patients with breast cancer in Iran	Self-administered questionnaires	Prayer or spiritual healing (74%), bio energy (12%), homeopathy (3%), herbs (3%), acupuncture (2%), meditation (2%), yoga (2%), sports medicine (2%), and counseling (2%)	Not specified	No significant factors were found.	Not specified
Morris et al., 2000	288 patients with breast cancer and 329 patients with other forms of cancer from a tumor registry in the United States	Self-administered questionnaires	Nutrition (65%), massage (57%), herbs (49%), chiropractor (43%), relaxation (41%), and acupuncture (31%)	Not specified	Not specified	To relieve pain, control side effects, boost the immune system, and cure cancer

Table 3. Contd.

Moschèn et al., 2001	117 patients with breast cancer in Australia	Self-administered questionnaires	Vegetable drinks (53%), megavitamins (51%), mistletoe (49%), minerals (48%), special diets (36%), homeopathy (31%), special teas (29%), relaxation training (26%), enzyme (20%) and thymus preparations (15%), and other (29%)	Physicians, friends and other patients, magazines or books, and general practi-tioners	Higher education, younger age, more active style of coping, and greater religious involvement	Patients sought an active role in their treatment, had a wish to leave nothing untried, felt CAM complemented conventional treatment, and believed CAM was a gentle treatment free from adverse effects.
Navo et al., 2004	250 patients with breast cancer and 250 patients with gynecologic cancer in Texas	Face-to-face interviews	Megavitamins or minerals (59%) and herbals such as glucosamine chondroitin, garlic, CQ 10, green tea, flaxseed, and fish oil (47%)	Media, friends and family, health profes-sionals, alternative care specialists, and formal education	Older age and higher education	To improve overall health, reduce adverse drug reactions, improve quality of life, and treat cancer
Owens et al., 2009	125 Hispanic patients with cancer in Texas	Self-administered questionnaires	Prayer (93%), humor (83%), music (70%), exercise (65%), relaxation therapy (44%), spirituality (40%), imagery (32%), massage (27%), herbs (26%), folk therapy (22%), group therapy (17%), diet (16%), energy therapy (11%), yoga (11%), biotherapy (10%), homeopathy (7%), chiropractor (6%), Reiki (5%), acupuncture (4%), and hypnosis (2%)	Not specified	Higher income	Not specified
Patterson et al., 2002	126 patients with breast cancer, 114 with prostate cancer, and 116 with colorectal cancer in Wash-ington	Telephone interviews	Dietary supplements (65%); mental therapies such as meditation, spiritual activities, and prayer (19%); and alternative providers such as naturopathic physicians, massage therapists, and spiritual advisors (17%)	Not specified	Higher education	Patients used CAM for general health and well-being, to treat their cancer, to ease cancer-related symptoms, and to treat other diseases.
Rakovitch et al., 2005	251 women diagnosed with breast cancer in Toronto, Canada	Self-administered questionnaires	Dietary methods such as vitamins and low-fat vegetarian diets (91%), psychological methods such as meditation and relaxation (54%), physical therapies such as massage (39%), and herbal or homeopathy (31%)	Not specified	Higher education, younger age, having private health insur-ance, and having full-time employment	To cure cancer, prevent the spread and recurrence of cancer, assist other treat-ments, relieve symptoms,

Table 3. Contd.

						boost the immune system, increase quality of life, and give a feeling of control
Rees et al., 2000	714 women with breast cancer in South Thames, United Kingdom	Self-administered questionnaires	Massage or aromatherapy (14%); psychotherapy (13%); chiropractic or osteopathy (10%); relaxation, yoga, and meditation (8%); healing (8%); reflexology (7%); homeopathy (6%); acupuncture (5%); herbal medicine (3%); nutrition (3%); hypnotherapy (2%); and use of support groups (1%)	Not specified	Higher education, younger age, and previous CAM use	To cure or slow down cancer and relieve symptoms
Richardson et al., 2000	60 patients with breast cancer and 393 patients with other forms of cancer in Texas	Self-administered questionnaires	Spiritual practices (81%), vitamins or herbs (63%), movement or physical therapies (59%), mind or body (49%), psychotherapy (41%), special diet (32%), and other (11%)	Not specified	Younger age	Patients felt hopeful when using CAM, believed it to be nontoxic, and felt that CAM use addressed their need for more control.
Salmenpera, 2002	216 patients with breast cancer and 190 patients with prostate cancer in South-Western Finland	Self-administered questionnaires	Vitamins, trace elements, or antioxidant treatments; dietary supplements and natural products; spiritual healing; homeopathy and extract of mistletoe; and other types such as aromatherapy and reflexology	Family or friends, reading, and healthcare professionals	Higher education and younger age	Patients believed they were doing as much as they could do; CAM gave them hope and addressed their disappointment in conventional treatments.
Shen et al., 2002	115 patients with advanced-stage breast cancer in an urban center in the United States	Face-to-face structured interviews	Herbal medicine, tai chi, yoga, Qi gong, imagery, spiritual healing, massage, megavitamin, shark cartilage, special diets, energy healing, acupuncture, hypnosis, chiropractic, biofeedback, homeopathy, and folk remedies	Friends, family members, mass media, healthcare professionals, and CAM practitioners	Higher education	To boost the immune system, treat cancer, relieve side effects of treatment, relieve symptoms, reduce stress, and trigger detoxification

Table 3. Contd.

Vande-Greek et al., 1999	112 women with early-stage breast cancer in the United States	Face-to-face interviews	Prayer (76%), exercise (38%), spiritual healing (29%), megavitamins (25%), relaxation (21%), self-help groups (21%), imagery (19%), herbs (14%), and massage (10%)	Internet	Not specified	Influence from family folklore
Van der Weg & Streuli, 2003	53 patients with breast cancer and 55 patients with other forms of cancer in a rural area of Switzerland	Face-to-face interviews	Mistletoe (74%), homeopathy (24%), diets (12%), bach flower remedies (10%), music and color therapy (7%), massage (7%), spiritual healing (7%), metals and crystals (7%), hypnosis (2%), acupuncture (2%), osteopathy (2%), bio-feedback (2%), and Simonton therapy (2%)	Not specified	Not specified	Patients wanted to do as much as possible, to feel more hopeful, and to harness their mental energy; they also believed CAM was nontoxic, corresponded well to their lifestyles, addressed their disappointment in conventional treatment, and helped them avoid chemotherapy or radiotherapy.
Yap et al., 2004	290 women diagnosed with early-stage invasive breast cancer in Toronto, Canada	Self-administered questionnaires	Extracts from organisms such as evening primrose oil or fish oil (28%), herbal therapies (24%), minerals (11%), energy life force therapies such as acupuncture and life path (5%), vitamins (3%), immune boosters (1%), diet therapies (1%), and drugs (1%)	Not specified	Younger age	Not specified

to increase, but testing and care facilities are few, unevenly distributed, and old. Most of the patients need radiation treatment, chemotherapy, and hormonal replacement therapy because of heavy disease load on the breast and metastasis. Treatment cost is prohibitive (Nigeria's annual GDP is about 7%). Healthcare spending has not been a priority of our government. Surgery for advanced BC in Nigeria features mastectomies predominance and cases with small volume of breast disease (or post neoadjuvant) (LASG-MOH, 2009; Ogundiran and Ezeome, 2008; Globalpressinstitute, 2012). It is complacent to continue subjecting at least 70% of women with breast cancer to surgery, a futile mutilating procedure. There is no evidence that early mastectomy affects survival; if patients knew this, they would most likely refuse surgery. Basically, all types and combinations of conventional breast cancer treatment appear to result in the same low long-term survival rates (Last, 2010).

