NEAR EAST UNIVERSITY

INSTITUTE OF GRADUATE STUDIES

DEPARTMENT OF CLINICAL PHARMACY

ASSESSMENT OF PHARMACY STUDENTS' KNOWLEDGE ABOUT BREAST CANCER AND COLON CANCER IN NORTHERN CYPRUS UNIVERSITIES

M.Sc. THESIS

Gamal ALSakkaf

Nicosia

June, 2023

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Approval

We certify that we have read the thesis submitted by Gamal Esam Ahmed ALSakkaf titled **"Assessment of Pharmacy Students' Knowledge About Breast Cancer and Colon Cancer in Northern Cyprus Universities"** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

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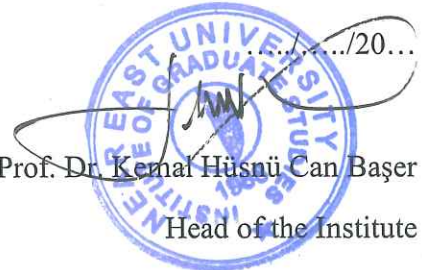Approved by the Head of the Department

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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Gamal ALSakkaf

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List of Abbreviations

Abbreviation	Word
NEU	Near East University
CIU	Cyprus International University
ADRs	Adverse Drug Reactions
RCT	Randomized Clinical Trial
PC	Pharmaceutical Care
GPPs	Good Pharmacy Practices
WHO	World Health Organization
FIP	The International Pharmaceutical Federation
ACCP	American College of Clinical Pharmacy
ESCP	The European Society of Clinical Pharmacy
DRPs	Drug-related Problems
TDM	Therapeutic Drug Monitoring
CT	Computerized Tomography
HPV	Human Papillomavirus
CDC	Centers for Disease Control and Prevention
IARC	International Agency for Research on Cancer
USPSTF	The United States Preventive Services Task Force
ABUS	Automated Breast Ultrasound
NHS	National Health Service
AJCC	American Joint Committee on Cancer
TNBC	Triple-Negative Breast Cancer
HER2+	Human Epidermal Growth Factor Receptor 2
NAC	Neo Adjuvant Chemotherapy
BC	Breast Cancer
CRC	Colorectal Cancer
NIH	National Institutes of Health
ACS	American College of Surgeons

ACP	American College of Physicians
NCCN	National Comprehensive Cancer Network

Abstract

Assessment of Pharmacy Students' Knowledge About Breast Cancer and Colon Cancer in Northern Cyprus Universities

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Background Colon and breast cancer is one of the most common types of cancer in cancer patients worldwide. Therefore, health students, especially pharmacy students, should be well educated about colon and breast cancer. Adequate education and knowledge provide significant benefits from early diagnosis to treatment.

Methodology This study was conducted as a cross-sectional study for 3 For Peer Review

months between 1 November 2022, and 31 January 2023, in Northern Cyprus. The aim of this study was to assess pharmacy students' knowledge of breast cancer and colon cancer in North Cyprus Universities.

Result A total of Four hundred ninety-four pharmacy students participated in this study. Twenty-three incompletely filled questionnaires were excluded from the study. Regarding NEU and CIU pharmacy students' knowledge of colon cancer, 298 out of 494 had good knowledge and 196 out of 494 had poor knowledge. Regarding NEU and CIU pharmacy students' knowledge of breast cancer, 317 out of 494 had good knowledge and 177 out of 494 had poor knowledge. The total score of knowledge of NEU and CIU pharmacy students about breast cancer was 10±3.43 and 11.40±3.67, respectively. The total score of knowledge of NEU and CIU pharmacy students about colon cancer was 7.54±3.67 and 9.19±4.08, respectively.

Conclusions Most pharmacy students have good knowledge about the risk factors and symptoms of breast cancer and colon cancer. These results will increase the effectiveness of pharmacists' understanding of cancer and their effectiveness in early diagnosis and treatment today and in the future.

Keywords; *breast cancer, colon cancer, pharmacy student, knowledge*

CHAPTER I
INTRODUCTION

Understanding colon and breast cancer are critical for pharmacy students because they are two of the most widespread cancers people face today. Pharmacy students will be better equipped to counsel and support breast and colon cancer patients if they understand these cancers thoroughly, including their causes, symptoms, risk factors, and treatment options. This knowledge is also necessary for managing patients' medications, including chemotherapy drugs, and answering any concerns or questions they may have. Furthermore, pharmacy students can be crucial in promoting preventive measures and improving patient outcomes by understanding the importance of early detection and screening for breast and colon cancer. Understanding breast and colon cancer is critical for providing high-quality patient care and proves the pharmacist's contribution to the patient's health.

