

UNIVERSITY OF EDUCATION, WINNEBA
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

**CONSUMPTION OF HERBS AND SPICES AND ITS HEALTH BENEFITS
ON THE CONSUMERS. A CASE STUDY OF KWADASO MUNICIPALITY**



CHRISTIANA GYAPONG

FEBRUARY, 2022

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A Dissertation in the Department of HOSPITALITY AND TOURISM EDUCATION,
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Studies, University of Education, Winneba, and in partial fulfillment of requirement
for the award of the Master of Technology (Catering and Hospitality) degree.

FEBRUARY, 2022

DECLARATION

STUDENT'S DECLARATION

I, CHRISTIANA GYAPONG, declare that this Dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE.....

DATE.....

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: DR. ELLEN OLU FAGBEMI

SIGNATURE:.....

DATE:.....

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DEDICATION

This project is dedicated to my husband Rev. Joe Asiedu Mintah.



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ABSTRACT

Consuming herbs and spices perform a variety of useful functions in foods that consumers often take for granted. Excessive consumption of herbs and herbs can even damage liver, or can cause death. The study aimed at investigating the consumption of herbs and spices and its health benefits on the consumers in Kwadaso Municipality in the Ashanti Region of Ghana. Survey research design was used for the study. The study population consisted of women who performed cooking activities in the Kwadaso Municipality. The sample size for the study was 385 based on Cochran's Sample size formula. Purposive and convenience sampling techniques were employed in selecting the various households and the women respectively. The finding showed that cloves (3.60 ± 1.157), anise seed (Nktinkiti) (3.75 ± 0.114), turkey berry (Kwahu Nsosuain) (4.25 ± 1.236), and onion (5.30 ± 0.333) were most frequently consumed herbs and spices among the consumers. The study confirmed that improving aroma of prepared food, lifestyle/modern, preparation of delicious meals, and preservation of foods influence consumers purchase of herbs and spices during food preparation. Based on this, the study concluded that herbs and spices have been used to prepare delicious meals and it does not only add flavour, and taste but also for its associated health benefits. It was recommended consumers education as a contribution to protecting the health and safety of consumers. It is mandatory for Food and Drugs Authority (FDA) to create awareness among the consumers towards herbs and spices which are more advantageous to humans as well as the environment.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Herbs and spices are ingredients that are mainly added for flavoring or seasoning while cooking (Krishnaswamy, 2008; Russo, 2009; Ganguly, 2010). Herbs and spices are an important part of the world's culinary traditions and are used for fragrance, decoration, processing of fruit and for medicinal purposes throughout history. Herbs and spices can be used to improve the acceptability and health of food. The World Health Organisation survey noted that 70–80 per cent of the world's population relies on modern medicine mostly from herbal sources in their main healthcare sectors (Chan, 2003). Moreover, 80% of population in developing Countries and up to 60% of the world's population depends directly on herbs and plants for their medical benefits (Shrestha & Dhillon, 2003).

In Ghana, herbs and spices have been used to prepare delicious meals. Virtually every home in the country has a range of spices, including chili pepper, thyme, ginger cayenne, and bay leaf, which are used as seasonings (Ahene, Odamtten & Owusu, 2011). While some are stored by smoking, some others are through drying, freezing, salting, and roasting. Ahene et al. (2011) indicated that when one thinks of spices, the first few spices that pop up in their mind might differ depending on what they eat. For some, it might be just pepper, paprika and various dried herbs. For others it might be curry powder, cumin seeds, cloves and fennel seeds. The Canadian African (2020) reported that in Ghana, choice of spices includes both indigenous and imported spices. Just like many African cuisines, indigenous African spices are not as

popular. There are a whole host of spices that are used to flavour foods that many people do not talk about.

Chandila & Puri (2019) mentioned that herbs and spices are consumed in very small quantities and the demand for herbs and spices has always been high for their good taste and flavor. They are mostly often found in ground or powdered form, making them a prime target for adulteration. Ground spices and unpackaged spices are adulterated by fillers, less expensive / low quality spices, flour, corn starch, sawdust etc. Sometimes to enhance the appearance and to hide the presence of fillers, toxic and potentially carcinogenic dyes are also added to older stocks (Chandila & Puri, 2019). Herbs and spices are ingredients used to enhance the sensory consistency of the food. The leaf of a fresh plant used for cooking food is sometimes referred to as a culinary herb and any dried part of the plant is called a spice (Rubio, Motilva & Romero, 2013). Thus, spices can be the bud (cloves), the stigma of flower (saffron), root (dried ginger), aromatic seeds (cumin seeds), berries (peppercorn), bark (cinnamon), etc. Spices have been effectively used in the indigenous systems of medicine in many countries.

Some health benefits of herbs and spices are part of what makes them essential ingredients in every meal. Consumption of herbs and spices is associated with improved health outcomes. Evidence supports the possible protective effects of culinary herbs and spices against oxidative damage, inflammation, cancer, infection and neurodegeneration (Kaefer & Milner, 2018; Lai & Roy, 2014). Many of these protective effects are attributed to the high concentration of beneficial plant-derived compounds called polyphenols in herbs and spices (Pandey & Rizvi, 2009). For instance, curcumin, a polyphenolic yellow pigment in turmeric, directly interacts with cell molecular targets to upregulate tumor-suppressor genes and inhibit inflammatory

signaling pathways (Tsai, Tsai, Yu & Ho, 2017). Cinnamon inhibits in vitro tumor cell proliferation and in vivo melanoma tumor growth (Tsai et al., 2017). Short-term human intervention trials demonstrate significant acute benefits of herb and spice intake (Carroll, Benya, Turgeon, Vareed, Neuman, Rodriguez, Kakarala, Carpenter, McLaren & Meyskens, 2011; Pandey, & Rizvi, 2009). Li, Henning, Zhang, Zerlin, Li, Gao, Lee, Karp, Thames and Bowerman (2010) demonstrated a significant reduction in plasma and urine malondialdehyde, a marker of oxidative damage, in volunteers fed hamburger containing 11g mixed spices those fed a control hamburger. In a clinical trial testing the effect of oral curcumin on colorectal cancer in 44 men and women, a 4-g dose over 30 days resulted in a 40% reduction in the number of early neoplasms (Carroll, et al., 2011).

As indicated by Tapsell et al. (2016), many herbs and spices contain antioxidant polyphenols, which are beneficial to health. Tapsell et al. (2016) mentioned that the spicy compound in chili peppers, and garlic have both been shown to reduce blood pressure. Prior work has shown that herbs and spices can be used to improve acceptability of reduced-fat (Peters, Polsky, Stark, Zhaoxing & Hill, 2014) and low-sodium (Ghawi, Rowland, & Methven, 2014) foods. A study by Andersen, Byrne, Bredie and Moller (2017) has also shown that perceived heat from chili peppers correlate with increased post-meal satiety. Furthermore, dried herbs and spices are shelf-stable due to their low water activity, making them feasible for use in institutional feeding settings such as school cafeterias. Ghana is an ideal setting to evaluate the consumption of these herbs and spices as they are key components of traditional diets.

1.2 Statement of the Problem

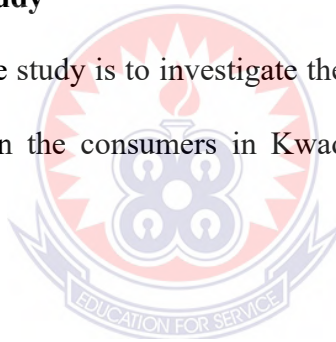
Consuming herbs and spices perform a variety of useful functions in foods that consumers often take for granted. Excessive consumption of herbs and herbs can even damage liver, or bring on a coma or death. Herbs and spice intake measurement is a tough and challenging task than estimating the intake of staple foods like cereals and other foods that are consumed in large quantities daily. Consumer's addition of herbs and spices in food preparation without measuring the quantity causes health implication. But most consumers today rely on the many aesthetic and convenient benefits that herbs and spices provide. With modern lifestyle and reference from friends some herbs and spices especially the artificial spices can be dangerous to the health of consumers.

Extreme consumption of herbs and spices have been found to cause health problems on consumers. Some herbs and spices are adulterated by fillers, less expensive / low quality spices, flour, corn starch, sawdust etc which can raise blood pressure and cause a fast heartbeat and shortness of breath. This fact, ultimately, led to serious concern on human health particularly on pregnant women, children and also adults who regularly/frequently consume herbs and spices. It's reported that certain herbs and spices trigger abdominal pain (Hassan, 2010). There are also reports that associate certain adulterated herbs and spices with hyper activity and neurological disturbances in children (Kumar & Srivastava, 2011), hallucinations and vomiting (Geha, Beiser, Ren, Patterson, Greenberger, Grammer & Ditto, 2000). This has raised health concerns to consumers and other stakeholders. However, regardless of the increasing incidence and range of health problems of excessive usage of herbs and spices, awareness of consumers is not as such significant.

In addition, most consumers need more information about the potential health effects of herbs and spices used in foods. Consumers with at least basic education level are expected to have knowledge about food and its relationship with general well-being. Nevertheless, many consumers are confused and do not know what constitutes a healthy diet and which food products can be harmful. Consequently, some of the concerns about herbs and spices may be attributed to the lack of adequate information being provided for the public, i.e. failures of food processing companies that are not listing (labeling) additives (and also their associated side effects) on the packages to provide information to consumers.

1.3 Purpose of the study

The purpose of the study is to investigate the consumption of herbs and spices and its health benefits on the consumers in Kwadaso Municipality in the Ashanti Region of Ghana.



1.4 Objectives of the study

The specific objectives of the study were:

1. To determine the consumption level of herbs and spices among consumers in the Kwadaso Municipality.
2. To ascertain the factors that influence the consumers consumption of herbs and spices in the Kwadaso Municipality.
3. To establish the health benefits associated with consumers consumption of herbs and spices.

1.5 Research Questions

The following research questions were developed to guide the study:

1. What are the consumption level of herbs and spices among consumers in the Kwadaso Municipality?
2. What are the factors influencing consumers consumption of herbs and spices in the Kwadaso Municipality?
3. What are the health benefits associated with consumers consumption of herbs and spices?

1.6 Significance of the Study

The research finding will be beneficial to the individual on the importance of consuming herbs and spices in food preparation. The finding of the study will help to reveal the consumption level of herbs and spices among consumers. The results of the research work will therefore be used as a basis by the producers and marketers of herbs and spices for developing strategies in advertising their products, since the factors that influence consumer's intake of herbs and spices in food preparation will be ascertained.

Moreover, the findings of the study may be used by Ghana Health Service (GHS) and other organizations working in the promotion of consumption of herbs and spices in food preparation. Furthermore, as an academic research project, it could be used as the basis for further academic research into other related studies.

1.7 Delimitation of the study

The study is limited to consumers of herbs and spices in the Kwadaso Municipality in the Ashanti Region of Ghana. The study was specifically concentrated

on the consumption level of herbs and spices among consumers, factors that influence the consumers consumption of herbs and spices, and health benefits associated with consumers consumption of herbs and spices.

1.8 Organisation of the Study

The study report was organized into five chapters, references and appendices. Chapter one highlights issues such as the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study and delimitation of the study. Chapter two deals with a review of literature relevant to the study. The chapter review views on both theoretical and empirical literature relating to the subject.

Chapter three discusses the methodology for conducting the study. This chapter focus on the research design, population, sample, and sampling technique, data collection instruments, administration of instruments, and the data analysis procedure. Chapter four presents the results and discussion of the data that were gathered from the field while chapter five covers the summary, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Herbs and Spices

Spices and herbs have been used since prehistoric times. Spices and herbs were employed to conceal disagreeable tastes and odors in food, as well as to keep food fresh (Rosengarten, 1969). Early evidence reveals that hunters and gatherers wrapped meat in bushes' leaves, realizing by accident that this procedure, as well as some nuts, seeds, berries, and bark, improved the taste of the meat (Rosengarten, 1969). Historically, culinary spices and herbs have been used as food preservatives and health-enhancing properties. Papyri from Ancient Egypt in 1555 BC classified coriander, fennel, juniper, cumin, garlic and thyme as health promoting spices (Tapsell *et al.*, 2006). Spices and herbs have historical importance and were once the source of great power and wealth. Arab traders established early spice trading routes. The Greeks expanded the trade routes to the Mediterranean. The Roman Empire had great control and power with the spice trade. Seafaring nations like Portugal, Spain, Holland, and Britain entered the lucrative spice trade and fought many wars to retain power. As plantations of pepper, nutmeg, cinnamon, and other important spices were established on tropical islands, the spice monopolies were disbanded. It is not known when humans began to use the first herbs and spices as flavoring agents. Garlic and onions were documented as being used 4,500 years before present (Li *et al.*, 2010).

Spices are the dried, pleasantly aromatic parts of the plants. More specifically, as defined by the Food and Drug Administration organization (FDA), spices are: “aromatic vegetable substances, in the whole, broken, or ground form, whose significant function in food is seasoning rather than nutrition (Embuscado, 2015). Herbs and spices are harvested from different parts of the plant. Herbs are usually

obtained from leaves of the plant while spices come from different seeds, root, bark, fruit berries, aril, pods and flowers of the plant (Herman, 2015). Li et al. (2010) mentioned that spices and herbs are plant derived substances that add flavour to any dish. It is difficult to distinguish between the two. Spices can come from the following plant parts: roots, rhizomes, stems, leaves, bark, flowers, fruits, and seeds. Herbs are typically thought of as non-woody plants.

The main difference between herb and a spice is that a spice comes from any part of a plant other than the leaves while a herb always comes from the leaves (Embuscado, 2015). Spices typically come from the dried part of a plant such as buds, flowers (cloves, saffron); bark (cinnamon); root (ginger, turmeric); fruits/berries (cloves, chili, black pepper); or seeds (cumin) that contain volatile oils or aromatic scents and flavors. Most of the known herbs and spices originate from Mediterranean countries, the Middle East or Asia, and many have been used since ancient Egyptian and Roman times (Embuscado, 2015). Herbs and spices have played, and continue to play, important roles as flavoring agents, food preservatives and medicines for centuries. Over the last few decades, research into their health benefits has increased significantly, as many herbs and spices are known to possess properties associated with reducing the risk of developing chronic diseases. In particular, some of the potential health benefits of herbs and spices include conferring protection against cardiovascular disease, neurodegenerative conditions, chronic inflammation, cancer, obesity, and type 2 diabetes (Rubio, Motilva & Romero, 2013; Aggarwal & Sung, 2009).

A number of herbs and spices have also been noted for their strong antioxidant, anti-microbial, and anti-inflammatory properties (Rubio et al., 2013). Moreover, the flavoring properties of many herbs and spices tend to reduce the use of

salt as a flavoring agent (i.e., reduced sodium intake) which has additional cardiovascular health benefits (Anderson, Cobb, Miller, Woodward, Hottenstein, Chang, & Mongraw-Chaffin, 2015). Most of the positive health effects of herbs and spices towards preventing or ameliorating chronic diseases such as cancer, cardiovascular disease, arthritis, and neurodegeneration appear to be mediated through the direct action of their constituent phytochemicals (particularly polyphenols or polyphenol breakdown products) targeting specific receptors or enzymes involved in various anti-inflammatory pathways or immune responses (Garcea et al., 2005). Herbs and spices (especially in their dried form) contain high levels of polyphenols and other physiologically active phytochemicals. The predominant class of polyphenols found in herbs and spices are the phenolic acids and flavonoids (mainly flavones and flavonols) (Tapsell et al., 2006).