Treatment cost

In Nigeria, the cost of BC treatment is minimally put at:

(i) Histology - ₦10,000 ($90.00) per month ₦25,000 ($225.00) per week, for 4 weeks.

Table 4. Some chemotherapeutic products from natural sources, and their mode of action (Baldi et al., 2007).

Source	Natural compounds or its derivatives	Mode of action	Cancer inhibited
Podophyllum spp.	Podophyllotoxin (Natural)	As a mitotic spindle poison, binds the microtubule and causes mitotic arrest in Metaphase	Lung
	Etoposide and teniposode (Semisynthetic derivatives)	Induce a premitotic blockage in the cell cycle, at two specific places, either in late S-phase or in early G-phase, by binding to and stabilizing the cleavable complex of DNA–topoisomerase II.	Lung, testicular, leukemias
Taxus baccata	10-Deacetyl Baccatin 111:Docetaxel (Semisynthetic derivatives)	Promotes tubulin assembly and inhibition of microtubule depolymerization; also acts as a mitotic spindle poison and induced mitotic block in proliferative cells.	Breast, ovarian, nonsmall- cell lung, head and neck, colorectal melanoma
Taxus brevifolia	Paclitaxel (Natural)	Promotes assembly of microtubules, stabilizes them against depolymerization, and inhibits cell replication; causes cell apoptosis.	Advanced breast, ovarian, adenocarcinoma, and other solid tumors
Camptotheca acuminata	10-hydroxy camptothecin, (Natural) Irinotecan (CPT-11), SN-38 (Semisynthetic derivatives)	Inhibits action of topoisomerase I, prevents religation of DNA strand, results in cell death.	Liver, colorectal, head and neck cancer, leukemia

(ii) Cytology - ₦5,000 ($45.00).
(iii) Mammogram - ₦7,000 ($55.00) per session for several sessions.
(iv) Chest x-ray - ₦1,000 ($10.00).
(v) ECG - ₦750 ($7.50).
(vi) Radiotherapy - ₦100,000 ($900.00).
(vii) Chemotherapy - ₦28,000 - ₦35,000 ($228.00 - $315.00) (for six sessions with interval of three weeks).
(viii) Laboratory tests - ₦30,000 ($270.00).
(ix) Treatment/surgery - ₦150,000 - ₦200,000 ($1,300.00 - $1,800.00) (depending on the severity/complexity of each cancer case) (LASG-MOH, 2009).

Prevalence rates of complementary therapy use by women with breast cancer have been estimated to range from 31.5 to 73%. The most common complementary therapies used by women with breast cancer include vitamin/mineral supplements, meditation/relaxation therapies, natural-health products, and spiritual therapies (Balneaves et al., 2006). An alternative and comprehensive approach is distinct in that the evaluation of each woman lends a great deal of attention not only to individual symptoms, but also to her individual risks for future diseases (Hudson, 2008). Approximately 41% of women are utilizing CAM forms of medicine to manage their BC, including products from the *Morinda citrifolia* (Noni) plant (Clafshenkel et al., 2012). Complementary and Holistic Medicine using MAPs have become significant in BC treatment and prevention. Numerous studies (128 out of 135 dietary studies) indicated that increased vegetable and fruit consumption by humans significantly reduced the risk of BC (Borek, 2010).

Vegetables and fruits

Vegetable and fruits have a high content of healthy components as vitamins, minerals, and fibers. Epidemiological evidence supports a diet rich in whole fruits and vegetables in the prevention of fibrocystic breast conditions. An international review estimated that increased fruit and vegetable consumption could prevent 5-12% of worldwide cancer burden (Table 5) (Hudson, 2008; Irimie et al., 2010).

Although a systematic review of fruit and vegetable consumption interventions has shown that face-to-face methods are most effective, telephone counselling is seen as an effective alternative and behaviour change tool for fruit and vegetable consumption in both healthy and ill people, with reported long-term success (up to 4 years) in a randomized trial of BC survivors (Yeh et al., 2010).

In China, 'kiwifruit' is widely used for plants in the genus *Actinidia Lindl*., and the fruit they produce. In *Actinidia* species, *mihoutao* are used to treat BC and

Table 5. Frequency of different food consumption (Irimie et al., 2010).

Category	More times/day %	Once/day %	2-3 times/week %	Once/week %	Less frequent %
Fruits	30.6	22.22	39.68	3.17	4.76
Vegetables	19.05	20.63	44.44	7.94	7.44
Saturated fats	1.59	9.52	26.98	19.05	42.86
Vegetable fats	10.64	27.66	38.30	21.28	2.13
White meat	7.81	32.81	45.31	7.81	6.25
Red meat	1.85	46.30	38.89	11.11	1.85
Fried meat	3.13	4.69	35.94	20.31	35.94
Diary products	11.11	14.29	44.44	17.46	12.70

Table 6. The practice of CAM, alternative and complementary medicine by cancer type (Malak et al., 2009).

Cancer site	Complementary and Alternative Medicine (CAM)		Alternative Therapy (AT)	Complementary Medicine (CM)
	User	Non-user	User	User
Breast cancer	13 (100)	-	11(84.6)	13 (100)
Lung cancer	10 (83.3)	2 (16.7)	9 (75.0)	6 (50.0)
Brain cancer	6 (85.8)	1 (14.2)	5 (71.4)	4 (57.1)
Prostate cancer	3 (60.0)	2 (40.0)	3 (60.0)	3 (60.0)
Colon cancer	4 (100)	-	3 (75.0)	4 (100)
Pancreatic cancer	3 (100)	-	3 (100)	2 (66.6)
Other	9 (81.9)	2 (18.1)	6 (54.5)	6 (54.5)
Total	**48 (87.2)**	**7 (12.8)**	**40 (72.7)**	**36 (65.5)**

cancers of the digestive system (Hunter et al., 2010; Wang and Gleave, 2012). *Persea americana Mill* (family: *Lauraceae*), commonly known as: 'avocado', 'avocado pear', 'Mexican avocado' and so on, is a medium-sized, single-stemmed, terrestrial, erect, perennial, deciduous, evergreen tree of 15-20 m in height. The leaves and other morphological parts of *P. americana* possess medicinal properties, and are widely used in traditional medicines of many African countries. In Nigeria, the leaves of *P. americana* have been used as an effective antitussive, antidiabetic, antihypertensive; and as analgesic and anti-inflammatory remedies. The root bark of *P. americana* (RPA) extract includes chemical compounds with estrogen-like activity and validates its potential use as anticancer agent, particularly against breast carcinoma, provided important information is potentially helpful in drug designing and discovery. RPA demonstrated a significant ($P < 0.05$) anti-proliferative activity against estrogen receptor positive breast cancer cell lines (MCF-7) (Engel et al., 2011). Vinblastine and vincristine are primarily used in combination with other cancer chemotherapeutic drugs for treating breast and lung cancers (Shoeb, 2006). Malak et al. (2009) reported in their study that 87.2% (n: 48) patients practiced CAM. 72.7% of the patients practicing CAM applied alternative therapy and 65.5% applied complementary therapy. CAM practice had been determined in all patients with BC (n: 13) as reflected in Table 6.