The study aims to assess the pharmacy students' knowledge of breast and colon cancer in Northern Cyprus universities. We aim to have pharmacy students fully equipped and prepared to understand, identify, and give concrete consultations to cancer patients.

This thesis will focus on pharmacist students' knowledge and roles as clinical pharmacists; some basic knowledge about cancer, breast, and colon cancer is explained broadly. The study will be conducted, the methodology will be explained, and the results will be discussed in the result section. A discussion section will discuss the same studies conducted assessing the pharmacy students' knowledge of breast and colon cancer, and all the references will be cited in the text.

1. Background

1.1 Pharmaceutical Care Services

In the past few decades, the pharmacy profession has become crucial for saving lives. Pharmacy has different models of social roles, and its primary role is to prepare and distribute medicines to patients. In the 20th century, pharmacy underwent three significant phases: traditional, transitional, and patient-centered services. These phases introduced a new philosophy of pharmacy practice that exceeded the conventional clinical pharmacy and emphasized a more responsible approach to providing pharmaceutical care. (Hepler & Strand, 1990)

Since 1960 and 1975, which coined the terms clinical pharmacy and pharmaceutical care, respectively, both definitions overlap somewhat. The latter term appears to be mainly linked to responsibility for therapy outcomes. (Dreischulte & Fernandez-Llimos, 2016)

Pharmaceutical care can improve health and lower costs by providing direct patient care, such as patient assessment and identifying therapy-related problems and their causes. It adheres to the active nature of pharmaceutical care detection of drug-related problems to prevent and resolve adverse medication outcomes. (Cataldo et al., 2022)

In 2020, the Spanish Society of Hospital Pharmacy and other pharmacists from different healthcare fields agreed on a new term for pharmaceutical care as the practice in which pharmacists set out strategies to align and achieve desired objectives of pharmacotherapy and use new technologies to improve the patient's health outcome. (Morillo-Verdugo et al., 2020)

1.2 Role of Pharmaceutical Care in Oncology

The study by Qi Lin et al. aimed to explore the role of clinical pharmacists in the oncology department's multidisciplinary team. The authors used a database review to assess the role of clinical pharmacists in oncology practices. The results showed that clinical pharmacists are crucial in monitoring adverse drug reactions, educating patients, managing opioid pain, and conducting cancer screening and risk assessment. The

authors concluded that the involvement of clinical pharmacists in the multidisciplinary care team is essential for improving patient outcomes and enhancing the quality of care for colorectal and stomach cancer patients. (Lin et al., 2015)

Kavya Karthikeyan et al. used a questionnaire to assess the impact of pharmaceutical care services on cancer patients. The researchers discovered that patients' knowledge improved significantly after interacting with clinical pharmacists. According to the authors, clinical pharmacists are important in improving patients' knowledge of their disease and its management, monitoring performance status, observing adverse drug reactions (ADRs), and ensuring drug safety. This emphasizes the importance of incorporating clinical pharmacists into the multidisciplinary team of the oncology department in order to improve the quality of care and patient outcomes. (Karthikeyan et al., 2022)

In the past few years, there has been a change in the approach of many healthcare systems from a focus on treating diseases to a focus on the needs and preferences of individual patients. The pharmacy profession has also evolved to reflect this change, from traditional drug-centered services to services prioritizing patient needs. Pharmacists now provide services such as compounding drugs for cancer treatment and monitoring critical medications. They also use pharmaceutical care to optimize individual drug therapy to improve patient safety, therapeutic outcomes, and, ultimately, the patient's quality of life. A close relationship with supportive care is required to achieve these goals, and a multidisciplinary approach is seen as beneficial. (Liekweg et al., 2004)

Pharmaceutical care is an important field in healthcare, and one specific area where it is utilized is cancer pain management. Managing pain in cancer patients can be challenging, especially for outpatients who are opioid-tolerant, as they may have differences in pain knowledge, treatment adherence, and a higher risk of inadequate pain relief and adverse events. Haiying Ding et al. conducted an open-label randomized clinical trial to investigate the impact of pharmaceutical care on outcomes for opioid-tolerant outpatients with cancer pain. The study results indicate that pharmaceutical care can significantly reduce patient-related issues and improve pain control in opioid-tolerant outpatients. (Ding et al., 2022)

The implementation of pharmaceutical care is now considered essential in healthcare. Although developed countries have been practicing it for many years, there are still gaps in its implementation. Despite the importance and demand of pharmacists' roles in patient-centered care, there is still a long way to go in fully realizing its potential. Developing nations face even more significant challenges, including education, policy, regulation, practice, economic, technological, and socio-behavioral barriers that are difficult to overcome.