Polyphenols, terpenoids, and other spice-derived alkaloids (such as capsaicinoids) are also known to possess antibacterial, antiviral, and antifungal properties. This is one reason why herbs and spices are so frequently used as preservative agents in food. The antimicrobial properties of herbs and spices have been attributed to their unique volatile oils and oleoresins (Cowan, 1999). For instance, comparative studies involving cloves, cinnamon, oregano, rosemary, sage, and thyme showed that thyme oil was particularly active against *Aeromonas hydrophila*-a pathogen widely distributed in the environment, domestic animals, and food (Kalemba & Kunicka, 2003). Likewise, essential oils found in thyme, oregano, mint, cinnamon, and cloves were found to possess strong antibacterial properties against several food-borne bacteria and fungi (Kalemba & Kunicka, 2003).

The number of herbs with known or potential anti-inflammatory activity is quite significant. Of the 25 herbs and spices analyzed in this review, 21/25 (84%) had

at least one published study supporting an anti-inflammatory finding. The spices that are most frequently identified as having anti-inflammatory effects are thyme, oregano, rosemary, sage, basil, mint, turmeric, dill, parsley, cinnamon, clove, nutmeg, lemon grass, ginger, chili pepper, fenugreek, and pepper (Kalemba & Kunicka, 2003). Many of the anti-inflammatory compounds found in herbs and spices, such as curcumin, gingerol, and capsaicin, appear to operate by inhibiting one or more of the steps linking pro-inflammatory stimuli with cyclooxygenase (COX) activation (Cowan, 1999). While the mechanisms behind some of the health benefits in herbs and spices are becoming clearer over time, the vast majority of herbs and spices still have rather ill-defined health benefits and yet-to-be-identified chemical “actors” (Fabio et al., 2003).

Given the widespread use of herbs and spices and given their known (and potential) health benefits, there is clearly a need to better understand the consumption patterns of herbs and spices. Population-wide average dietary intake of common spices varies considerably around the world. For instance, Europeans consume an estimated at 0.5 g/person per day, Australians and New Zealanders consume between 1.3-1.9 g/day, and residents of Africa consume 1.8 g/day. Moderate consumers of herbs and spices are found in the Middle East and Eastern Asia with daily consumption of 2.6 and 3.1 g/person, respectively. The highest consumers of herbs and spices are found in India, South Africa, and Latin America with an average of 4.4 g/day (WHO, 2016). In India, turmeric consumption, alone, has been estimated to be 1.5 g/person per day. While consumption of herbs and spices is generally higher in Southern countries such as India, Mexico, Peru, China, and Thailand, herb and spice intake has been increasing in many developed countries in Northern Europe and North

America, due to changing food habits and a growing preference for ethnic or spicy food (WHO, 2013).

2.1.2 Classification of herbs and spices

According to the various uses, herbs can be classified into different types such as culinary, medicinal, sacred and those used for pest control. There are many reasons for which people use spices, though, taste probably tops the list. There are several spices that simply smell good and those smells can be alternately soothing or exciting. On the other hand, ginger is said to be a stimulant and the smell of ginger could be just what you need to pep up your mood. Over the centuries, certain spices have been said to heal every infection, disease and malady known to man but there's no doubt that spices do have value far beyond enhancing the taste of food (Ziegler & Filer, 1996).

Herbs and Spices play an important role in the nutrition of our daily diet. Scientists have done a lot of research on this and have found out that spices contain more antioxidants than fruits and vegetables. Spices contain more antioxidants when they are dried than when they are raw or fresh. Half teaspoon of spices will contribute more amounts of antioxidants than half a cup of fruits. Spices play an active role by acting as medicines. Cloves, oregano, allspice, cinnamon, sage, peppermint, thyme and lemon balm are some of the spices. These spices may be of a significant dietary source (Pokorney, 1991). Spices, the predominant flavouring, colouring and aromatic agents in foods and beverages, are now gaining importance for their diversified uses. In the present scenario, the anti-diabetic, anti-hypercholesterolemic, anti-carcinogenic, anti-inflammatory effects of spices have paramount importance, as the key health issues of mankind nowadays are diabetes, cardio-vascular diseases,

arthritis and cancer. Spices or their active principles could be used as possible ameliorative or preventive agents for these health disorders (Shils, 1999).

Extensive studies on animal models carried out indicate that spices could be consumed at higher dietary levels without any adverse effects on growth, organ weights, and food efficiency ratio and blood constituents. Curcumin, the colouring pigment present in turmeric, capsaicin, the pungent principle in red pepper, allicin, the active principle in garlic, gingerol, the pungent principle in ginger, saponin and fibre present in fenugreek are immensely valuable in health care with their multiple physiological effects (Stipanuk, 2000). However, until recent times, the desiccation and freezing of food was not a viable option for those living in hot, humid climates; these societies discovered chemical preservation, in the form of salt and spices. As the former was only available in certain areas spices were often the only other option to protect food from insect infestation and microbial putrefaction (Sethi & Meena, 1997). We now know that many of the strongly flavoured phytochemicals which give plants protection against insect and microbial attack are the same compounds that "preserve" our bodies, by protecting us against degenerative disease (Shils, 1999).

Spices are consumed in much greater quantity and variety in warm, humid countries than in colder climates. India and Thailand have the highest consumption of spices; the warm Mediterranean countries follow somewhat behind these and other Eastern countries but are ahead of the United States. Chilly Scandinavian countries have the lowest spice consumption of all. Moreover, the importance of spices in helping to prevent chronic degenerative disease can be seen to correspond to the varying levels of spice utilization that occurs across different temperature zones. Cold countries, typically the most developed countries, tend to have much higher incidences of chronic degenerative diseases when compared to hotter regions. There is

the need to consume lots of spices on a daily basis as they could make one feel better, think better, age more slowly, and help to resist the onslaught of scourges like cardiovascular disease, cancer, diabetes, Alzheimer's disease and other chronic degenerative disorders (Shils, 1999).

Spices and herbs can be categorized into several groups based on their flavor and colour i.e., hot (Cayenne pepper, black & white peppers, mustard, chilies) slight flavor (coriander, paprika), aromatic spices (clove, cumin, dill fennel, nutmeg, mace, cinnamon) and aromatic herbs (thyme, marjoram, shallot, basil, bay leaf, onion, garlic). Based on colour (turmeric) and herbaceous (sage, rosemary) or based on their taste such as sweet, bitter, spicy, sour, and sharp (Bhattacharyya et al., 2017). These spices and herbs have been used as flavor, colour, aroma, enhancing agents and for preservation of foods. According to Embuscado (2015), a conventional classification of spices is based on degree of taste as: hot spices, mild spices, aromatic spices herbs and aromatic vegetables (Table 2.1).

Table 2.1: Classification of spices

Classes	Spices
Hot spices	Capsicum (chillies), Cayenne pepper, black and white peppers, ginger, mustard
Mild spices	Paprika, coriander
Aromatic spices	Allspice (pimento), cardamom, cassia, cinnamon, clove, cumin, dill, fennel, fenugreek, mace and nutmeg
Herbs	Basil, bay, dill leaves, marjoram, tarragon, thyme
Aromatic vegetables	Onion, garlic, shallot, celery

Source: Embuscado (2015)

2.2 Common Spices and Herbs used in Ghana

Ghana is home to some of the best range of dishes served in either international restaurants or street stalls. The country's delicacies are simple yet

flavourful. Several spices in Ghana contribute to these sumptuous meals adding outstanding health benefits (Adeage, 2020). Part of the secret behind Ghana's delicious meals is their spices. Virtually every home in the country has a range of spices, including chili pepper, thyme, ginger cayenne, and bay leaf, etc, which are used as seasonings. While some are stored by smoking, some others are through drying, freezing, salting, and roasting. The following are list of some common herbs and spices used in Ghana and their local names which comes from prominent language such as Twi, Ga, and Fante.

- *Cloves* are known as *Dadoa Amba* or *Pepre* in Twi, or *Mbrego Amba* in Fante.
- *Anise seeds* also known as *Osu kon* in Ga and *Nkitinkiti* in Twi.
- *Basil* is known as *Akuko Besa* in Twi, it's commonly used in tea and may be added to soups or vegetables.
- *Negro Pepper* is called *Hwentia* or *Ahentia* in Twi and *Soh* in Ga. It also goes by the names *Senegal pepper*, *Ethiopian pepper*, and *Moor pepper*. The spice is best used in soups, stews, and in cornmeal porridge.
- *West African black pepper* is known as *Esoero Wisa* in Twi and *Wie Din* in Ga. Interestingly, the pepper's leaves can be eaten. In terms of hotness, the pepper is not as hot as other peppers like the African bird pepper. When used in minimal quantities, it has a clove-like flavour in soups, stews, and cornmeal porridge.
- *Turkey berry* is known as *Abeduruin* or *Kwahu Nsosuain* in Twi. It is also known as wild eggplant or prickly nightshade. Its other local names are *Kwanwu nsosuaa*, *Kantɔsi*, and *Abeduru*. The leaves of turkey berry are rich in iron and vitamin C, making it suitable for pregnant women.

- *African locust bean* is known as *Dawadawa* in Twi. The spice contains the minerals riboflavin and thiamine. Also, it helps to promote good sight and rids off hypertension and disease conditions like stroke and diabetes.
- *Potash*, otherwise called *Potassium Carbonate (K₂CO₃)*, is locally known as *Kanwu or Kaawe*. Besides its chemical use in industries, it is used in preparing *Waakye*, which is a mush of rice with beans. The local spice is also a salt substitute and serves as a food thickener and tenderizer.
- *Alfalfa* also known as Buffalo grass, Lucerne, or Chilean clover, alfalfa's stem, leaves, and sprouts are rich in vitamins, minerals, and proteins. The herb is suitable for treating arthritis and digestive problems.
- *Ghana bearberry (leaves)* is good for treating inflammation of the urinary tract and urinary tract infections. The herb has diuretic and antiseptic properties.
- *Ghana black cohosh (roots, rhizome)* the herb is a diuretic and a remedy for TB and fatigue. In the past, the herb was used to treat menstrual irregularities, rheumatism, and sore throat.
- *Cayenne pepper (fruit)* also called red pepper, capsicum, and chilli pepper, cayenne is used to relieve pain and combat infections. It is also suitable for toothaches, arthritis and aids digestion.
- *Cinnamon (bark)* Cinnamon aids digestion, and treats nausea, cold, and inflammations. The bark has essential oils that possess anti-fungal and anti-bacterial properties.
- *Ginseng (root)* Ginseng's root has adaptogenic properties that help a person to handle stress, mentally and physically, better. The herb is good for warding off fatigue, sharpening mental abilities, and energizing the body.

- *Turmeric (root)* Turmeric contains a chemical substance known as curcumin, which is a natural liver detoxifier. It also has the potential of preventing heart disease, cancer, and Alzheimer's disease, and may also help improve symptoms of depression and arthritis.

According to Darkwa (2013), Ghana as a country is blessed with herbs and spices. An understanding of the medicinal properties of these spices, which can be effective remedies for common illnesses and infections, will also help in the careful selection of necessary spices when preparing foods. Whether for healing specific ailments or promotion of a healthy lifestyle, these species are essential.

2.3 Consumption level of Herbs and Spices among Consumers

Spices have been an integral part of culinary cultures around the world and have a long history of use for flavoring, coloring, and preserving food, as well as for medicinal purposes. The increased use of spices as flavorings in foods is a major trend worldwide. In China, chilli pepper is among the most popular spicy foods consumed nationwide (Billing & Sherman, 2008). Bhathal, Kaur, Bains and Mahal (2017) assessed the spices intake at individual level and comparing the urban and rural adult women intake in the selected households in Ludhiana district of Punjab. The study showed that out of 25 spices studied, most frequently consumed by more than 80 households were 12 and 9 spices among urban and rural 302 households, respectively. Madhyastha (1999) also showed that consumption frequency of turmeric powder and red chilli powder was higher than most of the other spices.

Spices are consumed in amounts much smaller than other dietary components such as staple cereals, constituting 0.8-2.2% of the total dry matter content of the diet (Kaefer & Milner, 2008). Quantification of spice intake at the individual level

presents several challenges as the frequency and quantity of intake varies with the type of spice, form in which it is used, quantity added to various and the frequency of preparing and consuming such dishes. Estimation of portion size of spice consumed per eating occasion or frequency is emerging as a useful approach for quantifying spice intake (Tantipopipat, 2010).

Consumption frequency of herbs and spices varies with regions and areas. Carlsen studied the intake of spices which ranged from 0.80 to 14.7 times per month in European countries which is lower than the consumption frequency of spices observed in the present study (Carlsen, Blomhoff & Andersen, 2011). Black salt is frequently used in *lassi* and curds during summers and sprinkled on salads. Carom and cumin seeds are frequently used in vegetable *tadkas* and *paranths* among both households. In Norway, it was observed that out of 27 different herbs and spices investigated only eight were consumed by one-third of the population which indicated the lower consumption of spices (Carlsen et al., 2011). Ferruci et al. (2010) observed regional differences in per capita spice consumption with the Northern and Western regions consuming a lesser number of spices as compared to the Southern regions of India. In Trivandrum, Mumbai and New Delhi, 95 % of the total participants (3625) reported consuming 12, 5 and 4 spices, respectively and turmeric powder was the only spice consumed by more than 95 % of the population (Carlsen et al., 2011).

The usage form of spices in the households also varied indicating that the unroasted form of spices consumed by the majority of urban and rural households. Generally, spices preferred for roasting are black pepper, asafoetida, carom seeds, cumin seeds, fenugreek seeds, mustard seeds, cinnamon, clove and black cardamom during food preparations. Susheela (2000) stated that some spices are processed for their microbial stability and removal of extraneous matter and roasting is one of the

cooking processes to release characteristic flavour volatiles and undesirable particles. Moreover, there is a possibility that some natural components could be significantly lost during thermal processing because some bioactive compounds are unstable to heat. Thus, heat-processed foods are considered to have lower health-promoting capacity than the fresh one (Nikousaleh & Prakash, 2008). In order to save time on the roasting process, women preferred to use an unroasted form of spices. In Indian tradition, most of the spices are subjected to roasting before addition to food preparation as roasting enhances the flavour (Behera, Nagarajan & Rao, 2004).

Spice intake determination is being acknowledged as they possess bioactive compounds and antioxidant properties. Frequency data of intake together with portion size estimations provided a good quantitative estimation of spice intake at individual level rather than opting for the frequency of spice intake alone. The spice intake varies substantially between different countries, states, geographical regions within the same country possessing different dietary habits and patterns and cuisines within the same region. At an individual level, spice intake measurement is a tough and challenging task than estimating the intake of staple foods like cereals and other foods that are consumed in large quantities daily (Behera et al., 2004). Sherman and Hash (2001) reviewed through traditional cookbooks which revealed the mean number of spices used in 36 countries were 6.5 and 9.3 spices through vegetable and meat-based recipes in India while in European countries mean number of spices ranged from 1.6 to 4.5 and 0.6 to 4.2 spices through meat and vegetable based recipes, respectively (Sherman & Hash, 2001). The mean intake of black pepper (0.97 g/portion) and contributing 40 % of total portion sizes were from the intake of salads in Hyderabad city.