Wearing a bra less than 12 h per day improved the risk to one out of 152, a rate reasonably close to women who wear bras rarely or never; they have a one out of 168 chance of BC. A tight bra blocks the lymph circulation in the breasts and is much worse than a loose-fitting bra (Last, 2010). This paper presents an ethnobotanical survey of MAPs-based foods for effective BC treatment.

METHODS

The major risk factors for BC were gathered and codified from 70 orthodox medical practitioners and textbooks. Questionnaires followed by face-to-face interviews were randomly administered to the 70 physicians from February 2009 to June 2012. Specific ethnobotanical data on medicinal plants having anticancer properties were randomly collected, recorded, and discussed through personal contacts in the field, local markets (*elewe-omo*), CAM practitioners, and community leaders. 500 CAM practitioners in Akure, Idanre, Ondo, Owo, and Supare towns in Ondo State of Nigeria who know and use MAPs for treating various diseases were interviewed using randomly administered semi-structured interview technique. The interviewers were taken on guided

Figure 2. Guided field-work on MAP data collection.

fieldworks through the areas where informants collected MAPs. MAP uses were discussed in detail with informants, after seeking prior informed consent from each respondent as exemplified in Figure 2.

Similar questionnaire method had been used by Moschèn et al. (2001), Patterson et al. (2002), Rakovitch et al. (2005), Hann et al. (2006) and Fasching et al. (2007) cited by Wanchai et al. (2010). Odugbemi (2010) shown in Figure 3 had also employed a similar method.

Additional data on MAPs were also collected from other published literature sources including Amusan (2010), Christian (2009), Dama et al. (2010), Dog (2010), Hywood (2010), Idu et al. (2010), NNMDA (2010), Olowokudejo et al. (2008), Rao et al. (2011) and WHO (2009); phytochemical databases; reputably cognate internet-based MAPs' sources; and internet peer-reviewed articles from NCCAM, EBSCO, SCOPUS, Web of Science, SCIELO, Medline, Google scholar, and PubMed databases using BC-related keywords. BC-related search keywords included "breast cancer", "women's health and cancer", "cancer-related morbidity", "cancer treatment with phytotherapy", "CAM and breast cancer", "alternative treatment/therapies and breast cancer", and "complementary and breast cancer", etc. To ensure that studies focused specifically on women with breast cancer, the authors retrieved documents that contained the words *breast cancer patients* or *women with breast cancer* within their titles or abstracts as adopted by Wanchai et al. (2010). Adverse reactions of each MAP for BC treatment were documented.

RESULTS

BC's major risk factors include earlier menarche, woman's age, overweight, hormone replacement therapy, eating high-fat diet, wearing a tight bra always, infertility, having the first child after age 35, and having dense breasts. The assembled MAPs' species belonged to 102 families where Leguminosae family topped the frequency table with 22 entries as shown in Table 7 and Figures 4 and 5. It was observed that 10% of the surveyed MAPs yielded Adzuki bean *(Phaseolus angularis*), Alfalfa (*Medicago sativa*), Asparagus *(Asparagus officinalis*), Avocado pear (*Persea Americana),* Broccoli *(Brassica oleracea* var. *italica*), Burdock *(Arctium lappa*), Cabbage *(Brassica oleracea* var. *capitata*), Chinese yam *(Dioscorea alata*), Dandelion *(Taraxacum officinale*), Noni *(Morinda citrifolia*), Onion (*Allium cepa*), and Tomato *(Lycopersicon esculentum*) in effectively treating BC in Nigeria.

Watercress (*Nasturtium officinale*, *Rorippa nasturtium-aquaticum)* and Watermelon (*Citrullus vulgaris, C. lanatus*) were listed to stop the menace of BC and hypertension.

Anticancer compounds found in vegetables include lycopene in tomatoes; lutein and beta-carotene in carrots,

(a) Medicinal Plant farm **(b) Guided Field-Walk**

Figure 3. Medicinal_plants_in_Nigeria.com (Odugbemi, 2010).

Table 7. Collected breast cancer-related medicinal and aromatic plants (MAPs).

Species / Scientific Name	***Family Name***	***Common Name(s)***	***Local Names (Yoruba Language)***	***Parts Used***	***Medicinal Use(S)***	***Graphics***	***Other Published Source(s)***
Annona senegalensis	Annonaceae	African custard apple	Abo	Root, bark, leaves, seeds	Cancer, dysentery, cough, venereal diseases, toothache, astringent, anthelmintic, ease labour, eye drops, tumour out growth, ant-bee sting		Odugbemi, 2010; Osemeobo, 2010
Arctium lappa		Burdock			breast cancer		
Asparagus officinalis		Asparagus		Roots	breast cancer		Dama et al. 2010
Brassica oleracea var. *capitata*		Cabbage			breast cancer		
Brassica oleracea var. *italica*		Broccoli			breast cancer		
Bryophyllum pinnatum	Crassulaceae	Resurrection plant, life plant	Eru-odundun, Abamoda	Leaves, roots, leaf sap	Cough, diarrhoea, dysentery, wounds, fever, sedative, diuretic, epilepsy, antifungal, antimicrobial, anticancer		Olowokudejo et al. 2008

Table 7. Contd.

Carica papaya	Caricaceae	Pawpaw	Ibepe	Leaves, fruits, seeds	With the bark of *Mangifera indica* to cure malaria; gonorrhoea, syphilis, amoebic dysentery, diabetes, mental disorder, convulsion; papain as meat tendirizer and as digester in breweries.		
Citrullus vulgaris, C. lanatus		Watermelon	Egusi-baara		breast cancer		
Dioscorea alata		Chinese yam			breast cancer		
Garcinia cola	Guttiferae	Bitter cola	Orogbo	Seeds, root, stem-bark, fruits	Dysentery, bronchitis, cough, fever, toothache, throat and respiratory ailments, liver disorders, headache, anticancer.		Olowokudejo et al. 2008
Habenaria roxburghii (Pers.) R.Br.	Orchidaceae			Tuber paste	Breast cancer		
Hedera nepalensis K.Koch [Da Wano Kalay]	Araliaceae			Leaves	Anticancer Artemisia brevifolia		Hamayun et al. 2006
Lycopersicon esculentum		Tomato			breast cancer		
Morinda citrifolia		Noni		Fruits, roots, bark, stems, flowers leaves (all parts)	breast cancer, infection, arthritis, diabetes, asthma, hypertension, and pain		Dama et al. 2010
Nasturtium officinale, *Rorippa nasturtium-aquaticum*		Watercress			breast cancer		
Persea americana (RPA)	Lauraceae	Avocado pear		Root	Breast cancer, threatened abortion, ulcer		Engel et al. 2011

Table 7. Contd.