PC interventions are critical in reducing prescription errors and their association with adverse drug events. One way PC interventions can achieve this is through regular visits by pharmacists to general practice prescribers, providing them with feedback, educational interventions, and support regarding drug prescriptions. This pharmacist intervention has significantly reduced medication errors in general practices. (Upadhyay & Ooi, 2018)

On the other hand, pharmacists must implement GPPs and, thus, patient-centered care. They may seek technical assistance from global organizations such as WHO and FIP, which have been developing relevant models and strategies to address these barriers and provide services to the public. (Upadhyay & Ooi, 2018)

1.2.1 *The Relationship Between Clinical Pharmacy and Oncology*

The ACCP defines clinical pharmacy as a health science discipline that involves pharmacists providing patient care to optimize medication therapy and promote health, wellness, and disease prevention. This practice embraces the philosophy of pharmaceutical care, which combines a compassionate approach with specialized therapeutic knowledge, experience, and judgment to ensure the best possible patient outcomes. Additionally, clinical pharmacy is responsible for contributing to the development of new knowledge that enhances health and improves the quality of life for patients. (Definition, 2008)

The ESPC defines clinical pharmacy as all the services pharmacists provide in clinics, hospitals, neighborhood drug stores, and other locations where prescription and over-the-counter medications are prescribed and used. (Dreischulte et al., 2022) The main objective of clinical pharmacy activities is to encourage the proper and appropriate use of drugs and medical equipment. Clinical pharmacists have established themselves

as an essential multidisciplinary team member that enhances patient care's effectiveness, quality, and safety by providing pharmaceutical support. The ESPC advises that all prescriptions be reviewed and validated as soon as possible by a hospital pharmacist, who should also participate fully in decision-making by advising, implementing, and overseeing medication changes in close collaboration with patients and other healthcare providers. (Moukafih et al., 2021)

During a certain period, there was a shift in pharmacy services in the United States from traditional pharmacy practice to a decentralized pharmacy practice model, which involved individual patient dosing. At the same time, in the United Kingdom, pharmacists began taking on a new role of visiting hospital wards to dispense medication and check for medication orders during ward rounds. This marked the beginning of the pharmacist's diverse functions in emerging pharmacy practices, which included gathering information and working with patients to provide individualized care. (Hepler, 1985)

The diversification of pharmacist functions has brought about significant changes in pharmacy practice. Pharmacists are now crucial in preventing adverse drug events and improving drug outcomes, resulting in fewer medication mishaps and better quality of life for patients, particularly those with chronic diseases.

This diversification of the clinical pharmacist's role has also led to a trend towards specialization, with clinical pharmacy becoming more patient-oriented and individualized. This patient-centered approach to pharmaceutical care helps reduce medication costs while improving patient outcomes. One of the areas of specialization within clinical pharmacy is oncology, which focuses on providing specialized care for cancer patients. (Hepler & Angaran, 1996)

Clinical pharmacists make essential contributions to the care of oncological patients. They evaluate medical prescriptions, considering quantity, quality, compatibility, stability, and potential interactions. They manage supportive care, including anti-infectious therapies, and assist with the transition of care. Clinical pharmacists also assess chemotherapies' toxicity and treatments' effectiveness while tracking iatrogenic effects. Finally, they educate patients, caregivers, and other healthcare providers about medications and their effects. These contributions help to

improve the quality of care for oncology patients and optimize their treatment outcomes. (Oliveira et al., 2021)

The introduction of clinical pharmacy service in oncology care units has been cited as a critical strategy for lowering the number of hospitalizations, which in turn lowers the number of incorrect prescriptions, drug interactions, adverse effects, and negative effects on the patient's life and health. (Oliveira et al., 2021)