Ferruci et al. (2010) stated the median per capita consumption (g/month/person) of chilli powder (35.7 %), *garam masala* (33.3 %), coriander (33.3 %) and turmeric powder (28.6 %) in New Delhi. While in Mumbai, chilli powder (58.3 %) had the highest median per capita consumption (g/month/person), followed by turmeric powder (21.7 %) and cumin seeds (20.0 %). Trivandrum was characterized by high consumption (g/month/person) of chilli powder (166.7 %) coriander (102.0 %) and ginger (373 %). Further study revealed that the per capita monthly median intake level of 0.17-4.6 and 3.1 g for cinnamon and cloves, respectively in different regions of India which were found to be higher than stated in the present study (Ferruci et al., 2010). This may be due to different methods of enumerating the spice intake. Per capita intake represents the average consumption of spices at household level while measurements as a portion sizes are based on the actual quantity of spice consumed from the dish in an eating occasion by an individual. In European countries, cinnamon is used in bakery and confectionary items whereas in India it is rarely consumed along with other spices such as cloves and cardamom for rice or sweet preparations. The maximum intake of 0.22 g/kg body weight was noted through rice pudding consumption in Europe.

Carlsen et al. (2011) assessed the intakes of individual herbs and spices and estimated the median of total spice and herb consumption which was found to be 2.7 g/person/day in Norway and average total intake of herbs and spices was 1.1 g per day with range from 0.19 to 45.0 g from the food frequency questionnaire (FFQ). The total intake of herbs and spices estimated by food frequency questionnaire (FFQ) between men and women showed non-significant results (Carlsen et al., 2011). Intake of total spices from food frequency questionnaire (FFQ) and 3 D weighed food record in Italian diet elicited that FFQ overestimated total spice intake by an average of 3.2g

per day among women subjects (Pellegrini, Salvatore, Valtuena, Bedogni & Porrini 2017). The total intake of seasoning and spice from food frequency questionnaire used in Japan Public Health Center showed that the food frequency questionnaire (FFQ) underestimated the total intake of seasoning and spice i.e. average intake of 5 g/day by more than 85% (Sasaki, Kobayashi. & Tsugane, 2013).

Worldwide, the daily consumption of spices varies and often reported as a mixture of common spices used frequently such as red chilli powder, turmeric powder, mustard, black pepper and white pepper. The average daily intake of common spices per person has been estimated as 4.0 g in the USA, 0.5g in Europe and 1.0g in New Zealand (Lampe, 2013). In South India, an average daily intake per person of a few spices, 3.08 g for red chilli powder, 0.33 g for black pepper and 0.87 g for turmeric powder were observed (Pradeep, Geervani & Eggum, 2013). In most households, fennel seeds were consumed as after-meal digestion but in various preparations, their inclusion as a spice was found to be limited. Information regarding the consumption of spices such as cloves, star anise, dill, black cardamom, cinnamon, nutmeg and mace was less documented as compared to red chilli powder and turmeric powder which indicated the low quantity and occasional use of these spices (Pradeep et al., 2013).

Tantipopipat et al. (2012) reported the portion size intake of individual spices and herbs. The portion eaten per meal of each appropriate spice or herb from the most frequently consumed dishes from 24 Hour recall method showed that various herbs and spices were widely consumed in local North-east Thai diets. Each popular recipe contains at least 3 spices/herbs and total spice/herbs intake was more than 14.7g/day in Thai diets (Tantipopipat et al., 2012). Several earlier studies support the observations and indicate the related information made in the present investigation.

The average total intake of spices was 3.2 g per day and determined the portion sizes per eating occasion for 5 individual spices (basil dry, basil fresh, cinnamon, oregano and pepper) and 3 spice blends their mean and median ranged from 0.5-1.3g and 0.2 - 0.9 g, respectively. The intake of spices in the Hyderabad district depicted that intake was as low as 0.01 g for clove and cinnamon and as high for red chilli powder (20 g). Further, high frequency consumption of spices was indicated by most portion sizes of spices consumed represented by chillies (19 %), turmeric powder (18.4 %) and cumin (10.4 %).

Siruguri and Bhat (2015) reported that chillies were consumed between 1-5 g by 70 % of portion sizes and the remaining 15 % were above 5g Similar results were observed regarding the spice intake in Thailand and Mexico (5 and 20 g/person/day, respectively). These intakes were higher as compared to the present study. The regular consumption of turmeric powder and asafoetida in everyday Nepali diets as they consider them as popular household remedies and components of prescriptions used in traditional healing. On the basis of food production statistics, European countries reported the per capita intake of nutmeg and mace to be 0.1 g, while in Hyderabad city it was 0.14 – 0.23 g/portion size found to lowest as compared to other spice consumption (Nesheim, 2002).

Intake of all spices daily is not possible and individual spice intake varied with how frequently dishes are consumed. Therefore, these observations assume significance for quantifying spice intake. Eigner and Scholz (1999) indicated that average portion size intake of total spices and herbs from habitual dishes ranged from 4.9g to 26.1g in Thailand. Turmeric powder and red chilli powder had maximum number of portion sizes from curry which is prepared daily among all households in Southern India. Further, the highest 90th and 97th percentile values for chillies (6.0 and

11.1 g/portion, respectively) were observed from chutney and dhal (Siruguri & Bhat, 2015). These obtained values were much higher than the results obtained in present study presenting the consumption of spices in Southern India is more as compared to Northern region. Dishes consumed weekly or monthly showed a lower mean total intake of spices than from those consumed daily (10.4g/day). Conferred that intake of spices differs with a frequency of the type of dish consumed and use of spices which further facilitates in calculating spice intake at the individual level.

Salma and Ramakrishnan (2017) studied the most frequently consumed spices in households and the consumer's knowledge and preferences to organic spices. From the study, spice intake survey in 100 Households showed that more than 50% consumed spices like Mustard seeds, Turmeric, Garlic, Red and Chillies, Coriander seeds, with 84.0% and 72% consuming cumin and mustard seeds respectively.

The intake levels of spices were relatively much lower than for the other foods do not necessarily mean that they are of little value as their high polyphenolic content and antioxidant potential cannot be ignored. The frequency of spice intake and portion size at the individual level of adult women in urban and rural households will provide a quantitative estimate of spice intake. Embuscado (2015) mentioned that most frequently consumed spices among rural and urban households were red chilli powder, turmeric powder, cumin seeds, carom seeds, black pepper, asafoetida, green cardamom, black salt, fennel seeds and coriander seeds.

2.4 Factors that influence the consumers consumption of herbs and spices

Consumption of herbs and spices is associated with improved health outcomes. Evidence supports the possible protective effects of culinary herbs and spices against oxidative damage, inflammation, cancer, infection and

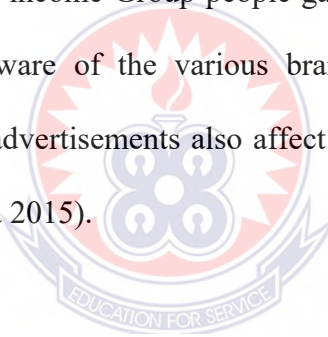
neurodegeneration. According to Salma and Ramakrishnan (2017) the usage and consumption of spices are mainly due to their extrinsic flavour. Demand for spices has always been high for their good taste and flavor. They are mostly often found in ground or powdered form, making them a prime target for adulteration. Ground spices and unpackaged spices are adulterated by fillers, less expensive / low quality spices, flour, corn starch, sawdust etc. Sometimes to enhance the appearance and to hide the presence of fillers, toxic and potentially carcinogenic dyes are also added to older stocks. For example, metanil yellow color and lead chromate used in turmeric; Sudan 1, a red dye, in chilli powder which are known to be category 3 carcinogens causing cancer are deliberately added (Gupta & Panchal, 2009).

It has been found that individuals with higher education, income and social status have a higher consumption of herbs and spices than those with lower education, income and social class status (Johansson & Andersen, 1998). In the Health Education Authority's Health and Lifestyle Survey of 1993 it was found that the main demographic characteristics that distinguished between low and high consumption of herbs and spices were age and gender (Thompson et al., 1999). It is these demographic characteristics that perhaps exhibit the strongest variations in intakes of herbs and spices, with women consuming more herbs and spices than men and older adults consuming more than the younger generations (McClelland et al., 1998).

A study of a random sample of 9003 British adults found that frequent herbs and spices consumption is due the importance associated with it. Herbs and spices are purchased to flavour food, enhance the appearance of cooked food, for preservation of foods, and in decorating cooked food (Whichelow & Prevost, 1996). In order to improve the health of the populace, herbs and spices intakes need to be increased, especially in those groups whose diets are particularly lacking in these important

dietary components. However dietary behaviour change is challenging and difficult to achieve both for the individual making the change and for the health professional recommending it. There are many factors, other than health, that affect the food a person chooses to consume herbs and spices. Knowledge of all of these factors, coupled with an understanding of the process of behaviour change, is vital for the successful completion of any dietary intervention to increase the consumption of herbs and spices.

Qualification of consumer, marital status, value, quantity, cost of branded spice and previous experience about spices was some of the major factors that influenced the consumer perception towards packaged and unpackaged spices. Educated people and high income Group people gave preference to quality and taste and they were mostly aware of the various brands of spices. Easy availability, attractive packaging and advertisements also affect the consumer perception towards spices (Abhirami & Radha 2015).



2.4.1 Sensory Appeal Influence

Herbs and spices are not just consumed for its nutrient value; for many people it is a source of pleasure, an enjoyable experience and even a comforting activity (Clark, 1998). The properties of individual foodstuffs, such as taste, texture, quality, smell and appearance, play an important role in whether a person will choose to consume herbs and spices. A number of studies have found sensory factors to be among the most influential in determining eating behaviour. In a pan-European survey, looking at consumer attitudes to herbs and spices, consumers were asked about their influences on the consumption of herbs and spices, 'flavour' was the most mentioned influence and 'taste' was within the first three mentioned. This was the

case for both the European Union (EU) sample and the UK sub-sample (Institute of European Food Studies, 1996).

A study by Brug et al. (1995) used focus group interviews to look at determinants of herbs and spices intake. Brug et al. found that, when looking at ‘satisfaction’ beliefs, ‘good’ taste was an essential prerequisite for the consumption of herbs and spices (Brug et al., 1995). Focus group participants in a US study indicated that good taste was perceived as a benefit of increasing spices intake (Heimendinger & Van Duyn, 1995). Heimendinger and Van Duyn mentioned that the usage and consumption of spices are mainly due to their extrinsic flavour, aroma and appearance.

2.4.2 Familiarity and habit Influence

Food habits have been described as ‘the way in which individuals in response to social and cultural pressures select, consume, and utilise portions of the available food supply’ (Khan, 1981). Food habits evolve from learned experience, which leads to the development of attitudes towards food. Thus, food habits become a form of self-expression. It has been said that ‘modelling’ is an indispensable aspect of the learning process. Brug et al. (1995) study found habit to be a strong determinant for the consumption of herbs and spices. Subjects stated repeatedly that ‘they were eating the way that they were taught at home in the past and continued eating according to those habits when they left their parents to go and live on their own or started their own family’ (Brug et al. 1995). These habits are the reason why cultures and traditions persist so strongly. It may be said that cultures and traditional practices are the foundations on which all food choice decisions are built. Some of the largest

variations in food choice are due to the boundaries laid down by cultures and traditions because they give values and beliefs in different foods and eating patterns.

Herbs and spices such as chilli, garlic, ginger, rosemary, thyme and many others may be used regularly due to certain cultures and traditions. The impact of culture on food choice is immense and varied; however, there are still many differences in food choices, and in food likes and dislikes, among members of the same culture (Rozin & Vollmecke, 1986). This suggests that although familial resemblance in food neophobia has been found this is likely to be due to familiarity and habit as opposed to heredity.

2.4.3 Social interactions Influence

Food is a major focus for social interactions. Westenhofer and Pudal (1993) found that pleasure from spices was only partly determined by the sensory aspects of the spices. Factors such as atmosphere, mood and people were all important aspects of the pleasure gained from consuming herbs and spices (Westenhofer & Pudal, 1993). Many eating occasions may affect the types and amounts of herbs and spices consumption.

Social pressures have been described to influence the consumption of certain herbs and spices (Thompson et al. 1999). It became evident that individuals that consumed high amounts of herbs and spices were more positive in attitude and experienced more social influence to consume herbs and spices than lower consumers (Lechner et al. 1997). A second study using the Theory of Planned Behaviour (Ajzen, 1991) to predict intention to increase herbs and spices intake found that the perceived social pressure to increase consumption was low. However, where a social pressure

was felt it was positive towards increasing herbs and spices consumption (Cox et al. 1998).

The large differences in intakes of herbs and spices between differing social classes may be due mainly to monetary concerns, but there is some thought that it could partly be due to differing social pressures and interactions. One study, conducted in Sweden, investigated how social networks and social support affected the socioeconomic differences in herbs and spices consumption (Lindstrom et al. 2001). The social network variables explored social participation within various formal and informal groups in society and also social anchorage, which dealt with feelings of membership within particular groups. The study found that low social participation was able to explain some of the differences in consumption of spices between differing socioeconomic groups (Lindstrom et al. 2001).

2.4.4 Availability Influence

This factor relates to the availability of herbs and spices at the various shops and supermarkets, and also to the physical effort required to obtain the food. In the 1980s there was a migration of many shopping facilities, including supermarkets, out of city and town centres. This drive has caused many local and smaller retailers within cities to either close down or increase prices. In the year 2000 supermarkets had 83 % of the market share in fresh fruit and vegetables, compared to 11 % for independent greengrocers and 3 % for market stalls (Mintel, 2001). Once again it is the low-income groups who suffer because it is the local retailers on whom families on low incomes, and those without transport, rely for their weekly food shopping. This means that these families have to either pay higher prices for foods, or pay to use public transport to travel to the new out-of-town supermarkets. Those families without their

own means of transport, in 1995, nationally represented a third of all households (Leather, 1995).

In relation to herbs and spices consumption, theoretically, availability could account for a large proportion of consumption. According to Heimendinger and Van Duyn (1995), perceived barriers to increasing herbs and spices consumption found that the participants were finding limited availability of spices and herbs.

2.4.5 Time constraints

Studies show conflicting opinions on all aspects of time constraints and how they affect food choice decisions. Issues include time available to go shopping and thus the perishable nature of foodstuffs, and also the time available for preparation and consumption of foods and therefore the convenience of foodstuffs. Fruit and vegetables seem to have opposing qualities. Anderson and Cox (2000) study using focus group interviews found that spices was viewed as convenient but some are considered perishable and expensive when out of season. For the addition of spices in food preparation time was considered to be a barrier to increasing consumption (Heimendinger & Van Duyn, 1995).

2.4.6 Personal thought

Personal ideologies may affect choice decisions, particularly those of the more affluent consumer (Holt, 1993). Issues surrounding organic produce, genetically modified foods, even down to the type of packaging used can influence an individual's choice decisions and public concern over food safety issues has been shown to be high (Frewer et al., 1998). Many consumers are concerned about the benefits derive from the consumption of herbs and spices. Consumers believed about the importance of herbs and spices influence their consumption pattern. The study

also found that fruit and vegetables were the most commonly purchased organic products (The Soil Association, 1999). Personal thought also incorporates any beliefs or concerns that individuals may possess and use when deciding what food items to purchase. For example, individuals may boycott certain herbs and spices because of what he/she thinks or believe (Burger, 1997). Many consumers will only buy herbs and spices because of health benefits he/she believes about it.