Phaseolus angularis		Adzuki bean			breast cancer		
Pterocarpus erinaceus	Leguminosae	African rose wood	Gbingbin, Imo-osun, Apepo, Agbelosun	Leaves, stem-bark	Insomnia, dysentery, dermatomycosis, breast cancer fever, diarrhoea		Olowokudejo et al. 2008
Pterocarpus erinaceus	Leguminosae		Apepo, Agbelosun	Leaves, stem-bark	Insomnia, dermatomycosis, breast cancer fever, dysentery, diarrhoea		
Taraxacum officinale		Dandelion			breast cancer		
Vernonia colorata	Asteraceae	Bitter tree	Eriro-Ijebu	Root, leaves	Antipyretic, antihelmintic, astringent; skin diseases, gonorrhoea, anaemia, poison antidote, prostrate cancer, loss of memory, stroke		Olowokudejo et al. 2008
Viola biflora L. [Banafsha]	Violaceae			Flower	Diaphoretic, antipyretic, febrifuge, cancer, epilepsy and nervous disorders		Hamayun et al. 2006
Viola canescens Wall. ex Roxb [Banafsha]	Violaceae			Whole plant	Astringent, demulcent, purgative, diaphoretic, antipyretic, febrifuge and anti cancerous		Hamayun et al. 2006
Viscum album	Loranthaceae	Mistletoe	Afomo	Whole plant	All purpose herb for cancer, anaemia, HBP, diabetes, stroke, hysteria, amenorrhoea, Infertility, dysmenorrhoea; emetic.		Olowokudejo et al. 2008
Zanthoxylum xanthoxyloides	Rutaceae		Orin ata	Bark, root	Sickle cell anaemia, venereal diseases, cough, tuberculosis, cancers, urinary disorders, arthritis, gonorrhoea		Olowokudejo et al. 2008

Table 7. Contd.

Zingiber officinale Rosc	Zingiberaceae	Common Ginger	Jinja, Atale, Atalekopa, Lali-funfun	Rhizome, Root	Cold, cough, asthma, cholera stimulant, rheumatism, piles, hepatitis, liver diseases, obesity, typhoid fever, malaria, digestive disorders, typhoid, anaemia, cancer, dysentery, Dysmenorrhoea		Olowokudejo et al. 2008, Idu et al. 2010, Osemeobo, 2010

Figure 4. Watermelon and other fruits' hawker, Lagos, Nigeria.

pumpkin, and squash; and allyl sulfides in onions and garlic; and sulforaphane in broccoli, cabbage and Brussels sprouts. BC constituted 10% of the prevalent diseases treated with MAPs (Figure 6).

The database of a previously developed software by this author (Multimedia-based Medicinal Plants Sustainability Management System - MMPSMS) to address MAPs' extinction challenge was populated with the discovered vegetables and fruits using the interfaces shown in Figure 7.

Figure 8 shows the video of the salient details of a retrieved plant, *Zingiber officinale* Rosc (Common Ginger) for treating asthma, stimulant, piles, hepatitis, liver diseases, obesity, typhoid, anaemia, cancer, dysentery, dysmenorrhoea, etc., which could be viewed, and its audio feature played.

Morinda citrifolia's fruits, roots, bark, stems, flowers and leaves (in fact, all parts) have become renowned for handling breast cancer, infection, arthritis, diabetes, asthma, hypertension, and pain. Little wonder as when approximately 41% of women utilizing CAM forms of medicine to manage their BC include products from the *Morinda citrifolia* (Noni) plant. *Morinda citrifolia*'s efficacious distinction has made it being planted by several people around their residence as shown in Figure 9.

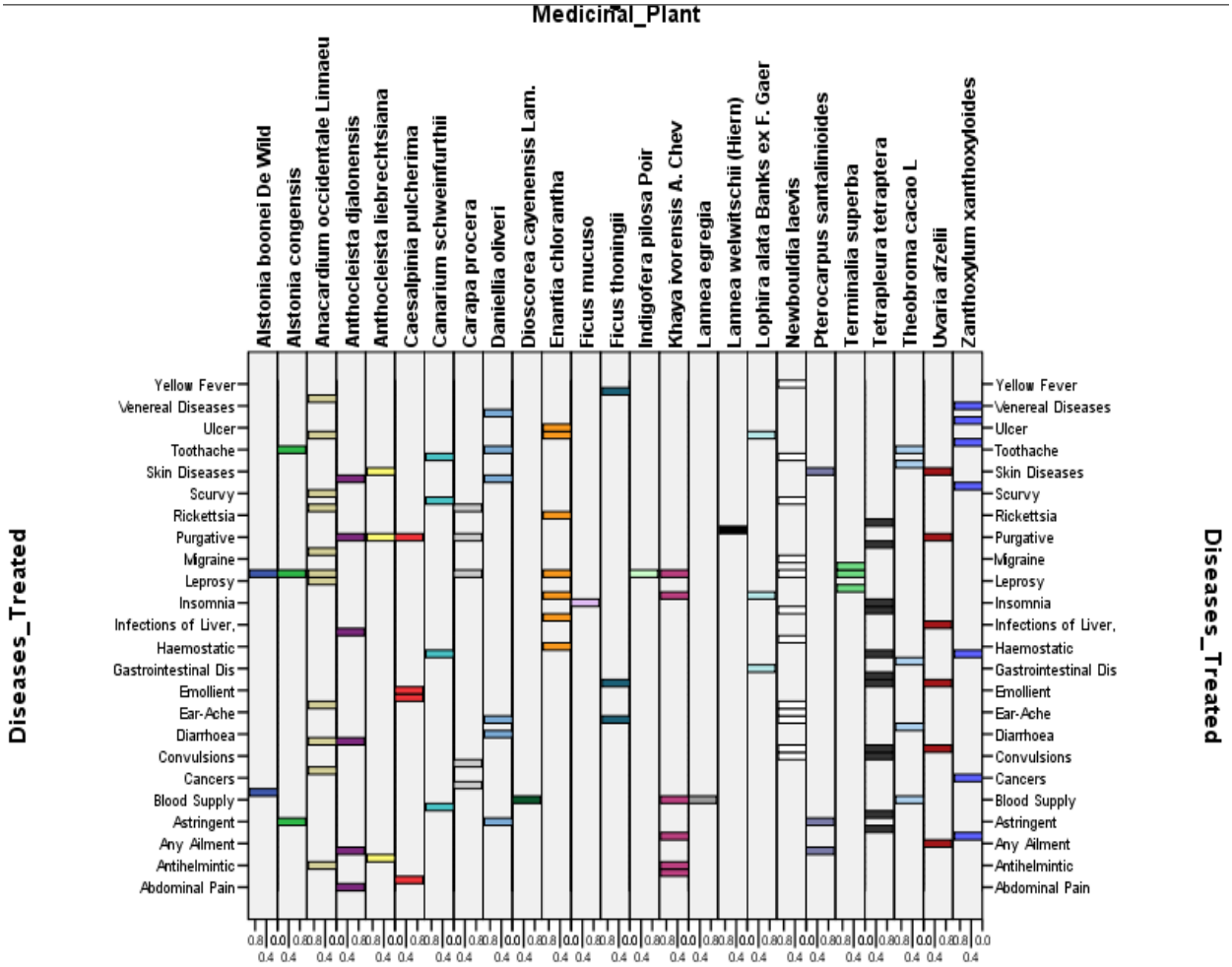

Figure 5. Medicinal_Plants versus Diseases_Treated Matrix.

