CHAPTER 1

INTRODUCTION

1.1 Background of the Study

In adults, cells divide in order to replace dead cells and the worn out cells or to repair injured cells. Cancerous cells form when cells at a particular site of the body begin to divide at a high rate. The growth of cancer cells are unlike normal cell growth. These cancer cells continue to grow and form new, abnormal cells containing abnormal DNA. These abnormal cells which contain the same defective DNA as the original cancer cell may invade other tissues (Mandal, 2013). Cancer cells have the ability to invade and destroy surrounding normal tissue. In addition, they possess the ability to travel and grow in other parts of the body. This condition is known as metastasis and it is the most lethal attribute of cancer cells. More than 90% of the morbidity and mortality associated with cancer is due to metastasis (AACR Cancer Progress Report, 2012). Some of the common causes of cancer include smoking, obesity, alcohol, lack of physical activities, unhealthy eating habits, sun and UV, air pollution, infections, hormones and workplace conditions.

Many anticancer treatments are targeted to kill rapidly growing cells as cancer cells grow and divide at a faster pace compared to normal cells. One of these treatments is chemotherapy. In conjunction to this, chemotherapy may affect certain healthy cells that also multiplies rapidly including blood cells forming in the bone marrow, cells in the digestive tract (mouth, oesophagus, stomach, intestines),
reproductive system (sexual organs), and hair follicles. Anticancer drugs are used to treat cancer cells besides chemotherapy. However, vital organs such as the heart, lungs, kidneys, bladder and nervous system may be affected by anticancer drugs (National Cancer Institute, 2004). Anti-cancer antibiotics work by altering the DNA of cancer cells to prevent them from growing and multiplying. These drugs can permanently damage the heart if given in high doses (American Cancer Society, 2015). The development of more aggressive regimens as well as newer agents and combination chemotherapies have resulted in the significant increase of chemotherapy induced ocular side effects (Parul & Abhishek, 2012). In hospitals, conventional drugs are commonly prescribed to cancer patients. However, the research on medicinal plants and cancer has been intensified due to less toxic and adverse effects of phytochemicals (Johnson, 2007).

Herbal medicine uses plants or mixtures of plant extracts to treat illness. It aims to restore the body’s ability to protect, regulate and heal from diseases. It is a whole body approach which focuses on the physical, mental and emotional well-being of an individual. Cancer patients turn to herbal medicine as one of the most commonly used alternative therapy. Certain studies have shown that in every 10 cancer patients, 6 of them use herbal remedies alongside conventional cancer treatments (Cancer Research U.K., 2015).

Many plants have been known to exhibit anticancer properties. Some of these anticancer herbs includes aloe vera. Aloe vera consists of a substance known as 1,8-dihydroxy-3-[hydroxymethyl]-anthraquinone which has been proven to induce cell death among T24 cells, human bladder cancer cell line (Lin et al., 2006). Besides that, Artemisia annua demonstrated anticancer activity. Artemisinin and its derivatives have been shown to induce apoptosis of prostate cancer cells and to possess activity against breast cancer, leukemia, colon cancer, and other cancer cells (Yoshiyuki et al., 2010). Apart from that, bitter melon (Momordica charantia) extract was effective against human breast cancer cells and primary human mammary epithelial cells. It was able to reduce the proliferation of cancer cells and induce cell death among breast cancer cells (Ray et al., 2010).
Moringa oleifera is a native plant in India. It is found growing in the Sub-Himalayan regions of Northern India. Moringa oleifera has become an important crop in India, Ethiopia, the Philippines and Sudan. It is being grown in Africa, Asia, Latin-America, the Caribbean, Florida and the Pacific Islands. Presently, it is a world-wide plant found in the tropics and non-tropics. Moringa oleifera is commonly known as the drumstick tree, miracle tree and horseradish tree (Centre for Jatropha Promotion & Biodiesel, 2007).

Moringa oleifera leaves contain nutrients such as essential amino acids, vitamins, minerals and β-carotene (Sabale et al., 2008; Sharma et al., 2012). The extract from its leaves have the potential for cancer chemoprevention and was claimed as a therapeutic target for cancer (Sreelatha et al., 2011). There are various benefits of Moringa oleifera for medical purposes. Some of these benefits includes the treatment of edema, stomach disorders, diabetes, herpes, asthma, urolithiasis, anemia, neurodegenerative diseases, nephrotoxicity, hypertension, sickle cell disease, cholesterol, and obesity besides being used for liver protection, cardiovascular protection, maintaining healthy bones, wound healing and as an antioxidant. Moringa oleifera possesses antibacterial and antimicrobial properties, immunosuppressive properties, anti-allergenic qualities, anti-fungal qualities, anti-fertility qualities, and is effective against the growth of disease-causing microbes (Organic Information Services Pvt Ltd, 2016).

Niazimicin is a thiocarbamate, an organic compound which consists of sulphur. It is one of the bioactive compounds found in the leaves of Moringa oleifera that have been recognized with significant anticancer activity (Guevaraa et al., 1999). Niazimicin inhibits the tumour promoter teleocidin B-4 which induces Epstein-Barr virus (EBV) activation (Murakami et al., 1998). EBV causes mononucleosis which leads to fatigue that can be prolonged for weeks or for months (Ratini, 2015). The virus is spread through direct contact with saliva from the mouth of an infected person and cannot be spread through blood contact. An individual can be exposed to the virus by a cough or sneeze, by kissing, or by sharing food or drinks with someone who has the virus. Apart from that, Niazimicin inhibited tumour promotion in a mouse. Niazimicin and compound 4-(4'-O-acetyl-a-L-rhamnopyranosyloxy)benzyl