2.4.7 Media and advertising Influence

Promotion influence consumers patronage of a particular herbs and spices. The promotion manipulates consumer tastes herbs and spices (McKee, 1995). The low branding of herbs and spices means that they are comparatively poorly promoted, and the money spent on advertising fruit and vegetables is decreasing. Innovative marketing strategies to promote herbs and spices are much needed to help in efforts to increase consumption levels. One Scottish study found that 48 % of focus group discussants thought that advertising to encourage higher consumption of herbs and spices was a good idea (Anderson et al. 1994). The image of herbs and spices needs to be redesigned using sophisticated marketing techniques to make them more attractive to the consumer.

2.4.8 Health Benefits Influence

Health benefits derived from herbs and spices may be an important consideration when making choices for herbs and spices. In the Health Education Authority's health and lifestyle survey, lower consumers of herbs and spices were more likely to disagree with the statement 'healthy foods are enjoyable' and more likely to agree with the statement 'I don't really care what I consume' (Thompson et

al., 1999). In a study looking at perceived important influences on the consuming herbs and spices, the five most important factors were quality, price, taste, family preferences and trying to eat healthily (Lennernas et al., 1997).

A study by Dittus et al. 1995), on the other hand discovered that health benefits associated with herbs and spices may well increase consumption and found that an individual's concern about nutrition is positively related to their dietary behaviour (Dittus et al. 1995). From these results it might be thought that health benefits such as herbs and spices reducing harmful inflammation in the body, reducing the risk of heart disease, protecting cells against damage aging, and other stressors, helping lower blood sugar levels, and lowering the risk of being diabetic increases herbs and spices consumption.

2.5 Health benefits associated with consumers consumption of herbs and spices

Consumption of herbs and spices is associated with improved health outcomes. Evidence supports the possible protective effects of culinary herbs and spices against oxidative damage, inflammation, cancer, infection and neurodegeneration (Kaefer & Milner, 2008). Many of these protective effects are attributed to the high concentration of beneficial plant-derived compounds called polyphenols in herbs and spices (Pandey & Rizvi, 2009). Herbs and spices have numerous effects on the human body. Some of the health effects are discussed.

2.5.1 Cloves (*Syzygium aromaticum*)

Like other spices, cloves are available throughout the year. Cloves are the unopened pink flower buds of the evergreen clove tree. The buds are picked by hand

when they are pink and dried until they turn brown in colour. Cloves resemble tiny nails. The English name is actually derived from the Latin word *clavus*, which means nail. (Ensminger *et al.*, 2006). Clove contains significant amounts of an active component called eugenol, which has made it the subject of numerous health studies, including studies on the prevention of toxicity from environmental pollutants like carbon tetrachloride, digestive tract cancers, and joint inflammation. In the United States, eugenol extracts from clove have often been used in dentistry in conjunction with root canal therapy, temporary fillings, and general gum pain, since eugenol and other components of clove (including beta-caryophyllene) combine to make clove a mild anaesthetic as well as an anti-bacterial agent (Amaechi *et al.*, 1999).

Eugenol, the primary component of clove's volatile oils, functions as an anti-inflammatory substance. Clove also contains a variety of flavonoids, including kaempferol and rhamnetin, which also contribute to clove's anti-inflammatory and antioxidant properties (Friedman *et al.*, 2002). Like its fellow spices, clove's unique phytonutrient components are accompanied by an incredible variety of traditionally-recognized nutrients. Cloves are excellent source of manganese, a very good source of dietary fibre, vitamin C and omega-3 fatty acids and a good source of calcium and magnesium (Ensminger & Esminger, 2006).

2.5.2 Onion (*Allium cepa*)

Onions like garlic, are a member of the *Allium* family, and are rich in powerful sulphur-containing compounds that are responsible for their pungent odours and for many of their health-promoting effect. Onions contain allyl propyl disulphide, (while garlic is rich in allicin, diallyl disulphide, diallyl trisulfide and others). In

addition, onions are very rich in chromium, a trace mineral that helps cells respond to insulin, plus vitamin C, and numerous flavonoid (Augusti, 1996).

Onions have been singled out as one of the small number of vegetables and fruits that contributed to the significant reduction in heart disease risk seen in a meta-analysis of seven prospective studies (Huxley and Neil, 2003). Quercetin, an antioxidant in onions, and curcumin, a phytonutrient found in the curry spice turmeric, reduce both the size and number of precancerous lesions in the human intestinal tract (Yang *et al.*, 2004). Making onion and garlic a staple in your healthy way of eating may greatly lower your risk of several common cancers (Fukushima *et al.*, 1997). In addition, quercetin, the thiosulfinates exhibit antimicrobial properties and other flavonoids found in onions work with vitamin C to help kill harmful bacteria. Onion is effective against many bacteria including *Bacillus subtilis*, *Salmonella*, and *E. coli*, making onions an especially good addition to soups and stews during cold and flu season (Augusti, 1996).

The World Health Organization (WHO) supports the use of onions for the treatment of poor appetite and to prevent atherosclerosis. In addition, onion extracts are recognized by WHO for providing relief in the treatment of coughs and colds, asthma and bronchitis. Onions are known to decrease bronchial spasms. An onion extract was found to decrease allergy-induced bronchial constriction in asthma patients. Onions have a universal appeal. They are safely consumed by most people. However, consuming large quantities of onions can lead to stomach distress and gastrointestinal irritation that may result in nausea and diarrhea (Winston, 2002).

2.5.3 Pepper

With pepper, two separate parts of the plant, the fruit, which is an edible herb, and the ground seed which is used as a spice are of importance. The fruit of the sweet pepper, which is large and hollow, is popular for adding colour and flavour to salads and stir fry dishes.

2.5.4 Black pepper (*Piper nigrum*)

Black pepper (*Piper nigrum*) is a flowering vine in the family Piperaceae, cultivated for its fruit, which is usually dried and used as a spice and seasoning. The same fruit is also used to produce white pepper, red/pink pepper, and green pepper. The fruit, known as a peppercorn when dried, is a small drupe five millimetres in diameter, dark red when fully mature, containing a single seed.

Dried ground pepper is one of the most common spices in European cuisine and its descendants, having been known and prized since antiquity for both its flavour and its use as a medicine. The spiciness of black pepper is due to the chemical piperine (McGee, 2004). Black pepper has long been recognized as a carminative, (a substance

that helps prevent the formation of intestinal gas), a property likely due to its beneficial effect of stimulating hydrochloric acid production. In addition, black pepper has diaphoretic (promotes sweating), and diuretic (promotes urination) properties (Abila *et al.*, 1996). Not only does black pepper help derive the most benefit from food, the outer layer of the peppercorn stimulates the breakdown of fat cells, keeping ones slim and giving energy. Black pepper is an excellent source of manganese, a very good source of iron and vitamin K, and a good source of dietary fibre (Ensminger *et al.*, 2006).

2.5.3 White pepper (*Piper nigrum*)

White pepper consists of the seed only, with the fruit removed. This is usually accomplished by allowing fully ripe berries to soak in water for about a week, during which the flesh of the fruit softens and decomposes. Rubbing then removes what remains of the fruit, and the naked seed is dried. Alternative processes are used for removing the outer fruit from the seed, including removal of the outer layer from black pepper produced from unripe berries (McGee, 2004).

2.5.5 Red pepper (chilli) (*Capsicum annuum*)

Red pepper is fruit pod. It is also called cayenne pepper and provides the dominant flavour of chilli. The chilli pepper, or more simply just "chilli", is the fruit of the plant *Capsicum* from the nightshade family, Solanaceae. These terms usually refer to the smaller, hotter types of capsicum; the mild larger types are called bell pepper (simply pepper in Britain and Ireland or capsicum in Australasia). Red chillies are very rich in vitamin C and provitamin A. Yellow and especially green chillies (which are essentially unripe fruit) contain a considerably lower amount of both substances. In addition, peppers are a good source of most B vitamins, and vitamin B6 in particular. They are very high in potassium and high in magnesium and iron.

Pepper also has antimicrobial properties (Dorman & Deans, 2000). Experts say capsaicin, the chemical that gives spicy food its kick, could be used to kill tumours with few or no side effects for the patient. Chilli peppers also have cardiovascular benefits, weight loss properties (by inducing thermogenesis) and helps to clear mucus from stuffed noses or congested lungs (Heidi, 2002). Chilli also helps to lower the risk of diabetes; according to a study by the American Journal of Clinical Nutrition, the amount of insulin required to lower blood sugar after a meal is reduced

if the meal contains chilli pepper. Canadian researchers believe that chillies could play a vital role in curing diabetes (Ahuja *et al.*, 2006).

Red chili peppers, such as cayenne, have been shown to reduce blood cholesterol, triglyceride levels, and platelet aggregation, while increasing the body's ability to dissolve fibrin, a substance integral to the formation of blood clots. Cultures where hot pepper is used liberally have a much lower rate of heart attack, stroke, pulmonary embolism and also help fight against prostate cancer (Mori *et al.*, 2006). The 5th century Syriac Book of Medicines prescribes pepper (or perhaps long pepper) for such illnesses as constipation, diarrhoea, earache, gangrene, heart disease, hernia, hoarseness, indigestion, insect bites, insomnia, joint pain, liver problems, lung disease, oral abscesses, sunburn, tooth decay, and toothaches (Turner, 2004).

2.5.6 Garlic (*Allium sativum*)

Garlic is a member of the lily or *Allium* family, which also includes onions. Garlic is rich in a variety of powerful sulphur-containing compounds including thiosulfinates (of which the best known compound is allicin), sulfoxides (among which the best known compound is alliin), and dithiins (in which the most researched compound is ajoene). While these compounds are responsible for garlic's characteristically pungent odour, they are also the source of many of its health-promoting effects including cancer prevention. In addition, garlic is an excellent source of manganese, a very good source of vitamin B6 and vitamin C and a good source of selenium (Fukushima *et al.*, 1997; Andorfer *et al.*, 2003).

Numerous studies have demonstrated potential benefits of regular garlic consumption on blood pressure, platelet aggregation, serum triglyceride level, and cholesterol levels. Routine eating of garlic may also help stimulate the production of

nitric oxide in the lining of blood vessel walls, which may help to relax them (Apitz-Castro *et al.*, 2006; Spigelski & Jones, 2001).

As a result of these beneficial actions, garlic can be described as a food that may help prevent cancer, atherosclerosis and diabetic heart disease, as well as reducing the risk of heart attack or stroke (Berthold & Sudhop, 1998; Fleischauer *et al.*, 2000). The compounds in garlic responsible for its pungency also excite a neuron pathway providing cardiovascular benefits. Garlic's numerous beneficial cardiovascular effects are due to not only its sulphur compounds, but also to its vitamin C, vitamin B6, selenium, manganese calcium, potassium, iron and copper (Fugh-Berman, 2000; Bautista *et al.*, 2005). One reason for garlic's beneficial effects may be its ability to lessen the amount of free radicals present in the bloodstream (Dillon *et al.*, 2003).

Garlic is a very good source of vitamin C, the body's primary antioxidant defender in all aqueous (water-soluble) areas, such as the bloodstream, where it protects Low-density lipoprotein (LDL) cholesterol from oxidation. Since it is the oxidized form of LDL cholesterol that initiates damage to blood vessel walls, reducing levels of oxidizing free radicals in the bloodstream can have a profound effect on preventing cardiovascular disease (Superko & Krauss, 2000; Bhattacharya *et al.*, 2004).

2.5.7 Ginger (*Zingiber officinale*)

Ginger is a perennial spice which grows from underground rhizomes, which are often mistakenly called the "roots." Botanically it is the rhizome that provides the slightly hot, citrus-like taste, and wonderful aroma. Its family name is Zingiberaceae. The rhizome has thick lobes coloured from tan to white. A highly valued variety,

especially for medicinal uses, has a blue ring circling the fleshy inside of the rhizome. The nutrients present inside ginger, especially its volatile oils - gingerols and shogaols, accord a number of health benefits to its users (Chen *et al.*, 2007). In fact, ginger has also been found to be effective in fighting some fatal ailments like cancer (Afshari & Taghizade, 2007).

Ginger has been found to be helpful in blocking the harmful effects of prostaglandin, a substance that can lead to inflammation of the blood vessels in the brain and even cause migraines. Ginger has been associated with alleviation of the feeling of nausea, even in case of pregnant women (Portnoi *et al.*, 2003). Ginger is quite effective for relief of cramps caused by stomach gas. Ginger makes the platelets less sticky and is thus, pretty helpful in case of circulatory disorders. Preliminary studies suggest that ginger may lower cholesterol and prevents the clotting of blood. Each of these effects may protect the blood vessels from blockage and the damaging effects of blockage such as atherosclerosis, which can lead to a heart attack or stroke. (Bordia *et al.*, 1997).

There are a variety of uses suggested for ginger. Tea brewed from ginger is a folk remedy for colds. Ginger ale and ginger beer have been recommended as "stomach settlers" for generations in countries where the beverages are made, and ginger water was commonly used to avoid heat cramps in the US. Ginger has also been historically used to treat inflammation which several sugar, soluble and insoluble fibre, sodium, vitamins, minerals, fatty acids and amino acids. (Ensminger & Esminge, 2006).

2.5.8 Rosemary (*Rosmarinus officinalis*)

Rosemary is generally considered safe when taken in recommended doses. However, there have been occasional reports of allergic reactions. Large quantities of rosemary leaves, because of their volatile oil content, can cause serious side effects, including vomiting, spasms, coma and, in some cases, pulmonary edema (fluid in the lungs). Because larger doses of rosemary may cause miscarriage, pregnant and nursing women should not use it in quantities other than those used for cooking (Lemonica *et al.*, 1996). People with high blood pressure, ulcers, Crohn's disease, or ulcerative colitis should not take rosemary (Atsumi *et al.*, 2007).

2.5.9 Thyme (*Thymus vulgaris*)

Thyme leaves are curled, elliptically shaped and very small, measuring about one-eighth of an inch long and one-sixteenth of an inch wide. The upper leaf is green-grey in colour on top, while the underside is a whitish colour. Thyme has a long history of use in natural medicine in treatment of chest and respiratory problems including coughs, bronchitis, and chest congestion. The volatile oil components of thyme include carvacolo, borneol, geraniol, but most importantly, thymol (Bagamboula *et al.*, 2004). Thymol - named after the spice itself - is the primary volatile oil constituent of thyme, and its health-supporting effects are well documented.

In studies on aging in rats, thymol has been found to protect brain, kidney, and heart cell membranes when dietary supplementation with thyme was increased. Thyme also contains a variety of flavonoids, including apigenin, naringenin, luteolin, and thymonin. These flavonoids increase thyme's antioxidant capacity, and combined with its status as a very good source of manganese, give thyme a high standing on the

list of anti-oxidant foods (Kelm *et al.*, 2000). The volatile oil components of thyme have also been shown to have antimicrobial activity against a host of different bacteria and fungi. *Staphalococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Shigella sonnei* are a few of the species for which thyme has been shown to have antibacterial activity (Kulevanova *et al.*, 2000). For thousands of years, herbs and spices have been used to help preserve foods and protect them from microbial contamination. Research shows that both thyme and basil contain constituents that can both prevent contamination and decontaminate previously contaminated foods). It is an excellent source of iron, a very good source of calcium, manganese and a food source of dietary fibre (Cosentino *et al.*, 1999).