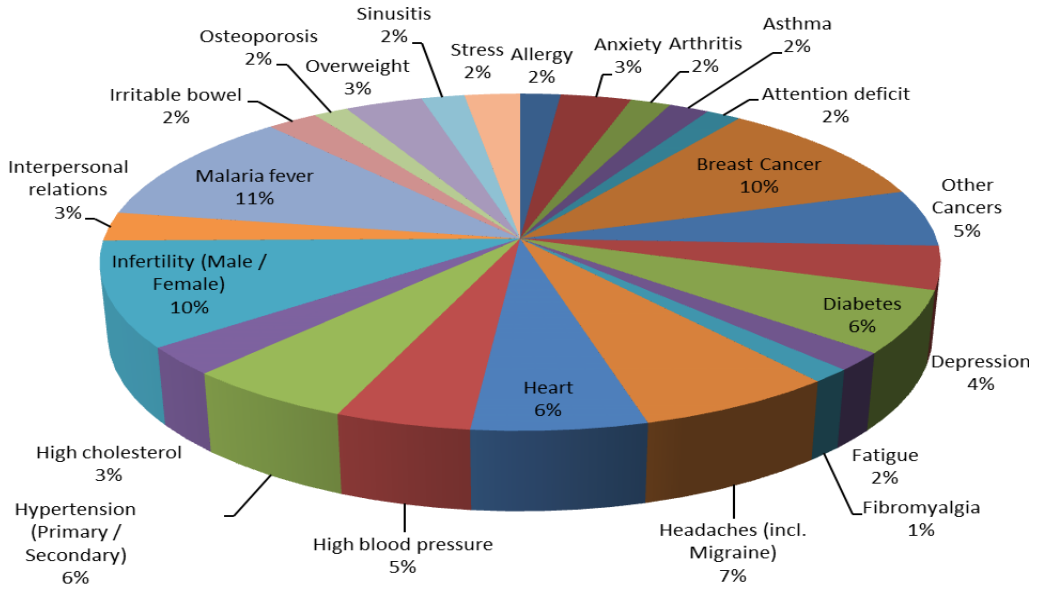

Figure 6. Patients Prevalent Diseases Treated with MAPs.

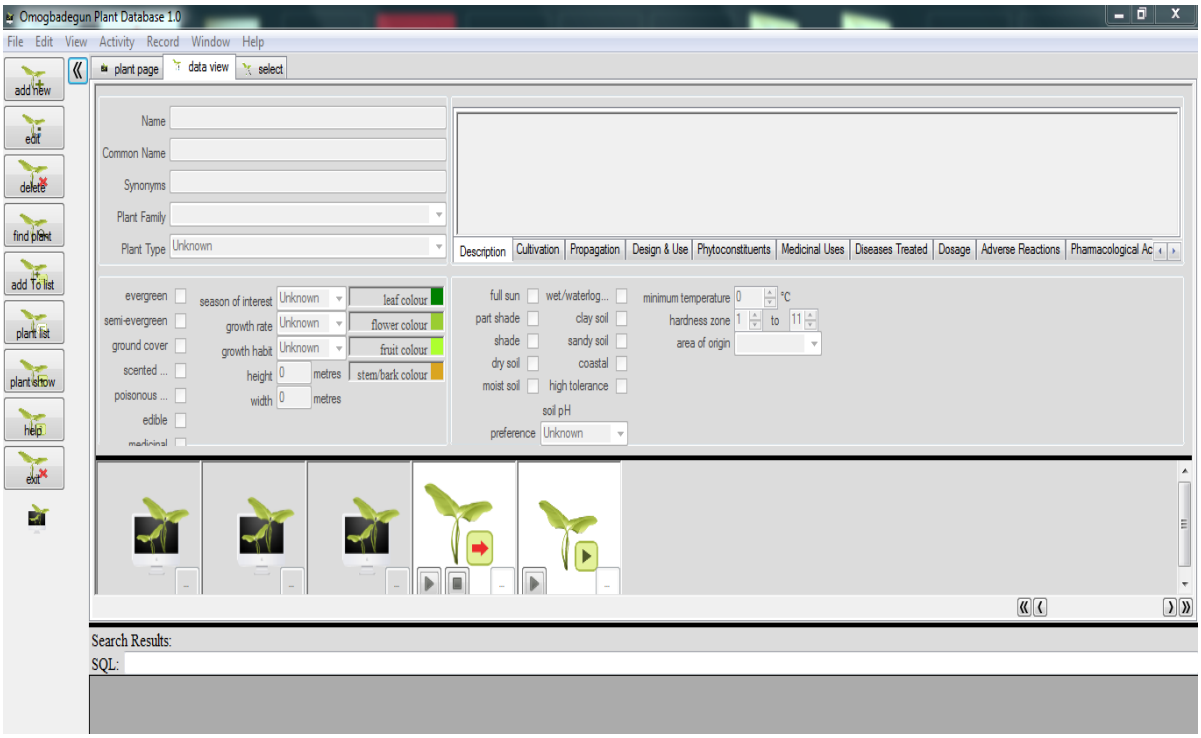

Figure 7. Multimedia-based medicinal plants sustainability management system (MMPSMS) interface.

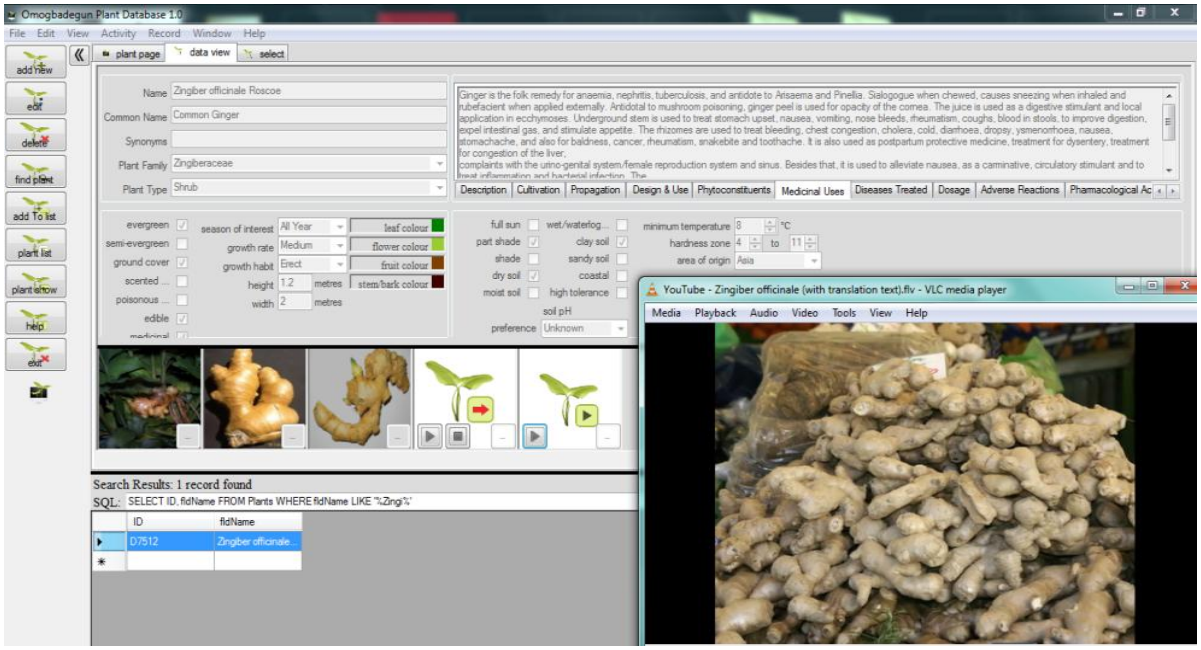

Figure 8. Enquiry from MMPSMS showing diseases treated with a plant.