Clinical pharmacists have a vital role in the treatment of cancer patients. They help enhance drug use, including chemotherapy and other high-alert medications, by ensuring appropriate dosing, monitoring potential interactions, and managing adverse effects. They offer drug education and psychological support to patients and caregivers to help them understand and cope with their medications and treatment. Clinical pharmacists also assess medication response, track efficacy, and adverse effects, and adjust treatment plans. They develop and implement guidelines for using and handling chemotherapeutics, ensuring these powerful drugs' safe and effective use. Overall, clinical pharmacists work to enhance patient outcomes and quality of life by optimizing medication use in cancer treatment. (Shrestha et al., 2019)

Clinical pharmacy is crucial in cancer care and is widely practiced in several countries. Multiple studies have demonstrated the crucial role of clinical pharmacists in patient care. They educate patients about their conditions and medications, aiding oncologists and other healthcare professionals with their expertise in oncology drugs, preparing and compounding chemotherapy, and developing guidelines for the safe preparation and handling of chemotherapy. By integrating clinical pharmacists into oncology care settings, medication management can be made more efficient, and the quality of life of cancer patients can be improved. (Shrestha et al., 2019)

While physicians and nurses may have detected many DRPs identified on the ward, the pharmacist's contribution most likely provides a more systematic drug focus on the patient. Many studies have found that physicians are more open to them when clinical pharmacists provide their services in a collaborative setting through consultation. Medication treatment management is one of these clinical services, and collaborative tools are needed to bridge the gap between healthcare providers and pharmacists.

1.3 The Role of Clinical Pharmacists in Cancer Therapy

As a result of technological advancements, pharmacists now primarily serve as drug dispensers. This appeared to diminish the value of the pharmacy profession and undermine the close bonds pharmacists had built with their patients. Due to this conundrum, pharmacists must discover fresh ways to get more involved in-patient care to stay relevant in their field. In order to fill this gap, clinical pharmacist positions have grown in popularity. These positions entail more direct patient interaction, such as giving medication advice and confirming that the medications being taken are effective. The requirement for pharmacists to participate in developing patient care plans has increased due to an increased demand for pharmacists' expertise and knowledge in recent years.

Clinical pharmacists are essential for the human services care team, resulting in better patient care. Collaboration with medical service specialists on rounds, questioning patients, compromising pharmaceuticals, advising patients, and follow-up resulted in better outcomes. (Kaboli et al., 2006) Clinical pharmacists play an essential role in modifying medicines in oncology, and as members of a multidisciplinary team, they avoid and supervise medication errors. (AlQuteimat & AlBadaineh, 2013) Clinical pharmacists are essential in prescription auditing, a quality improvement process. The primary activity of a clinical pharmacist is scientific work, medication monitoring, evaluation, and optimization. This movement includes identifying and resolving drug-related problems and risks associated with administering and using drugs in a specific patient. The evaluation is based on knowledge of the therapeutic use of drugs, medical records, attending physicians' requests, and patients' needs.

Clinical pharmacists have a crucial role in evaluating chemotherapy protocols and ensuring drug treatments are safe and effective by checking for drug interactions and potential errors. They are an important part of the multidisciplinary team in oncology care and can improve the use of antiemetics for treating chemotherapy-induced nausea and vomiting. (Yamada & Nabeshima, 2015) Another area where clinical pharmacists' interventions effectively improved security, adequacy, and patient fulfillment was the pain management team. In addition, clinical pharmacist collaboration in patient care is critical to improving adherence to recommended pharmaceuticals and avoiding drug-futile therapy. (Viktil & Blix, 2008)

Clinical pharmacists have a crucial role in improving patient care through activities such as therapeutic drug monitoring and patient pharmacotherapy oversight. Clinical pharmacists can significantly impact patient outcomes by working collaboratively with medical oncologists and other healthcare professionals, including nurses. They can provide valuable insights and answer queries related to drug profiles, dosages, potential drug interactions, side effects, drug use during pregnancy and lactation, and drug storage. Overall, clinical pharmacists work closely with patients and other healthcare professionals to enhance the quality of care and reduce healthcare costs by addressing risk factors and making necessary changes in patient care. (Shrestha et al., 2019)

Additionally, clinical pharmacists in oncology settings may encourage using new anticancer agents in the medical center and other paramedical organizations. Drug specialists can provide pertinent advice, information to healthcare professionals, and patient guidance by including and acknowledging drug associations and symptoms. (Shrestha et al., 2019)