2.5.10 Anise (*Pimpinella anisum*)

Anise seed is a gray brown oval seed from plant in the parsley family. It is related to caraway, dill, cumin and fennel. Anise seeds smell and taste like licorice. Anise is native to Middle East and has been used as a medicine and as a flavour for medicine since prehistotoric times. Ancient Romans hung anise plant near their pillows to prevent bad dreams. They also used anise to aid digestion and ward off epileptic attacks (Chopra & Chandler, 2008) intestinal gas and spasmodic coughs (Blumenthal *et al.*, 1998). Anise has been combined with cathartic laxatives to reduce the spasmodic cramping. It has modest antiparasitic actions and has been recommended by some practitioners to treat mild intestinal parasite infections (Weiss, 2005).

The anise fruit has a nice taste and is used in phytotherapy. As a ripe fruit or juice, it is recommended for curing asthenia and for stimulating suckling mothers' lactation. It is also recommended for curing nervous asthenia, migraines, vertigos,

rheumatism, bronchial asthma, gastric pains, and slow digestion (Chopra & Chandler, 1998).

2.5.11 Aidan (Prekese) (*Tetrapleura tetraptera*)

Prekese (*Tetrapleura tetraptera*) which is an indigenous tree species belonging to the Mimosaceae family. In West Africa, the plant *Tetrapleura tetraptera* (locally known as Prekese) is popular among the Akans of Ghana for its use as a spice, as a dietary supplement rich in vitamins and a medicine for many ailments. Traditionally, the fruits, leaves, bark and roots are seen to have important medicinal properties (Thomas *et al.*, 2001).

Research has demonstrated how careful planting of *Tetrapleura tetraptera* in areas of high *Bilharzia* transmission can reduce the rates of infection, offering countries with limited resource a more environmentally and financially friendly way of protecting their populations from this dreaded disease. It was found that it had anti-ulcer and anti-convulsant properties, confirming its ethno medicinal use to treat these symptoms. The active ingredients were found to be rapidly passed through the mammalian body, with little retention in tissues. They were also found to exhibit very few toxic effects, and were mutagenic only in the presence of other more dangerous chemicals which are not frequently found. (Thomas *et al.*, 2001).

Prekese has many potential uses for instance it is a potential source of raw material for the growing pole industry of Ghana, which is currently based on teak. Farmers are critical of negative environmental impact of teak therefore it is a suitable indigenous substitute which is agro-forestry and environmentally friendly (Adewunmi, 2008). Biological study has shown that Prekese extract has some useful therapeutic action easing hypertension, and Asthma. Active constituents include

Scopletin which appears to have a relaxing action on smooth muscle, helping to ease constriction in the Bronchioles of the lung, and on constricted blood vessels (Adewunmi, 2008).

2.5.12 Senegal pepper (Hwentea) (*Xylopia aethiopia*)

There are several widely used indigenous forest species which are harvested from the wild. *Xylopia aethiopia* or Ethiopia pepper or Senegal pepper or locally known as (hwentea), the seeds are used as spice and a substitute for pepper. As a spice S n gal Pepper should always be used whole and grounded, as the hull of the fruit lends the spice its aromatic notes whilst the seeds within lend pungency and bitterness to the flavour (Burkill, 2005).

The chemical composition and mineral constituents of Senegal pepper, which is valued as a spice in Nigeria, were determined along with the physicochemical characteristics of the seed oil. The seeds had the following chemical compositions: moisture, ash, crude lipid, crude protein crude fibre and carbohydrate. Calcium and potassium were the major minerals in the seed. The extracted lipid was examined for the fatty acid composition. Linoleic and oleic acids were the predominant unsaturated fatty acids, while palmitic acid was the major saturated acid (Tatsadjieu *et al.*, 2003). The essential oils of Senegal pepper and four Cameroonian plants used as spices in local food, showed antibacterial and antifungal activity (Tatsadjieu *et al.*, 2003).

2.5.13 Ashanti pepper (Soro Wisa) (*Piper guineense*)

“False cubeb pepper” also known as “soro wisa” by the akans of Ghana, stems from Central Africa of the species *Piper guineense*. It belongs to the Piperaceae (pepper family). Its fruits, also known as “Ashanti pepper”, indeed strongly resemble cubeb berries, but are prolate-elliptically shaped, smaller, smoother in surface and

somewhat reddish coloured. Ashanti pepper tastes like the cubeb pepper, but fresher and less bitter. The stalked berries are a little bit larger than pepper corns, having a furrowed surface. Most berries are hollow. They are sold whole and should be crushed or ground before usage). It has a pungent and bitter with a strong terpene aroma. It has anti-convulsant properties (Abila *et al.*, 1996).



CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section discusses the research methodology used in this study and provide a general framework for this research. It encompasses the study area, research design, population, sample size and sampling technique, data collection instrument, validity and reliability of instruments, data collection procedures, and data analysis techniques.

3.2 Study Area

Kwadaso Municipality is located in the Ashanti Region of Ghana. It was part of the newly created Assemblies out of then Kumasi Metropolitan Assembly in 2018. The Municipality was established by the LI 2292 of 2017, inaugurated on March 15, 2018, with Kwadaso as its administrative capital. The Municipality has a projected population of about 251,215 (2018) with a growth rate of 2.3 percent. The males constitute 139,304 of the total population, while females are 111,911. The figure implies that Kwadaso Municipality in a male-dominated urban location and necessary contributor to the overall population growth rate Ghana (3.2%).

The local economy is structured into three key sectors. These include; agricultural, commerce or service and industrial sectors all have their fair share of the local economic base. The Municipality is the major transit point for goods and services between the Brong Ahafo North and southern parts of the Country, economic activities are dominated by the provision of Services of retail and wholesale trading. Industrial activities are concentrated around Sofoline and its environs with commerce and service activities also being concentrated at a different location of the

Municipality. Agricultural activities have been on the down turn due to competing for interest of land for commercial and other purposes rather than Agric. However, it is gradually making way for the service and industrial sector. The service sector now has to do with telecommunication, taxi and transport services, education and health services and general public administration. The industrial/manufacturing sector is also dominated by small-scale artisans like carpenters, auto mechanics, tailors, and hairdressers. Out of the 41% of the population who are employed, 91.2% are in the private sector with 79.2% of them engaging in private informal economic activities (Ghana Statistical Service, 2010).

In terms of education, the Municipality is currently without an Education Directorate to facilitate the routine management of all educational activities at all levels of education. Notwithstanding, the educational system in the Municipality comprises basic schools (from Pre-School to JHS), Senior High 7 Kwadaso Municipal Assembly PBB, 2019 Schools (SHS), Vocational and Technical Schools, Agric College and other Tertiary Institutions. To enhance teaching and learning, there is a total of 102 educational facilities in Kwadaso Municipality (Metro Education Department, 2018). Basic schools constitute majority of these institutions due to the level of enrolment. It is also important to note the significant role the private sector plays in ensuring quality and easy access to education in Kwadaso. The active involvement of the private sector in education in the metropolis can be attributed to the increased demand for quality education coupled with the growing performance of private schools in national examinations e.g., Basic Education Certificate Examination (B.E.C.E). However, limited data is available on the distribution of KGs in the basic schools. Figure 3.1 showed the map of Kwadaso Municipality.



Figure 3.1: Kwadaso Municipality

Source: PHC, 2018

3.3 Research design

This study adopted survey design to explore the consumption level of herbs and spices among consumers in Kwadaso Municipality. According to Aigbomia and Momoh (2007), survey research method gathers data from a population, with respect to one or more variables. Survey method was adopted because of the following reasons: The design is useful in describing the characteristics of a large population, makes use of large samples, thus making the results statistically significant even when analyzing multiple variables, many questions can be asked about a given topic giving considerable flexibility to the analysis, the design allows use of various methods of data collection like questionnaire and interview methods and It also makes use of standardized questions where reliability of the items is determined (Owen, 2002).

Survey design was used to collect data from consumers of herbs and spices at Kwadaso Municipality. The study used quantitative research paradigms. The quantitative research paradigm was used to obtain a sample from a large data and performed statistical analysis in order to produce results that could be generalized to the target population.

3.4 Population

Population is a collection of all possible individuals, objects or measurement that have one or more characteristics in common that are of interest to the researcher (Arthur, 2012). Thus, population is a complete set of individuals (subjects or events) having common characteristics in which the researcher is interested (Fraenkel & Warren, 2002). The study population consisted of women in the Kwadaso Municipality in the Ashanti Region of Ghana. The estimated population of the study includes 111,911 women in the Kwadaso Municipality (PHC, 2010).

3.5 Sample Size and Sampling Technique

Sampling is the process of selecting a portion of the population to represent the entire population in the study (Amedahe, 2004). Sample on the other hand consist of a carefully selected unit of the population for a particular study (Sarantakos, 2005) or is a sub-group of the population that is an ideal representative of the entire population (Kumar, 1999). It is the representative of the population to the extent that it exhibits the same distribution of characteristics as the population (Arthur, 2012).

In determining the sample size for the study, Cochran's Sample size formula was used. From the equation, a population of 111,911 requires a sample size of 385. Cochran's formula is considered especially appropriate in situations with large populations. A sample of any given size provides more information about a smaller population than a larger one, so there's a 'correction' through which the number given by Cochran's formula can be reduced if the whole population is relatively small. The Cochran formula is:

$$n_o = \frac{Z^2 pq}{e^2}$$

Where:

- e is the desired level of precision (i.e. the margin of error),

- p is the (estimated) proportion of the population which has the attribute in question,
- q is $1 - p$.
- The z -value is a 95 % confidence level gives us Z values of 1.96

Therefore, three hundred and eighty five (385) respondents were selected for the study comprising customers from each community in the Kwadaso Municipality in the Ashanti Region of Ghana.

Purposive and convenience sampling techniques were employed. In sampling the various households at the various communities in Kwadaso Municipality, purposive sampling technique was used. Here, any households within the study area that was approachable to the researcher at a particular point in time was selected. A purposive sample refers to selection of units based on personal sentiments rather than randomization. This judgmental sampling in some way is representative of the population of interest without sampling at random.

Convenience sampling technique was used for selecting the consumers at the various selected households in the study area. The researcher established relationship with the consumers during the visits. Convenience sampling is a type of nonprobability or non-random sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study (Dornyei, 2007). This sampling technique was used because it is affordable, easy and the subjects are readily available. Again, the absence of adequate and reliable information on the number of customers that consumes herbs and spices.

It must however, be stated that, the major limitations of convenience sampling is that, this method introduced biases since the researcher was influenced by factors such as affections towards a respondent. It is advised that convenience sampling

should not be taken to be representative of the population. Still, there is another problem of great concern related to convenience sampling, i.e. the problem of outliers. Because of the high self-selection possibility in non-probability sampling, the effect of outliers can be more devastating in this kind of subject selection. Outliers are cases whom consider as not belonging to the data.

3.6 Data collection instrument

The choice of data collection instrument(s) for a particular study depends on the research approach adopted, thus whether quantitative, qualitative or mixed methods approach as well as the pertinent research questions posed (Boateng, 2014). In this study, the quantitative approach was adopted. Therefore, for the purpose of data collection and analysis, the study employed questionnaire to collect data from the respondents. Questionnaire is regarded as an effective instrument for securing factual information about practices and conditions of which the respondents are presumed to have knowledge and opinions on (Cohen, Manion & Morrison, 2005).

Questionnaire was used simply because they can reach a large number of respondents within a short time, it gives the respondents adequate time to respond to the items, offers a sense of security and confidentiality to the respondents and lastly it tends to be objective since there is no bias resulting from the personal characteristics (Ogula, 2005). The questionnaires were divided into various sections based on the research objectives. Section I of the entire questionnaire dealt with demographic characteristics. Section II covered the frequency consumption of herbs and spices among consumers, section III dealt with factors that influence the consumers consumption of herbs and spices, and Section IV covered the health benefits of consuming herbs and spices.

Closed-ended questions were used for this study. Closed ended were employed for the reason that they are easy to ask and quick to answer, they require no writing by either respondent or interviewer, and their analysis is straightforward (Naoum, 1998). The closed-ended items were rated using a five-point Likert scale with a response category of: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly agree.

3.7 Validity and Reliability of the Research Instruments

3.7.1 Validity of Instruments

Validity is the degree to which test measures what is supposed to measure (Gay 1992). Orodho (2005) defines validity as the degree to which results obtained from the analysis of data actually represent the phenomenon under study. Validity checks whether research instruments are doing what they are intended to do. The research instruments should be able to depict what is measuring and what it is supposed to measure. For the purpose of this study, the designed questions probe the respondents to give their views on their age, education, occupation, and income level. The questionnaire instrument was then submitted to my supervisor. My supervisor scrutinized the details of the instruments; gave its views which were incorporated during the pilot study.

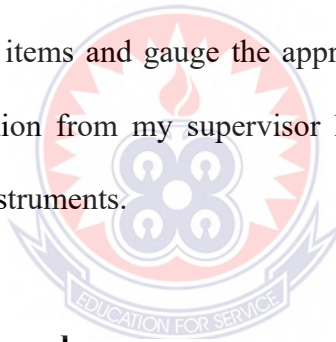
3.7.2 Reliability of the Instrument

The reliability of the study addressed the similarity of the results through repeated trials. Mugenda (1999) defines reliability as the measure to which research instrument yields consisted results after repeated trials. The identified problems were supplied with the instruments and were scored manually for the consistency of results.

The responses were analyzed after which two weeks period was allowed to pass before the same treatment to be applied to the same respondents and analysis done. The results were recorded accordingly. The reliability scores were also calculated using Cronbach's alpha. A coefficient of 0.745 was obtained which implied that the instrument was reliable

3.7.3 Piloting

Before data collection, the research instrument was pre-tested i.e. pilot study. A pilot study was conducted with a small representative sample which did not take part in the actual study. Questionnaires were piloted at the Abuakwa Community. Piloting was carried out to ascertain clarity and sustainability of the language to be used ensure relevance of items and gauge the appropriateness of the questionnaires. Furthermore, expert opinion from my supervisor helped check on the content and constant validity of the instruments.



3.8 Data collection procedure

Permission to conduct the study was sought from the households and the women wishing to participate in the study were invited to attend the study on a pre-arranged date. All the adult women included in the study were given an identification number. In addition, the questionnaire items were explained to the women in the language they understand better and time is given to them to reflect on the responses before giving their options.

3.9 Data analysis

The data obtained from the field were edited, coded for its consistency and then entered in a computer using the statistical package for social scientists (SPSS)

programmer version 23.0 to perform descriptive statistics. The frequency of herbs and spices consumed and the factors that influence their consumption level was scored in terms of mean (\bar{x}) and standard deviation (SD).



CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The chapter records the results obtained from the field of the study. It establishes the key findings from the data analysis in addition to the discussion of the findings with theories in the literature.