Conclusion

BC, an important and potentially fatal condition, is associated with both genetic and non-genetic risk factors. Wearing a tight bra always blocks the lymph circulation in the breasts thereby increasing BC risk. Orthodox BC treatments have devastating effects including temporary infertility. Women with breast cancer seek CAM more

Figure 9. *Morinda citrifolia* (Noni) around residence.

than other patient populations with cancer. BC patients should take several portions of macrobiotic diet daily, while nutritional antioxidant effects on immune functions in relation to the pathogenesis of cancer and atherosclerosis deserve increased research effort, given their effect on mortality and morbidity. Although botanical gardens used to ensure sustainable availability of efficacious medicinal and aromatic plants in treating ailments and diseases are established, other barriers impeding acceptance of CAM into conventional healthcare delivery system should be identified and overcome. A Board of Traditional Medicine Practitioners (BTMP) under each State's Ministry of Health should be established to regulate the practice of biologically-based phytomedicine by CAM practitioners. Researches for a paradigmatic approach to CAM integration that could create a common basis for scientific dialogue, encourage exchanges between medical communities, and establish policies for the development of a true multidisciplinary health care cooperative that is consistent with the current public health model should be encouraged and funded by governments.

Digitization of the MAPs achieved in this project would help health care providers and decision-makers make informed clinical and management decisions based on evidence, so they could choose care appropriate to the individual, and share knowledge and experience. Data mining and data warehousing capabilities that would give health managers new knowledge and insights into a wide range of health trends and enable them to manage resources better would be facilitated by this research effort. Health care professionals would have access to more data on prevention, health hazards and diseases, and be better equipped to understand the impact of lifestyle, environmental hazards and socioeconomic status on the health of the population. More health and healthcare researches would be needed in order to reduce the uncertainty associated with the diagnosis, treatment and delivery of health care to all of the people in our society who are in need of it.

ACKNOWLEDGEMENTS

The author is grateful to Dr. Godwin Adebose Olawale (Physician [Public and Reproductive Health] and Consultant to National Primary Healthcare Development Agency, Ministry of Health, Akure, Ondo State); Dr. Michael Adeboro Alabi (Physician, St. Michael Medical Centre, Akure, Ondo State); Dr. Funsho Oladipo (Physician, RJolad Hospital Nig. Ltd, Bariga, Lagos); Dr. Toogun (Physician and Chief Medical Director, Covenant University Health Centre Services, Ota, Ogun State); Engineer Reuben Olanipekun Aladetoyinbo (Director, Ministry of Agriculture, Akure, Ondo State - posthumously); Professor Adetokunbo Babatunde Sofoluwe (Professor of Computer Sciences and Vice-Chancellor, University of Lagos, Lagos - posthumously); Professor Charles Onuwa Uwadia (Professor of Computer Sciences, University of Lagos, Lagos); Professor Charles Korede Ayo (Professor of Computer and Information Sciences and Vice-Chancellor, Covenant University, Ota, Ogun State); Professor Louis Osayenum Egwari (Professor of Biological and Medical Sciences Research, Covenant University, Ota, Ogun State); Professor Victor W. Mbarika (Professor of Management Information Sciences and Healthcare Informatics Research, Southern University and A&M College, Baton Rouge, Louisiana, USA); Dr. Nicholas Omoregbe (Senior Lecturer of Computer Science and Healthcare Informatics Researcher, Covenant University, Ota, Ogun State); Chief Pius Oluwole Akinyelure (Idanre, Ondo State); Dr. (Mrs) Mary Adeyanju (Registered Nurse, Diabetes / HIV Educator, and Director of Nursing Services Department, Ministry of Health, Ado-Ekiti, Ekiti State); Mrs. Florence Rogbitan (Registered Nurse/Midwife (Retired), Supare-Akoko South West, Ondo State); Mrs. Mary Adesida (Registered Nurse/Midwife, National Orthopaedic Hospital, Yaba-Lagos); Mrs. Elizabeth Iyabo (Registered Nurse/Midwife, Lagos State University Teaching Hospital, Ikeja-Lagos); Mrs. Behinda 'Bunmi Asotun (Registered Nurse/Midwife, Government State Hospital, Ondo, Ondo

State); Miss Oluwayemisi 'Tosin Oluwasusi (Registered Nurse, Government State Hospital, Ado-Ekiti, Ekiti State); Mrs. Chikaodili Amalachi Ukegbu (Pharmacist, The Federal Polytechnic Medical Centre, Ado-Ekiti, Ekiti State); Dr. S.A. Fewesola (CAM Practitioner, Ota, Ogun State); Mr. Ehis Idiahi (CAM Practitioner, Benin City, Edo State); Mr. Fidelis Tapfuma (Johannesburg, South Africa), Pastor Olu Ayeni (Nestle Nig. Plc, Lagos); staff of NAFDAC (Lagos, Nigeria); International Institute of Tropical Agriculture (IITA), Ibadan; staff of Forestry Research Institute of Nigeria (FRIN), Ibadan; National Institute of Horticultural Research (NIHR), Ibadan; University Botanical Garden, Ibadan; CAM Patients (names withheld); and Traders, herbs hawkers, numerous CAM practitioners in Akungba-Akoko, Idanre, Oba-Akoko, Oka-Akoko, Ondo, Owo, and Supare-Akoko (Ondo State, Nigeria), Ijebu-Ode, Ota, and Abeokuta (Ogun State, Nigeria); and Agege, Mushin, Oyingbo, Lagos (Lagos State, Nigeria) for their time, input, support and cooperation.

REFERENCES

Alaoui-Jamali M (2010). *Alternative and Complementary Therapies for Cancer: Integrative Approaches and Discovery of Conventional Drugs*, 1st Edition, Springer.

Amusan OG (2010). Herbal Medicine in Swaziland: An Overview. In: Juliani HRD, Simon JE, Ho CT, eds. *African Natural Plant Products: New Discoveries and Challenges* in *Chemistry and Quality (American Chemical Society Symposium Series)*, Oxford University Press, USA, pp. 26-44.

Bafford AC, Garber JE, Chittenden A, Golshan M (2008). Young Breast Cancer Patients Undergoing Breast-Conserving Therapy: Role of BRCA1 and BRCA2. In: In: Hayat MA, ed. *Methods of Cancer Diagnosis, Therapy, and Prognosis, Volume 1 Breast Carcinoma*, Springer Science + Business Media B.V, pp. 515-523.

Baldi A, Bisaria VS, Srivastava AK (2007). Biotechnological Approaches for the Production of some Promising Plant-Based Chemotherapeutics. In Kayser O, Quax WJ (eds) *Medicinal Plant Biotechnology. From Basic Research to Industrial Applications,* WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, pp. 117-156.

Balneaves LG, Bottorff JL, Hislop TG, Herbert C (2006). Levels of Commitment: Exploring Complementary Therapy Use by Women with Breast Cancer. J. Altern. Complement. Med., 12(5): 459-466

Borek C (2010). Garlic and Aging: Current Knowledge and Future Considerations. In: Watson RR Preedy VR, eds. *Bioactive Foods in Promoting Health: Fruits and Vegetables*, Elsevier Inc, pp. 227-238.