These demands and responsibilities discussed above led the clinical pharmacy department to sub-specialize and expand into more specializations, such as Cardiology pharmacy, Critical care pharmacy, and Oncology pharmacy. By 1996, the United States Board of Pharmacy recognized oncology pharmacy as a specialty. (Bremberg et al., 2006)

1.4 Cancer

Life is fundamentally about self-preservation and replication. On the other hand, cells are nothing more than self-sustaining, replicating droplets in which a series of biochemical reactions carry out replication. Cells are enclosed by a membrane surrounding their aqueous inner solutions to provide a separate compartment for those reactions. The formation of the cell membrane, as we know it today, was a watershed moment in the evolution of the cell. (Adlung, 2022) This complex structure can form vesicles, allowing genetic material to be segregated inside and the molecular machinery required for this new structure to grow and reproduce copies of itself throughout the cell cycle (Fan, 2016). Different structures evolved within cells to perform their functions of self-maintenance and replication. A cell blueprint must be delivered as a construction

plan for each newly produced cell for replication. This data is stored on the long macromolecule deoxyribonucleic acid (DNA). In conclusion, cells can be considered membrane-enclosed pieces of DNA in an aqueous solution. (Adlung, 2022)

Understanding cancer starts from the understanding of Greaves's rationale. Genetic variations cause cancer. In other words, without genetic changes, there would be no cancer. However, there would be no us without genetic changes - it is that simple. So, eliminating genetic changes to avoid getting cancer, despite its unwiseness, is ultimately wrong. Without genetic variability, we may not suffer from growth chaos like cancer. However, without mutations that allow at least some of us to adapt to and survive in a world of changing environmental conditions, we will face insurmountable problems sooner or later. (Erren et al., 2012)

The evolution of life on our planet has been dramatically influenced by cancer. (Fan, 2016) The term "cancer" refers to various tumor forms that are a leading cause of death for Americans and people globally (Chisholm-Burns et al., 2022). The idea of cellular pathology holds that diseases result from a pathological process occurring at the cellular level. This idea is especially true of cancer, which is unquestionably a disease of a cell within a multicellular organism. (Fan, 2016)

Cancer is a disease that causes specific cells in the body to grow uncontrollably and spread to other body parts. Cancer is not unique to humans. It is a phenomenon that unifies diverse branches of the tree of life. (Erten & Kokko, 2020) It can begin almost anywhere in the human body, which contains trillions of cells. Human cells typically divide and multiply to form new cells as needed by the body. Cells die as they age or become damaged, and new cells replace them.

The process of the body's cells dividing and multiplying can sometimes fail, leading to abnormal or damaged cells proliferating and forming tissue lumps called tumors. Tumors can be either benign or cancerous, with cancerous tumors being able to spread and invade nearby tissues or form new tumors in distant areas of the body, known as metastasis. Blood cancers like leukemia usually do not develop solid tumors, but many other types of cancer do, and there are over a hundred diseases called "cancer," each uniquely affecting different parts of the body. Different types of cancer pose various challenges in diagnosis and treatment and are generally categorized based on the

type of cell from which it originated and its behavior, such as lung, breast, colon, skin, oncology, and gastrointestinal cancer.

Lung cancer results from the uncontrolled growth of cells in the lung, and it is the leading cause of cancer-related deaths globally, accounting for about 1.8 million deaths annually. The disease is classified into two types, non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC), based on the type of cells present in the tumor. Smoking is the primary risk factor for lung cancer, causing 85-90% of all cases, with other risk factors including exposure to radon, asbestos, air pollution, and genetic predisposition. Common symptoms of lung cancer include chronic coughing, chest pain, fatigue, shortness of breath, and unintentional weight loss. Unfortunately, lung cancer is often diagnosed at an advanced stage when it has already spread to other parts of the body, making treatment more difficult. Treatment options include surgery, chemotherapy, radiation therapy, targeted therapy, and immunotherapy, but the prognosis remains poor, with a 19% 5-year survival rate. Therefore, early detection and prevention are critical to reducing lung cancer morbidity and mortality. Strategies like reducing smoking rates, improving air quality, and encouraging lung cancer screening in high-risk individuals are necessary to alleviate the burden of this deadly disease. (Wheless et al., 2013)