4.2 Response Rate

A total of 385 questionnaires were sent out to collect data from respondents. However, after the data collection exercise, three hundred and fifty three (353) questionnaire were returned after the data collection exercise. Therefore, the study realized an instrument return rate of 91.7%, which was very satisfactory for the purpose of the study which is in line with Mugenda and Mugenda (2003). This efficient response rate was realized since the researcher personally administered the questionnaires, and to some of the respondents ticked the answers myself per their choice and collected the instruments immediately after they were completed.

4.3 Demographic Data of Respondents

Data on age category of the respondents, educational level of the respondents, and employment status of the respondents were gathered.

Table 4. 1: Age group of respondents

Age group	Frequency (N)	Percentage (%)
18-20 years	18	5.1
21-30 years	168	47.6
31-40 years	103	29.2
41-50 years	55	15.6
51-60 years	5	1.4
Above 60 years	4	1.1
Total	353	100.0

Table 4.1 indicates that 18(5.1%) of the respondents were between 18-20 years; 168(47.6%) were between the age category of 21-30 years, 103(29.2%) constituting between the age of 31-40 years. On the other hand, 55(15.6%) of the respondents were between 41 - 50 years, and 5(1.4%) of the respondents were in the age category of 51-60 years, while the remaining 4(1.1%) of the respondents were in the age group above 60 years. This shows that majority of the respondents were between the age bracket of 21-30 years followed by age bracket of 31-40 years.

Table 4. 2: Educational status of respondents

Educational status	Frequency (N)	Percentage (%)
No formal education	25	7.1
Primary education	57	16.1
Junior High education	62	17.6
Senior High education	116	32.9
Tertiary education	93	26.3
Total	353	100.0

In terms of the highest level of education attained by respondent, the results pointed out that Senior High School education 116 (32.9%) was the commonest among the respondents in Kwadaso Municipal, Tertiary education 93(26.3%) was

common among the respondent; while Junior High School 62(17.6%) was also common among the respondent (Table 4.2). On the other hand, Primary Education 57(16.1%) and No formal education 25 (7.1%) generally constituted the least proportion of respondent in the Kwadaso Municipality.

Table 4. 3: Employment status of respondents

Employment status	Frequency (N)	Percentage (%)
Self-employed	178	50.4
Unemployed	24	6.8
Formally Employed	98	27.8
Informal Sector Employee	53	15.0
Total	353	100.0

As indicated in Table 4.3, 178 respondents representing 50.4% were self-employed, whereas 24 of them constituting 6.8% were unemployed. Moreover, 98 respondents representing 27.8% were formally employed. On the other hand, 53 respondents constituting 15.0% were informal sector employee. The finding indicates that majority of the women who performed cooking activities in the households were self-employed.

4.4 Consumption level of Herbs and Spices among consumers

This section sought to determine the consumption level of herbs and spices among consumers in the Kwadaso municipality. In the following evaluation these 20 most consumed herbs and spices were analysed. Therefore, the intakes of the consumers consumption of herbs and spices are presented in Table 4.4.

Table 4. 4: Consumption level of herbs and spices among consumers in the Kwadaso municipality

S/N	Herbs and spices	Frequently consumed										Mean±SD		
		Never		Rarely		Monthly once/twice		Weekly once		2-3 times/week			Everyday	
		<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%		<i>f</i>	%
1.	Cloves (Pepre)	---	---	177	50.1	68	19.3	20	5.6	79	22.4	9	2.5	3.60±1.157
2.	Anise seed (Nktinkiti)	6	1.7	89	25.2	72	20.4	88	24.9	93	26.3	5	1.4	3.75±0.114
3.	Basil (Akuko Besa)	176	49.9	131	37.1	33	9.3	11	3.1	2	0.6	---	---	2.25±0.707
4.	Negro pepper (Hwentia)	48	13.6	185	52.4	97	27.5	19	5.4	4	1.1	---	---	2.75±0.433
5.	Black pepper (Esoro Wisa)	114	32.3	193	54.7	22	6.2	15	4.2	9	2.5	---	---	2.60±1.094
6.	Turkeyberry (Kwahu Nsosuain)	---	---	104	29.5	168	47.5	73	20.7	8	2.3	---	---	4.25±1.236
7.	African locust bean (Dawadawa)	39	11.0	215	60.9	89	25.2	6	1.7	3	0.85	2	0.57	2.85±1.121
8.	Mint (Nunum).	264	74.8	81	22.9	7	1.9	1	0.3	---	---	---	---	2.00±1.000
9.	Guinea Pepper (Efom Wisa)	298	84.4	47	13.3	8	2.3	---	---	---	---	---	---	1.25±1.101
10.	Chili Pepper (Misewa)	299	84.7	53	15.0	1	0.3	---	---	---	---	---	---	1.00±1.301
11.	Galbanum (Prekese)	3	0.8	84	23.8	105	29.7	123	34.8	38	10.8	---	---	4.30±0.503
12.	Salt petre (Kanwo)	133	37.7	129	36.5	71	20.1	11	3.1	9	2.5	---	---	3.50±1.177
13.	Onion	---	---	---	---	---	---	---	---	4	1.1	349	98.9	5.30±0.333
14.	Garlic	6	1.7	13	3.7	15	4.2	197	55.4	49	13.8	73	20.7	4.85±0.709
15.	Cayenne	58	16.4	73	20.7	176	49.9	37	10.5	9	2.5	---	---	4.49±1.203
16.	Allspice (Afrafra)	11	3.11	46	13.0	124	35.1	167	47.3	5	1.4	---	---	4.59±1.221
17.	Curry	18	5.1	51	14.4	88	24.9	139	39.4	57	16.1	---	---	4.70±1.067
18.	Bay leaf	33	9.3	101	28.6	193	54.7	18	5.1	8	2.3	---	---	4.00±0.120
19.	thyme	77	21.8	177	50.1	59	16.7	37	10.4	---	---	---	---	3.30±0.245
20.	Rosemary	49	13.9	96	27.2	128	36.3	66	18.7	13	3.7	1	0.3	4.63±1.310

Note: Frequently consumed: > 3.5; Infrequently consumed: < 3.5

Source:

Field

Survey,

2022

Herbs and spices intake survey among women showed that Basil (Akuko Besa) (49.9%), Mint (Nunum) (74.8%), Guinea Pepper (Efom Wisa) (84.4%), Chili Pepper (Misewa) (84.7%) are never consumed. The results in Table 4.4 revealed that Cloves (Pepre) (50.1%), Negro pepper (Hwentia) (52.4%), Black pepper (Esoro Wisa) (54.7%), African locust bean (Dawadawa) (60.9%), and thyme (50.1%) are rarely consumed by the women who performed cooking activities in the households.

The results further showed that Turkeyberry (Kwahu Nsosuain) (47.5%), Cayenne (49.9%), Bay leaf (54.7%), and Rosemary (36.3%) are consumed at least once/twice per month. Conversely, the respondents emphasized that Galbanum (Prekese) (34.8%), Garlic (55.4%), Allspice (Afrafra) (47.3%), and Curry (39.4%) are consumed once in a week. Interestingly, 98.9% of the respondents mentioned that they consume onion every day. This shows that onion has been singled out as one of the small number of vegetables and fruits that are consumed everyday and contribute to the significant reduction in heart disease risk. The finding agrees with Adeage (2020) herbs and spices like including chili pepper, thyme, ginger, cayenne, and bay leaf, etc, which are used as seasonings. Adeage mentioned that these herbs and spices are part of the secret behind Ghana's delicious meals is their spices. While some are stored by smoking, some others are through drying, freezing, salting, and roasting.

From the frequently consumed herbs and spices in Kwadaso Municipality, it was observed that the most frequently consumed categories of herbs and spices among respondents were Cloves (Pepre) (3.60 ± 1.157), Anise seed (Nktinkiti) (3.75 ± 0.114), Turkeyberry (Kwahu Nsosuain) (4.25 ± 1.236), and Galbanum (Prekese) (4.30 ± 0.503). It was also revealed that Onion (5.30 ± 0.333), Garlic (4.85 ± 0.709), Cayenne (4.49 ± 1.203), Allspice (Afrafra) (4.59 ± 1.221), Curry (4.70 ± 1.067), Bay leaf (4.00 ± 0.120), and Rosemary (4.63 ± 1.310) are frequently consumed by the women

who performed cooking activities in the households. The Mean intakes were highest for these herbs and spices. The finding is line with Bhathal et al. (2020) study that common spices added to food were red chilli powder, turmeric powder, onion, garlic, mustard seeds, carom seeds, cumin seeds, Cayenne, black pepper and asafoetida among urban and rural households. Salma and Ramakrishnan (2017) studied the most frequently consumed spices in households and the consumer's knowledge and preferences to organic spices. From the study, spice intake survey in 100 Households showed that more than 50% consumed spices like Mustard seeds, Turmeric, Garlic, Red and Chillies, Coriander seeds, with 84.0% and 72% consuming cumin and mustard seeds respectively. Embuscado (2015) mentioned that most frequently consumed spices among rural and urban households were red chilli powder, cloves, cumin seeds, carom seeds, black pepper, onion, and cayenne.

4.5 Factors influencing consumer's consumption of herbs and spices

The second research question was intended to answer the question on the factors that influence consumption intention of consumers on herbs and spices. The factors were listed for the respondents to indicate the degree at which they agree or disagree. Presented in Table 4.5 showed the mean and standard deviation on the data gathered.

Table 4. 5: Factors influencing consumers consumption of herbs and spices

S/N	Factors	Mean	Std. dev.	Decision
1.	Herbs and spices are used to improve aroma to prepared food	3.64	1.215	Agreed
2.	Lifestyle/Modern food habit influence the purchase herbs and spices during food preparation	3.53	1.237	Agreed
3.	Purchase to help in the preparation of delicious meals	3.49	0.441	Agreed
4.	Herbs and spices are purchase for preservation of foods	3.45	1.268	Agreed
4.	Herbs and spices are purchased to flavour food	3.20	1.315	Agreed
5.	Herbs and spices have always been used for their good taste	3.10	0.386	Agreed
6.	Herbs and spices are used to improve acceptability of the food	3.05	1.405	Agreed
7.	To assist with calorie control and weight management	3.01	0.271	Agreed
8.	To enhance the appearance of cooked food	2.95	0.561	Disagreed
9.	Herbs and spices are used in decorating cooked food	2.80	0.345	Disagreed
10.	Reference group influence for the purchase herbs and spices during food preparation	2.45	0.456	Disagreed

Note: Agreed: > 3.0; Disagreed: < 3.0

From the analysis, herbs and spices for improving aroma to prepared food was ranked highest with a mean score of 3.64 and a standard deviation (SD) of 0.215. The respondents agreed that they consume herbs and spices to improve aroma to prepared food. The finding agrees with Brug et al. (1995) that aroma was an essential prerequisite for the consumption of herbs and spices. Heimendinger and Van Duyn (1995) mentioned that the usage and consumption of spices are mainly due to their extrinsic flavour, aroma and appearance.

In addition, the respondents agreed that lifestyle/modern food habit influence the purchase herbs and spices during food preparation. This statement reflected a mean of 3.53 and a standard deviation of 1.237. The finding is in line with Thompson et al. (1999) study. In a study looking at perceived important influences on the

consuming herbs and spices, modern lifestyle is one of the most important factors influencing consumers usage of herbs and spices. Again, the respondents affirmed that herbs and spices are purchase to help in the preparation of delicious meals. This statement attained a mean of 3.49 and a standard deviation of 0.441. The finding agrees with Adeage (2020) that several spices in Ghana contribute to delicious meals adding outstanding health benefits.

On the other hand, the respondents revealed that herbs and spices are purchase for preservation of foods. This statement reflected a mean score of 3.45 and standard deviation of 1.268. This indicates that consumers purchase herbs and spices for preserving food. The finding is in agreement with Whichelow and Prevost (1996) study that herbs and spices are purchased for preservation of foods, and in decorating cooked food. Sethi and Meena (1997) indicated that certain spices are often purchase to protect food from insect infestation and microbial putrefaction

On the issue that herbs and spices are purchased to flavour food, a mean of 3.20 and a standard deviation of 1.315 was attained. The mean score indicated that consumers purchase herbs and spices to flavour food. The result collaborates with Embuscado (2015) who found flavour to be among the most influential in the consumption of herbs and spices. In a pan-European survey, looking at consumer attitudes to herbs and spices, consumers were asked about their influences on the consumption of herbs and spices, 'flavour' was the most mentioned influence and 'taste' was within the first three mentioned. This was the case for both the European Union (EU) sample and the UK sub-sample (Institute of European Food Studies, 1996).

Furthermore, the respondents indicated that herbs and spices have always been used for their good taste with a mean score of 3.10 and a standard deviation of 0.386.

Brug et al. (1995) found that, when looking at 'satisfaction' beliefs, 'good' taste was an essential prerequisite for the consumption of herbs and spices. Focus group participants in a US study indicated that good taste was perceived as a benefit of increasing spices intake (Heimendinger & Van Duyn, 1995). The study by Abila *et al.*, (1996) revealed that the smell and taste of False cubeb pepper” also known as “soro wisa”, and anise seeds influence consumers consumption. However, the respondents agreed that herbs and spices are used to improve acceptability of the food with a mean score of 3.05 and a standard deviation 1.405 respectively. This indicates that herbs and spices are consumed to improve the tastes and healthy of food.

From the analysis, herbs and spices assist with calorie control and weight management was ranked highest with a mean score of 3.01 and a standard deviation (SD) of 0.271. The respondents agreed that they consume herbs and spices to assist them with calorie control and weight management. The finding agrees with Thompson et al. (1999) study that health benefits such as calorie control derived from herbs and spices may be an important consideration when making choices for herbs and spices. A study by Dittus et al. (1995), on the other hand discovered that health benefits associated with herbs and spices may well increase consumption and found that an individual's concern about nutrition is positively related to their dietary behaviour.

Conversely, the respondents disagreed to the statement to enhance the appearance of cooked food ($x=2.95$, $SD=0.561$), Herbs and spices are used in decorating cooked food ($x=2.80$, $SD=0.345$), and Reference group influence for the purchase herbs and spices during food preparation ($x=2.45$, $SD=0.456$) are factors to influence the consumption of herbs and spices. The statements failed to meet the predetermined cut-off point of 3.0.

The results showed that improving aroma of prepared food, lifestyle/modern, preparation of delicious meals, and preservation of foods are the factors that influence consumers purchase of herbs and spices during food preparation. It was further discovered that herbs and spices are purchased to flavour food, good taste, improve acceptability of the food, and to assist calorie control and weight management. This indicates that herbs and spices are not just consumed for its nutrient value; for many consumers it is a source of pleasure, an enjoyable experience and even a comforting activity. The finding buttresses with Clark (1998) that taste, texture, flavour, and smell play an important role in whether a person will choose to consume herbs and spices. According to Rozin and Vollmecke (1986), herbs and spices such as chilli, garlic, ginger, rosemary, thyme and many others may be used regularly due to certain sensory appeal like taste, flavour, smell and appearance. A study of a random sample of 9003 British adults found that frequent herbs and spices consumption is due the importance associated with it. Herbs and spices are purchased to flavour food, enhance the appearance of cooked food, for preservation of foods, and in decorating cooked food (Whichelow & Prevost, 1996). In order to improve the health of the populace, herbs and spices intakes need to be increased, especially in those groups whose diets are particularly lacking in these important dietary components.

4.6 Health benefit associated with consumption of herbs and spices

In answering research question three, the respondents were asked to indicate their level of agreement on the health benefits associated with consumption of herbs and spices. The mean and standard deviation on the data were presented in Table 4.6.