Cassileth BR, Gubili J, Yeung KS (2007). Complementary Therapies for Cancer Patients. In Leung PC, Fong H (eds), Alternative Treatments for Cancer, World Scientific Publishing Co. Pte. Ltd, London, UK, pp. 163-178.

Cho-Ngwa F, Abongwa M, Ngemenya MN, Nyongbela KD (2010). Selective activity of extracts of *Margaritaria discoidea* and *Homalium africanum* on *Onchocerca ochengi*. BMC Complement. Altern. Med., 10(62): 1-7. 10:62doi:10.1186/1472-6882-10-62.

Christian GE (2009). *Digitization, Intellectual Property Rights and Access to Traditional Medicine Knowledge in the Developing Countries – Nigerian Experience*, International Development Research Centre (IDRC), Ottawa, Canada, pp. 1-35

Clafshenkel WP, King TL, Kotlarczyk MP *(*2012). Morinda citrifolia (Noni) Juice Augments Mammary Gland Differentiation and Reduces Mammary Tumor Growth in Mice Expressing the Unactivated c-erb B2 Transgene, *Evidence-Based Complementary and Alternative Medicine,* Article ID 487423, pp 1-15, doi:10.1155/2012/487423.

Courage-to-dare-foundation (2012). Breast Cancer in Africa, http://www.couragetodare.org/facts/get-involved. Accessed May 10, 2012.

Dama MS, Akhand SP, Rajender S (2010). Nature versus nurture – plant resources in management of male infertility, *Frontiers in Bioscience* E2, 1001-1014, June 1, 2010 1001, From Endocrinology Division, Central Drug Research Institute, Council of Scientific and Industrial Research, Lucknow, India -226001.

de Leiva A, Corcoy R, Brugués E (2008). Quality of care for the woman with diabetes in pregnancy. In: Hod M, Jovanovic L, Renzo GCD, de Leiva A, Langer O, eds. *Textbook of Diabetes and Pregnancy,* Second Edition, Informa UK Ltd, pp. 399-408.

Desai AG, Qazi GN, Ganju RK, El-Tamer M, Singh J, Saxena AK, Bedi YS, Taneja SC, Bhat HK (2011). Medicinal Plants and Cancer Chemoprevention. Curr. Drug Metab., 9(7): 581-591.

Dieppe P (2005). Research on health and health care. In: Bowling A, Ebrahim S, eds. *Handbook of Health Research Methods: Investigation, measurement and analysis,* Open University Press, England, pp. 3-11

Dog TL (2010). Chaste Tree Extract in Women's Health: A Critical Review. In: Cooper R, Kronenberg F, eds. *Botanical Medicine: From Bench To Bedside,* Mary Ann Liebert, Inc, pp. 216-226

Ekanem AP, Udoh FV (2010). The Diversity of Medicinal Plants in Nigeria: An Overview. In Ho C, ed. *African Natural Plant Products: New Discoveries and Challenges In Chemistry and Quality (ACS Symposium Series)*, Oxford University Press, USA, pp. 135-150.

Elufioye TO, Oladele AT, Cyril-Olutayo CM, Agbedahunsi JM, Adesanya SA (2012). Ethnomedicinal Study and Screening of Plants Used for Memory Enhancement and Antiaging in Sagamu, Nigeria. Eur. J. Med. Plants, 2(3): 262-275.

Engel N, Oppermann C, Falodun A, Kragl U (2011). Proliferative effects of five traditional Nigerian medicinal plant extracts on human breast and bone cancer cell

lines. J. Ethnopharmacol., 137: 1003-1010.
Fasching PA, Thiel F, Nicolaisen-Murmann K, Rauh C, Engel J, Lux MP, Bani MR (2007). Association of complementary methods with quality of life and life satisfaction in patients with gynecologic and breast malignancies. *Supportive Care in Cancer,15:* 1277–1284. doi: 10.1007/s00520-007-0231-1.
Globalpressinstitute (2012). Breast Cancer Threat is Rising in Nigeria, http://globalpressinstitute.org/global-news/africa/nigeria/breast-cancer-rising-threat-nigeria. Accessed May 25, 2012.
Gunduz M, Gunduz E (2011). *Breast Cancer - Focusing Tumor Microenvironment, Stem cells and Metastasis*, InTech, p. 9.
Hamayun M, Khan SA, Sohn EY, Lee I (2006). Folk medicinal knowledge and conservation status of some economically valued medicinal plants of District Swat, Pakistan, L*yonia.* J. Ecol. Appl., 11(2): 101-113.
Hann D, Allen S, Ciambrone D, Shah A (2006). Use of complementary therapies during chemotherapy: Influence of patients' satisfaction with treatment decision making and the treating oncologist. Integrative Cancer Therapies, *5:* 224-231.
Hayat MA (2008). Breast Cancer: An Introduction. In: Hayat MA, ed. *Methods of Cancer Diagnosis, Therapy, and Prognosis, Volume 1 Breast Carcinoma*, Springer Science + Business Media B.V; pp. 46-48.
Heimall J, Bielory L (2008). Complementary and Alternative Medicine in the Treatment of Allergic and Asthmatic Disease. In: Mahmoudi M, ed. *Allergy and Asthma: Practical Diagnosis and Management*, McGrawHill, New York, pp. 299-309.
Hiscox S, Gee J, Nicholson RI (2009). Therapeutic Resistance to Anti-hormonal Drugs in Breast Cancer: New Molecular Aspects and their Potential as Targets, Springer.
Howell A, Sims AH, Ong KR, Harvie MN, Evans DG, Clarke RB (2005). Mechanisms of disease: Prediction and prevention of breast cancer—cellular and molecular interactions. Nat. Clin. Pract. Oncol., 2(12): 635-646.
Hudson T (2008). Women's Encyclopedia of Natural Medicine: Alternative Therapies and Integrative Medicine for Total Health and Wellness, McGraw-Hill, New York, pp. 91-187.
Hunter DC, Skinner MA, Ferguson AR *(*2010). Kiwifruit and Health. In: Watson RR, Preedy VR, eds. Bioactive Foods in Promoting Health: Fruits and Vegetables, Elsevier Inc, pp. 555-570.
Hywood AJ (2010). Fertility Challenges. In: Romm AJ, ed. *Botanical Medicine for Women.*, Churchill Livingstone, an imprint of Elsevier Inc, pp. 345-357
Idu M, Erhabor JO, Efijuemue HM (2010). Documentation on Medicinal Plants Sold in Markets in Abeokuta, Nigeria. Trop. J. Pharm. Res., 9(2): 110-118.
Idu M, Onyibe HI (2007). Medicinal Plants of Edo State, Nigeria. Res. J. Med. Plant, 1(2): 32-41.
Ingelheim B (2011). Breast Cancer Backgrounder. Internet material available at: http://breastcancerclinicaltrials.thewhiteroom.info/?utm_source=breastcancerres_BMC&utm_medium=banner&utm_campaign=flight2#._Retrieved June 7, 2011.
Irimie S, Vlad M, Mireştean IM *(*2010). Risk Profile in a Sample of Patients with Breast Cancer from the Public Health Perspective. Appl. Med. Inf., 27(4): 21-30.
Kasirajan B, Maruthamuthu R, Gopalakrishnan V *(*2007). A database for medicinal plants used in treatment of asthma. Bioinformation, 2(3): 105-106.
Kayode J, Ogunleye TO (2008). Checklist and Status of Plant Species Used as Spices in Kaduna State of Nigeria. Res. J. Bot., 3(1): 35-40, DOI: 10.3923/rjb.2008.35.40.
Kelvin JF, Tyson LB (2011). 100 Questions and Answers about Cancer Symptoms and Cancer Treatment Side Effects, Second Edition*,* Jones and Bartlett Publishers, Sudbury, MA 01776, USA, pp. 22-23.
LASG-MOH (2009). BC treatment statistics at Lagos University Teaching Hospital, Nigeria, Ministry of Health, Lagos State Government of Nigeria, http://www.lagosstate.gov.ng/index.php?page=projectdetail&ptype=Programme&poid=113&mnu=module&mnusub=ministry&mpid=32&pocat=ministry&pocatsub=32. Accessed May 5, 2012.
Last W (2010). Heal Yourself the Natural Way: Overcome Diseases & Create Superior Health, Huckleberry Enterprises, Australia*,* pp. 47-55
Leung PC . Alternative Treatment for Cancer - World Scientific*,* (2007). *www.worldscientific.com/doi/pdf/10.1142/9789812709301_fmatter*
Li HT, Wang H, Yang JB, Li DZ (2011). Genetic diversity of the traditional Chinese medicinal plant Ypsilandra thibetica (Melanthiaceae): Applications for conservation. Biochem. Syst. Ecol., 39: 425-433.
Locatelli P, Restifo N, Gastaldi L, Corso M (2012). Health Care Information Systems: Architectural Models and Governance. In Kalloniatis C (ed.) Innovative Information Systems Modelling Techniques, InTech, Janeza Trdine 9, 51000 Rijeka, Croatia.
Malak AT, Karayurt Ö, Demir E, Yümer AS (2009). Complementary and Alternative Medicine in Cancer Patients - Analysis of Influencing Factors in Turkey. Asian Pacific J Cancer Prev., 10: 1083-1087.
Matthews A, Stepney R, Sikora K, Marriott P (2011). Anni's Cancer Companion: An A–Z of Treatments, Therapies and Healing, Singing Dragon, UK.
Moschèn R, Kemmler G, Schweigkofler H, Holzner B, Dünser M, Richter R, Sperner-Unterweger B (2001). Use of alternative/complementary therapy in breast cancer patients—A psychological perspective. Supportive Care in Cancer, 9: 267-274.
NNMDA - Nigeria Natural Medicine Development Agency (2010). Medicinal Plants of Nigeria Vol 1 (North-Central, North-East, North-West, South-East, and