Table 4. 6: Health benefit associated with consumption of herbs and spices

S/N	Health benefits	Mean	Std. dev.	Decision
1.	Consuming herbs and spices lower the risk of being obese	4.10	.433	Agreed
2.	Herbs and spices are beneficial for improving digestion	4.00	.411	Agreed
3.	Herbs and spices are being studied for their ability to reduce harmful inflammation in the body.	3.83	1.830	Agreed
4.	Herbs and spices help in relieving nausea	3.69	.830	Agreed
5.	Herbs and spices help to protect cells against damage aging, and other stressors.	3.55	.435	Agreed
6.	Using herbs and spices reduce the risk of heart disease	3.28	.435	Agreed
7.	Consuming herbs and spices improve the brain function	3.10	.433	Agreed
8.	Herbs and spices reduced cancer risk	3.0	1.830	Agreed
9.	Consuming herbs and spices lower the risk of being diabetic	2.95	.801	Disagreed
10.	Herbs and spices help to lower blood sugar levels.	2.90	.830	Disagreed

Note: Agreed: > 3.0; Disagreed: < 3.0

As depicted in Table 4.7, the respondents were made to select some listed health benefits associated with consumption of herbs and spices. The respondents indicated that consuming herbs and spices lower the risk of being obese with a mean score of 4.10 and standard deviation of 0.433. The view of the respondents is in agreement with Chopra and Chandler (2008) study that consumption of cinnamon, turmeric and ginger is effective in the management of obesity and metabolic syndrome. According to Thomas *et al.* (2001) adding herbs and spices have been shown to increase metabolism, enhance fat burning and promote feelings of fullness. Diversifying spice cabinet is a simple and easy way to increase weight loss with minimal effort.

Again, the respondents agreed that herbs and spices are beneficial for improving digestion. This statement had a mean score of 4.00 and a standard deviation of 0.41. The finding is in agreement with Chopra and Chandler (2008) that

consumption of cinnamon aids digestion, and treats nausea, cold, and inflammations. The bark has essential oils that possess anti-fungal and anti-bacterial properties. Moreover, the results showed that herbs and spices are being studied for their ability to reduce harmful inflammation in the body. This statement reflected a mean score of 3.83 and a standard deviation of 1.830 indicating that herbs and spices consumption reduces harmful inflammation in the body. The finding is in line with Dittus et al.'s (1995) study that adding herbs and spices to food reduces harmful inflammation in the body and reducing the risk of heart disease.

On the other hand, the respondents agreed that herbs and spices help in relieving nausea with a mean score of 3.69 and standard deviation of 0.830. The study by Weiss (2005) emphasized that ginger is widely used for reducing nausea. Studies have shown ginger to be effective in treating symptoms of nausea and vomiting caused by pregnancy and by chemotherapy. Moreover, the respondents agreed on herbs and spices help to protect cells against damage aging, and other stressors. This statement had a mean of 3.55 and standard deviation of 0.435 among the numerous health benefits. Dittus et al. (1995) results showed that herbs and spices protect cells against damage aging. It is evident that frequent consumption of herbs and spices is linked to a preventing ageing, lowering risk of death from cancer and ischemic heart and respiratory system diseases.

The finding further indicates that reducing the risk of heart disease is one of the key health benefits associated with the consumption of herbs and spices. This statement had a mean score of 3.28 and a standard deviation of 0.435. Blumenthal *et al.* (1998) study found that consuming herbs and spices can help promote better cardiovascular health. Weiss (2005) study found that adding herbs and spices to meals may help reduce blood pressure in people at risk of heart disease. According to

Huxley and Neil (2003) consumption of spices like onions have been singled out as one of the small number of vegetables and fruits that contributed to the significant reduction in heart disease risk. Conversely, consuming herbs and spices improve the brain function with a mean score of 3.10 and a standard deviation of 0.433. The view of the respondents is in accord with Kelm *et al.* (2000) study that thymol has been found to protect brain, kidney, and heart cell membranes when dietary supplementation with thyme was increased. Cosentino *et al.* (1999) indicated that herbs and spices have been consume improve the brain function.

On the statement that herbs and spices reduced cancer risk, a mean score of 3.00 and a standard deviation of 1.830 was attained. The mean score showed the respondents agreed that consumption of herbs and spices reduces cancer risk. Andorfer *et al.* (2003) affirmed that garlics are the source of many of its health-promoting effects including cancer prevention. Afshari and Taghizade (2007) on the same issue emphasized that ginger has also been found to be effective in fighting some fatal ailments like cancer.

On the contrary, the respondents disagreed that consuming herbs and spices lower the risk of being diabetic ($X=2.95$, $SD=0.801$), and herbs and spices help to lower blood sugar levels ($x=2.90$, $SD=0.830$). All these statements failed to meet the predetermined cut-off point of 3.0.

The view of the women who performed cooking activities revealed that consuming herbs and spices lower the risk of being obese. improve digestion, reduce harmful inflammation in the body, and helps relieving nausea. Moreover, it was evident that herbs and spices usage help to protect cells against damage aging, and other stressors, reduce the risk of heart disease, improve the brain function, and reduce cancer risk. The finding showed that the consumption of herbs and spices is

associated with improved health outcomes. The finding supports Kaefer and Milner (2008) study that adding herbs and spices to favourite food reduce inflammation, cancer, infection and heart disease. Pandey and Rizvi (2009) also revealed that consuming of herbs and spices have numerous effects on the human body.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter sums up the findings from the study, draws conclusions arising from the study and makes relevant recommendations based on the findings and conclusions.

5.2 Summary of Key Findings

A number of findings were made after discussion of the responses and summarized as below;

5.2.1 Consumption level of herbs and spices among consumers

- The finding showed that cloves (Pepre) (3.60 ± 1.157), anise seed (Nktinkiti) (3.75 ± 0.114), turkeyberry (Kwahu Nsosuain) (4.25 ± 1.236), and galbanum (Prekese) (4.30 ± 0.503) were most frequently consumed herbs and spices among the consumers.
- It was also revealed that onion (5.30 ± 0.333), garlic (4.85 ± 0.709), cayenne (4.49 ± 1.203), allspice (Afrafra) (4.59 ± 1.221), Curry (4.70 ± 1.067), bay leaf (4.00 ± 0.120), and rosemary (4.63 ± 1.310) were frequently consumed by the consumers.

5.2.2 Factors that influence the consumers consumption of herbs and spices

- The study confirmed that improving aroma of prepared food, lifestyle/modern, preparation of delicious meals, and preservation of foods influence consumers purchase of herbs and spices during food preparation.

- It was further discovered that herbs and spices are purchased to flavour food, good taste, improve acceptability of the food, and to assist calorie control and weight management.

5.2.3 Health benefits associated with consumers consumption of herbs and spices

- The study found that consuming herbs and spices lower the risk of being obese, improve digestion, reduce harmful inflammation in the body, and helps relieving nausea.
- It was discovered that herbs and spices usage help to protect cells against damage aging, and other stressors, reduce the risk of heart disease, improve the brain function, and reduce cancer risk.

5.3 Conclusion

In Ghana, herbs and spices have been used to prepare delicious meals. Virtually every home in the country has a range of spices. According to the study cloves (Pepre), anise seed (Nktinkiti), turkeyberry (Kwahu Nsosuain, and galbanum (Prekese) were most frequently consumed herbs and spices among the consumers. On the other hand, onion, garlic, cayenne, allspice (Afrafra), curry, bay leaf, and rosemary were found to be frequently consumed by women who performed cooking activities.

The consumption levels of herbs and spices of most people were by improving aroma of prepared food, lifestyle/modern, preparation of delicious meals, and preservation of foods influence consumers purchase of herbs and spices during food

preparation. It is pertinent to mention that spices do not only add flavour, and taste but also assist calorie control and weight management.

Consuming herbs and spices perform a variety of useful functions in foods that consumers often take for granted. It was concluded that consuming herbs and spices lower the risk of being obese, improve digestion, reduce harmful inflammation in the body, and helps relieving nausea. Also, herbs and spices usage help to protect cells against damage aging, and other stressors, reduce the risk of heart disease, improve the brain function, and reduce cancer risk.

5.4 Recommendation

Based on the outcome of the study, the following recommendations are made by the researcher.

1. Consumer education is highly recommended as a contribution to protecting the health and safety of consumers. It is mandatory for Food and Drugs Authority (FDA) to create awareness among the consumers towards herbs and spices which are more advantageous to humans as well as the environment.
2. The government of Ghana must invest in long-term research and improved seed supply sources for herbs and spices to ensure they can be competitive in the marketplace.
3. Farmers should package and market these herbs and spices to attract consumers attention as packaging and advertisement influence consumers purchase intention.

5.5 Suggestion for Further Studies

There are numerous research avenues in future as a result of this study. The following are therefore recommended for further research:

- A replication of this study would be helpful in reexamining the validity of its findings for which the researcher was not able to investigate.
- Further empirical studies should be conducted in comparing food consumption pattern in rural and urban areas in Ghana.
- Further research should use observation and interviews to investigate the usage of herbs and spices.



REFERENCES

- Abhirami, S. & Radha S. (2015). Detection of food adulteration in selected food items procured by homemaker. *International Journal of Recent Scientific Research*, 6(8): pp 5938-5843.
- Aggarwal, B. B. & Sung, B. (2009). Pharmacological basis for the role of curcumin in chronic diseases: an age-old spice with modern targets. *Trends Pharmacology Science*, 302:85–94.
- Ahene, R. E, Odamtten, G. T. & Owusu, E. (2011). Fungal and bacterial contaminants of six spices and spice products in Ghana. *African Journal of Environmental Science and Technology*, 5(9), pp. 633-640.
- Aigbomia, O. & Momoh, A. (2007). *Research methods in library and information science*. Ibadan: Sterling Holden Publishers.
- Amedahe, F. K. (2004). Notes on educational research. Unpublished notes, University of Cape Coast, Cape Coast
- Andersen, B. V. Byrne, D. V., Bredie, W.L.P. & Moller, P. (2017). Cayenne pepper in a meal: Effect of oral heat on feelings of appetite, sensory specific desires and well-being. *Food Quality and Preference*, 60 (7), pp. 1-8.
- Anderson, C. A., Cobb, L. K., Miller, E. R., Woodward, M., Hottenstein A, Chang, A. R. & Mongraw-Chaffin, M. (2015). Effects of a behavioral intervention that emphasizes spices and herbs on adherence to recommended sodium intake: results of the SPICE randomized clinical trial. *American Journal of Clinical Nutrition*, 1023:671–9.
- Anderson, J.J., Anthony, M.S., Cline, J.M., Washburn, S.A., Garner, S.C. (1999). Health potential of soy isoflavones for menopausal women. *Publication Health Nutrition*, 2, 489–504
- Arthur, J. (2012). Data Normality Tests Using P-value and Critical Values. Denver: Know Ware International, Inc.

- Behera, S., Nagarajan, S. & Rao, L. J. M. (2004). Microwave heating and conventional roasting of cumin seeds (*Cuminum cyminum* L.) and effect on chemical composition of volatiles. *Food Chemical*; 87: 25-29.
- Bhathal, K. S., Kaur, H., Bains, K. & Mahal, K. A. (2020). Assessing intake and consumption level of spices among urban and rural households of Ludhiana district of Punjab, India. *Nutrition Journal*, 19:121
- Bhathal, K. S., Kaur, H., Bains, K. & Mahal, A. K. (2017). Assessing intake and consumption level of spices among urban and rural households of Ludhiana district of Punjab, India. *Research Square*, 3: 1-19.
- Bhattacharyya, S., Chakraborty, C., Moitra, S., Bandyopadhyay, K. (2017). Potential application of milk and milk products as carrier for herpes and spices: a Review. *International Journal Engineering Resource Science and Technology*, 6, 113–124.
- Billing, J. & Sherman, P. W. (2008). Antimicrobial functions of spices: why some like it hot. *Q Review Biological*, 73:3-49.
- Bin, S., Yi-Zhong, C., John, D. B. & Harold, C. (2011). Potential application of spice and herb extracts as natural preservatives in cheese. *Journal of Medical Food*, 14, 284–290.
- Boateng, R. (2014). *Research Made Easy*. Accra: Pearl Richards Foundation.
- Bortolin, E., Boniglia, C. & Calicchia, A. (2007). Irradiated herbs and spices detection: lightinduced fading of the photo-stimulated luminescence response. *International Journal Food Science Technology*, 42 (3), 330–335.
- Canadian African (2020). Important Spices in Ghanaian Cooking. Retrieved from <https://thecanadianafrican.com/important-spices-in-ghanaian-cooking/>. Accessed: February, 3, 2021
- Carlsen, M. H., Blomhoff, R. & Andersen, L. F. (2011). Intakes of culinary herbs and spices from a food frequency questionnaire evaluated against 28-days estimated records. *Nutrition Journal*; 10: 50.

- Carroll, R. E., Benya, R. V. Turgeon, D. K. Vareed, S., Neuman, M., Rodriguez, L.; Kakarala, M.; Carpenter, P.M.; McLaren, C. & Meyskens, F. L. (2011). Phase IIa clinical trial of curcumin for the prevention of colorectal neoplasia. *Cancer Previous Resource*, 4, 354–364.
- Chandila, J. & Puri, D. (2019). Comparative Study on Consumer Perception towards Packaged Spices among Rural and Urban Women. *International Journal of Health Sciences & Research*, 9(8), 399-406.
- Cohen, L., Manion, L. & Morrison, K. (2005). *Research Methods in Education* (5th ed.). Madison: University of Wisconsin.
- Conn, E.E. (1995). The world of phytochemicals. In: Gustine, D.L., Flores, H.E. (Eds.), *Phytochemicals and Health. American Society of Plant Physiologists, Rockville, MD, pp. 1–14.*
- Cowan, M. M. (1999). Plant products as antimicrobial agents. *Clinical Microbiology Review*; 124:564–82.
- Darkwa, S. (2013). Spices and Condiments in Ghana: Their Utilization in Comminuted Meat Products. *Asian Journal of Agriculture and Rural Development*, 3(12): 899-908
- Eigner, D. & Scholz, D. (1999). *Ferula asafoetida* and *Curcuma longa* in traditional medical treatment and diet in Nepal. *Journal of Ethnopharmacology*; 67: 1-6.
- El-Sayed, S. M., El-Sayed, H.S., Salama, H. H. & Abo El-Nor, S. A. H. (2017). Improving the nutritional value and extending shelf life of labneh by adding *Moringa oleifera* oil. *International Journal Dairy Science*, 12 (2), 81–92.
- El-Sayed, S.M., Salama, H. & El-Sayed, M.M. (2015). *Preparation and properties of functional milk beverage fortified with kiwi pulp and sesame oil. RJPBCS 6 (5), 609-618*
- Embuscado, M. E. (2015). Spices and herbs: Natural sources of antioxidants-a mini review. *Journal of Function Foods*, 18(2): 811–9

- Fabio, A., Corona, A., Forte, E. & Quaglio, P. (2003). Inhibitory activity of spices and essential oils on psychrotrophic bacteria. *New Microbiological*, 261:115–20
- Ferrucci, L. M., Daniel CR, Kapur K, Chadha, P., Shetty, H. & Graubard, B. I. (2010). Measurement of spices and seasonings in India: Opportunities for cancer epidemiology and prevention. *Asi Pac J Canc Prev*. 2010;11: 1621–29.
- Garcea, G., Berry D. P., Jones, D. J., Singh, R., Dennison, A. R., Farmer P. B., Sharma R. A, Steward, W. P. & Gescher, A. J. (2005). Consumption of the putative chemopreventive agent curcumin by cancer patients: assessment of curcumin levels in the colorectum and their pharmacodynamic consequences. *Cancer Epidemiology, Biomarkers & Prevention*; 141:120–5.
- Gay, L. R. (1992). *Education Research Competencies for Analysis and Application*: London: Charles E. Milton Keynes Philadelphia Company.
- Geha, R.S., Beiser, A., Ren, C., Patterson, R., Greenberger, P.A., Grammer, L.C. & Ditto, A.M. (2000). Review of alleged reaction to monosodium glutamate and outcome of a multicenter double-blind placebo-controlled study. *Journal of Nutrition* 130 (45): 1058-1062.
- Ghawi, S. K., Rowland, I. & Methven, L. (2014). Enhancing consumer liking of low salt tomato soup over repeated exposure by herb and spice seasonings. *Appetite*, 81 (2), pp. 20-29.
- Gupta, N. & Panchal P. (2009). Extent of Awareness and Food adulteration detection in selected food items purchased by Home Markers. *Pakistan journal of nutrition*, 8(5):660-667.
- Hassan, M A. (2010). Food and Drug Partnership for Safe Medicines Interchange. Retrieved from <http://www.fda.gov/downloads/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/Cou>. Accessed: October, 9, 2021.
- Herman, L. (2015). Herb & Spice Companion: the Complete Guide to over 100 Herbs & Spices. *Wellfleet Press, New York, NY*.