South-West Zones), NNMDA Automated Digital Library. http://www.nnmda.gov.ng/. Accessed 20 February 2012.

Odugbemi T (2010). Medicinal Plants in Nigeria. www.medicinalplantsinnigeria.com. Accessed June 4, 2011.

Ogundiran TO, Ezeome ER (2008). Epidemiology, Clinical Presentation and Management of Advanced Breast Cancer in Nigeria, 1-42 www.socron.net/socron/.../Advanced_Breast_Cancer_in_Nigeria.pdf. Accessed 3 Jan; 2013

Okobia MN, Bunker CH, Okonofua FE, Osime U (2006). Knowledge, attitude and practice of Nigerian women towards breast cancer: A cross-sectional study. World J. Surg. Oncol., 4:11. doi:10.1186/1477-7819-4-11.

Oladele AT, Alade GO, Omobuwajo OR (2011). Medicinal plants conservation and cultivation by traditional medicine practitioners (TMPs) in Aiyedaade Local Government Area of Osun State, Nigeria, *Agriculture and Biology Journal of North America,* doi:10.5251/abjna.2011.2.3.476.487, ScienceHuβ, http://www.scihub.org/ABJNA .

Olowokudejo JD, Kadiri AB, Travih VA (2008). An Ethnobotanical Survey of Herbal Markets and Medicinal Plants in Lagos State of Nigeria. Ethnobotanical Leaflets, 12: 851-865.

Omogbadegun Z, Uwadia C, Ayo C, Mbarika V, Omoregbe N, Otofia E, Chieze F *(*2011). Multimedia-based Medicinal Plants Sustainability Management System. Int. J. Comput. Sci. Iss. (IJCSI), 8(5)(3): 492-503.

Omolara, KA (2011). Feasible Cancer Control Strategies for Nigeria: Mini-Review. Am. J. Trop. Med. Public Health, 1(1): 1-10.

Osemeobo GJ (2010). Can the Rain Forests of Nigeria Sustain Trade in Medicinal Plants? Int. J. Soc. For., 3(1): 66-80.

Patterson RE, Neuhouser ML, Hedderson MM, Schwartz SM, Standish LJ, Bowen DJ, Marshall LM (2002). Types of alternative medicine used by patients with breast, colon, or prostate cancer: Predictors, motives, and costs. J. Altern. Complement. Med., 8: 477-485.

Rakovitch E, Pigno JP, Chartier C, Ezer M, Verma S, Dranitsaris G, Clemons M (2005). Complementary and alternative medicine use is associated with an increased perception of breast cancer risk and death. Breast Cancer Res. Treatment, 90: 139-148. doi: 10.1007/s10549-004-3779-1.

Rao JK, Suneetha J, Reddi TVVS, Kumar OA (2011). Ethnomedicine of the Gadabas, a primitive tribe of Visakhapatnam district, Andhra Pradesh, *International Multidisciplinary Research Journal,* 1/2: 10-14.

Shoeb M (2006). Anticancer agents from medicinal plants. Bangladesh J. Pharmacol., 1: 35-41

Tabor A (2009). Fight Now: Eat & Live Proactively Against Breast Cancer, pp. 1-2.

Taghian AG, Smith BL, Erban JK (2009). Breast Cancer: A Multidisciplinary Approach to Diagnosis and Management, Demos Medical Publishing.

Tewari DN (2000). Report of the Task Force on Conservation and Sustainable use of Medicinal Plants, Government of India, Planning Commission, March – 2000, http://planningcommission.nic.in/aboutus/taskforce/tsk_medi.pdf Accessed February 7, 2011.

Wanchai A, Armer JM, Stewart BR (2010). Complementary and Alternative Medicine Use Among Women With Breast Cancer: A Systematic Review. Clin. J. Oncol. Nurs., 14(4). Digital Object Identifier: 10.1188/10.CJON.E45-E55

Wang T, Gleave AP (2012). Applications of Biotechnology in Kiwifruit (*Actinidia*). In: Agbo EC, ed. Innov. Biotechnol., pp. 1-30

WHO - World Health Organization (2009). *Fructus Agni Casti*, *WHO monographs on selected medicinal plants* vol 4, WHO Press, World Health Organization, 2009: 9-29

Wisneski LA, Anderson L (2009). The Relaxation System: Therapeutic Modalities. In: Wisneski LA, Anderson L, eds. *The Scientific Basis of Integrative Medicine*, Second Edition, Taylor and Francis Group, pp 161-204

Yeh M, Obenchain J, Viladrich A (2010). Barriers and Facilitating Factors Affecting Fruit and Vegetable Consumption. In: Watson RR, Preedy VR, eds. *Bioactive Foods in Promoting Health: Fruits and Vegetables*, Elsevier Inc, pp. 92-105.