- Kaefer, C. M. & Milner, J. A. (2008). The role of herbs and spices in cancer prevention. *Journal Nutrition Biochemistry*; 347–61.
- Kaefer, C. M. & Milner, J. A. (2018). The role of herbs and spices in cancer prevention. *Journal of Nutrition Biochemistry*, 19:347-61.
- Kaefer, C. M. & Milner, J. A. (2018). The role of herbs and spices in cancer prevention. *Journal of Nutrition Biochemistry* 8, 19, 347–361.
- Kaefer, C.M. & Milner, J.A. (2008). The role of herbs and spices in cancer prevention. *Journal of Nutrition Biochemic*, 19, 347–361
- Kalembe, D. & Kunicka, A. (2003). Antibacterial and antifungal properties of essential oils. *Current Medicinal Chemistry*, 1010:813–29.
- Kumar, G. & Srivastava, N. (2011). Genotoxic effects of two commonly used food additives of boric acid and sunset yellow in root meristems of *Trigonella foenum-graecum*. *Journal of Environmental Health Science and Engineering*, 8: 361-366.
- Kumar, R. (1999) *Research Methodology: A Step-by-Step Guide for Beginners*. Sage Publications, London, Thousand Oaks, New Delhi.
- Lai, P. K. & Roy, J. (2014). Antimicrobial and chemopreventive properties of herbs and spices. *Current Medicinal Chemistry*, 11, 1451–1460.
- Lai, P.K. & Roy, J. (2004). Antimicrobial and chemopreventive properties of herbs and spices. *Curr. Medical Chemical*, 11, 1451–1460.
- Lampe J. W. (2013). Spicing up a vegetarian diet: chemo preventive effects of phytochemicals. *American Journal of Clinical Nutrition*, 78: 579-83.
- Lang, Q. & Wai, C.M. (2001). *Supercritical fluid extraction in herbal and natural product studies-a practical review*. *Talanta*, 53 (4), 771–782.
- Li, Z., Henning, S. M., Zhang, Y., Zerlin, A., Li, L., Gao, K., Lee, R. P., Karp, H., Thames, G. & Bowerman, S. (2010). Antioxidant-rich spice added to hamburger meat during cooking results in reduced meat, plasma, and urine

malondialdehyde concentrations. *American Journal of Clinical Nutrition*, 91, 1180–1184.

Madhyastha M. S. (1999). Mycotoxic Fungi and Mycotoxins in Major Spices with 490 Special Reference to *Piper nigrum L.* Ph.D. Thesis, Mangalore, Karnataka, 491 India. University of Mysore.

Mugenda, O. (1999). *Research methods dictionary*. Nairobi: Applied Research & Training Services.

Naoum, S. G. (1998). *Dissertation Research and Writing for Construction Students*, Butterworth-Heinemann, Oxford, UK.

Nesheim, R. O. (2002). Measurement of food consumption-past, present, future. *American Journal of Clinical Nutrition*; 35:1292–96.

Nikousaleh, A. & Prakash J. (2008). Effect of Dry Heat Treatment of Six Spices on Antioxidant Activity of their Water Extracts. *Food*. 2008; 2:139-44.

Ogula, P. A. (2005). *Research Methods*. Nairobi: CUEA Publications.

Opara, E. I. & Chohan, M. (2014). Culinary herbs and spices: Their bioactive properties, the contribution of polyphenols and the challenges in deducing their true health benefits. *Int. Journal of Mol. Science*, 15, 19183–19202.

Orodho, A. J. (2005). *Essentials of Educational and Social Sciences Research Method*. Nairobi: Masola Publishers.

Owens, L.K (2002). *Introduction to Survey Research Design*. SRL Fall 2002 Seminar Series. Retrieved from <http://www.srl.uic.edu/seminars/Intro/introsrm.pdf>

Pandey, K. B. & Rizvi, S. I. (2009). Plant polyphenols as dietary antioxidants in human health and disease. *Oxidative Medicine Cellular Longevity*. 2, 270–278

Pandey, K. B. & Rizvi, S. I. (2009). Plant polyphenols as dietary antioxidants in human health and disease. *Oxid. Med. Cell. Longev*, 2, 270–278.

Pellegrini, N., Salvatore, S., Valtuena, S., Bedogni, G. & Porrini M. (2017). Development and validation of a food frequency questionnaire for the

- assessment of dietary total antioxidant capacity. *Journal of Nutrition*, 137:93-98.
- Peters, J. C., Polsky, S. Stark, R., Zhaoxing, P. & Hill, J. O. (2014). The influence of herbs and spices on overall liking of reduced fat food. *Appetite*, 79 (4), pp. 183-188.
- Pradeep, K. U., Geervani, P. & Eggum B. O. (2013). Common Indian spices: nutrient composition, consumption and contribution to dietary value. *Plant Foods Humanity Nutrition*, 44: 137-48.
- Rubio, L., Motilva, M. J. & Romero, M. P. (2013). Recent advances in biologically active compounds in herbs and spices: a review of the most effective antioxidant and anti-inflammatory active principles. *Critical Review Food Science and Nutrition*, 53:943-53.
- Rubio, L., Motilva, M. J. & Romero, M. P. (2013). Recent advances in biologically active compounds in herbs and spices: a review of the most effective antioxidant and anti-inflammatory active principles. *Critical Rev Food Science Nutrition*, 53: 943-53.
- Salma, S. & Ramakrishnan, L. (2017). Study on most frequently consumed spices in households and the consumer's knowledge and preferences to organic spices in Coimbatore district, Tamil Nadu, India. *International Journal of Herbal Medicine*, 5(3): 49-52
- Sarantakos, S. (2005) *Social Research*. (3rd ed.). Palgrave Mac-Millan, New York.
- Sasaki, S., Kobayashi, M. & Tsugane, S. (2013). Validity of a self-administered food frequency questionnaire used in the 5-year follow-up survey of the JPHC study cohort I: comparison with dietary records for food groups. *Journal of Epidemiology*, 2003; 13:57-63.
- Shelef L. A. (2014). Antimicrobial effects of spices. *Journal of Food Safety*. 6: 29-44.
- Sherman, P. W. & Hash, G. A. (2001). Why vegetable recipes are not spicy. *Evolution Humanity Behaviour*, 22:147-63.

- Siruguri, V &, Bhat, R. V. (2015). Assessing intake of spices by pattern of spice use, frequency of consumption and portion size of spices consumed from routinely prepared dishes in southern India. *Nutrition Journal*, 14: 1-9.
- Susheela R. U. (2000). Handbook of spices, seasonings and flavourings. Lancaster, USA: Technomic Publishing. 2000.p. 47–48.
- Tantipopipat S, Boonpradern A, Charoenkiatkul S, Wasantwisut E, Winichagoon P. (2012). Dietary intake of spices and herbs in habitual northeast Thai diets. *Malnutrition Journal of Nutrition*; 16: 137 – 48.
- Tantipopipat S, Boonpradern A, Charoenkiatkul S, Wasantwisut E. & Winichagoon, P. (2010). Dietary intake of spices and herbs in habitual Northeast Thai diets. *Malnutrition Journal Nutrition*; 16:137–48.
- Tapsell, L. C., Hemphill, I., Cobiac, L., Patch, C. S., Sullivan D. R., Fenech, M. & Roodenrys S, (2006). Health benefits of herbs and spices: the past, the present, the future. *Medical Journal of Australia*, 185(2): 14–24.
- Tapsell, L. C., Hemphill, I., Cobiac, L., Patch, C. S., Sullivan, D. R., Fenech, M, Roodenrys, S., Keogh, J. B., Clifton, P. M., Williams, P. G., Fazio, V. A. & Inge, K. E. (2016). Health benefits of herbs and spices: the past, the present, the future. *Medical Journal*, 6; 185:4–24.
- Thimmayamma, B.V.S., Rau, P. & Radhaiah, G. (1983). Use of spices and condiments in the dietaries of urban and rural families. *Indian Journal Nutrition Dietary*, 20:153–62.
- Tsai, P. J., Tsai, T. H. Yu, C. H. & Ho, S.C. (2017). Evaluation of NO-suppressing activity of several Mediterranean culinary spices. *Food Chemical Toxicology*, 45, 440–447.
- WHO (2013). GEMS/Food regional diets: regional per capita consumption of raw and semi-processed agricultural commodities / prepared by the Global Environment Monitoring System/Food Contamination Monitoring and Assessment Programme (GEMS/Food).

WHO (2016). GEMS/Food consumption Database. https://www.who.int/nutrition/landscape_analysis/nlis_gem_food/en

Williams P. G. (2006). Health benefits of herbs and spices. *Publication Health Medical Journal*, 185: 17–8.



APPENDIX

UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

Preamble: I am a student at University of Education, Winneba. The purpose of this questionnaire is to assess “**consumption of herbs and spices and its health benefits on the consumers**”. It would be greatly appreciated if you could complete this questionnaire. The study is purely for academic purpose and nothing else. Be assured that your response will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick (✓) or writing the appropriate answer when needed. Thank you

Section I: Socio-demographic characteristics

1.0 What is your age?

18-20 years () 21-30 years () 31-40 years () 41-50 years ()
51-60years () Above 60 years ()

2.0 What is your marital status?

Single () Married () Divorced ()

If other specify:.....

3.0 What is your educational level?

No formal education () Primary education () Junior high school ()

Senior high education () Tertiary education ()

4.0 What is your Employment status?

Self-employed () Unemployed () Formally Employed ()

Informal Sector Employee ()

Section II: Consumption level of herbs and spices among consumers in the Kwadaso Municipality

6.0 Please tick [√] to indicate your position on the frequency of consumption of these herbs and spices for cooking.

S/N	Herbs and spices	Every day	2-3 times/week	Weekly once	Monthly once/twice	Rarely	Never
1.	Cloves (Pepre)						
2.	Anise seed (Nktinkiti)						
3.	Basil (Akuko Besa)						
4.	Negro pepper (Hwentia or Ahentia)						
5.	Black pepper (Esoro Wisa)						
6.	Turkey berry (Kwahu Nsosuain)						
7.	African locust bean (Dawadawa)						
8.	Mint (Nunum).						
9.	Guinea Pepper (Efom Wisa)						
10.	Chili Pepper (Misewa)						
11.	Galbanum (Prekese)						
12.	Salt petre (Kanwe)						
13.	Onion						
14.	Garlic						
15.	Cayenne						
16.	Allspice						
17.	Curry						
18.	Bay leaf						
19.	thyme						
20.	Rosemary						

Section III: Factors influencing consumers consumption of herbs and spices

7.0 Where do you get your spices from?

Local market () Local vendor () Super market ()

98.0 How is the spices packaged?

Plastic containers () Polythene sack () others please specify.....

9.0 Do you process some of the spices? Yes () No ()

If yes what processing does the spices goes through
.....

10.0 Please tick [√] to indicate the factors that influence your consumption of herbs and spices. Please rate your responses using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly agree (5).
Please tick the box which best reflect your view and state briefly where necessary

S/N	Statement	Scale				
		1	2	3	4	5
1.	To assist with calorie control and weight management					
2.	Herbs and spices are purchased to flavour food					
3.	To enhance the appearance of cooked food					
4.	Herbs and spices are purchase for preservation of foods					
5.	Herbs and spices are used to improve aroma to prepared food					
6.	Herbs and spices have always been used for their good taste					
7	Herbs and spices are used in decorating cooked food					
8.	Reference group influence for the purchase herbs and spices during food preparation					
9.	Purchase to improve the acceptability the food					
10.	Purchase to help in the preparation of delicious					

	meals					
11.	Lifestyle/Modern food habit influence the purchase herbs and spices during food preparation					
12.	Herbs and spices are used to enhance the sensory consistency of the food.					
13.	Herbs and spices are used to improve acceptability of the food					



Section III: Health benefits associated with consumers consumption of herbs and spices

11.0 Please tick [] to indicate the perceived the health benefits associated with consumers consumption of herbs and spices. Please rate your responses using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly agree (5). **Please tick the box which best reflect your view and state briefly where necessary**

S/N	Statement	Scale				
		1	2	3	4	5
1.	Herbs and spices are being studied for their ability to reduce harmful inflammation in the body.					
2.	Using herbs and spices reduce the risk of heart disease					
3.	Herbs and spices help to protect cells against damage aging, and other stressors.					
4.	Consuming herbs and spices improve the brain function					
5.	Herbs and spices reduced cancer risk					
6.	Herbs and spices help to lower blood sugar levels.					
7	Consuming herbs and spices lower the risk of being diabetic					
8.	Herbs and spices help in relieving nausea					
9.	Herbs and spices are beneficial for improving digestion					
10	Consuming herbs and spices lower the risk of being obese					

13.0 Do you agree that excessive consumption of herbs and spices have negative health effects on the body?

- a. Yes () b. No () c. Never thought of that ()

- 14.0 If “Yes” to question 13 above, what are some of the health problems the body can experience? Please rate your responses by ticking [√] using a scale of 1 to 5: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly agree (5). **Please tick the box which best reflect your view and state briefly where necessary**

S/N	Statement	Scale				
		1	2	3	4	5
1.	Cancer is the effects of excessive consumption of herbs and spices					
2.	Diarrhea as side effect of excessive consumption of herbs and spices					
3.	Stomach disorder is the side effects of excessive consumption of herbs and spices					
4.	Vomiting or nausea is the problem of of excessive consumption of herbs and spices					
5.	Constipation is the effect of excessive consumption of herbs and spices with lead poisoning.					
6.	Excessive consumption of herbs and spices can cause heart problems for man					
7.	Headache is the effects of excessive consumption of herbs and spices					