Genitourinary (GU) cancer affects the organs and tissues of the genitourinary system, including the kidneys, bladder, prostate, testicles, and penis. GU cancers are relatively common and can spread quickly, making early detection and treatment critical for positive outcomes. The most common types of GU cancer are prostate, kidney, and bladder cancer, with prostate cancer being the most common type in men. Risk factors for GU cancer vary depending on the type of cancer, and symptoms may include blood in the urine, pain or discomfort in the pelvic region, changes in urinary function, and unexplained weight loss. Diagnosis may involve imaging tests and laboratory tests. Treatment options for GU cancer include surgery, radiation therapy, chemotherapy, targeted therapy, and immunotherapy, with a combination of treatments used in some cases. While advances in diagnosis and treatment have improved outcomes, more research and development of new therapies are needed. Smoking cessation and reducing

exposure to environmental toxins are also essential strategies for reducing the incidence of GU cancer. (Guo et al., 2021)

Skin cancer occurs due to the development of abnormal skin cells, and it affects the body's largest organ, the skin. The leading cause of skin cancer is exposure to UV radiation from the sun or other sources and genetic factors. The three primary types of skin cancer are basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma. BCC and SCC are the most common types of skin cancer, typically caused by repeated exposure to UV radiation over time. On the other hand, melanoma, a more dangerous type of skin cancer, is less common and often caused by intense, intermittent exposure to UV radiation, such as sunburns. Risk factors for skin cancer include fair skin, a history of sunburns, a family history of skin cancer, exposure to UV radiation, and certain genetic disorders. Symptoms of skin cancer vary based on the cancer's type and stage, including changes in the appearance of the skin, growth of new moles or growths, and the appearance of sores that do not heal. Skin cancer is diagnosed through a physical examination and biopsy. Treatment options depend on the type and stage of cancer and may include surgical removal of cancerous tissue, radiation therapy, chemotherapy, or immunotherapy. The best way to prevent skin cancer is by using sunscreen, wearing protective clothing, and avoiding UV radiation exposure during peak hours. Regular skin exams by a healthcare professional can also aid in early skin cancer detection. (Gupta & Kaur, 2021)

Gynecologic cancers affect the reproductive organs of women, including the cervix, uterus, ovaries, fallopian tubes, vagina, and vulva. These cancers are usually aggressive and require specialized treatment. The most common types of gynecologic cancer are uterine (endometrial), ovarian, and cervical cancer, with uterine cancer being the most common. (Ledford & Lockwood, 2019) The risk factors for each type of cancer vary, with factors like HPV infection, smoking, weakened immune system increasing the risk of cervical cancer, and age, family history, and specific genetic mutations increasing the risk of ovarian cancer. Symptoms may include abnormal vaginal bleeding, pain during sex, abdominal or pelvic pain, and changes in bowel or bladder habits. Diagnosis is made through imaging tests and biopsies. Treatment options include surgery, radiation therapy, chemotherapy, targeted therapy, and immunotherapy.

Preventive measures like getting vaccinated against HPV, practicing safe sex, and undergoing regular screenings can help lower the risk of gynecologic cancer. Maintaining a healthy lifestyle and diet can also reduce the risk of certain gynecologic cancers, such as endometrial cancer. (Donovan & Hagan, 2015)

Since this study is about breast and colon cancer, we must explain them more deeply and in detail.

1.4.1 *Breast Cancer*

Breast cancer starts in the cells that line the ducts or lobules of the glandular tissue, with 85% of cases originating in the ducts and 15% in the lobules. Initially, the cancerous growth is contained within the duct or lobule, referred to as "in situ," which typically causes no symptoms and has a low risk of spreading (metastasis). Over time, however, these in situ cancers may progress and invade the surrounding breast tissue, becoming invasive breast cancer and potentially spreading to the lymph nodes or other organs in the body, which can be life-threatening. Metastasis is the main cause of death in women with breast cancer. (WHO, 2021)

Breast cancer has two main types: (Joe & Burstein, 2023)

- Invasive ductal carcinoma: The cancerous cells first appear in the breast tissue's ducts before spreading to other regions. Additionally, metastasizing invasive cancer cells can spread to different body parts.

- Invasive lobular carcinoma: A type of breast cancer that originates in the lobules and has the ability to spread to nearby breast tissues and potentially to other parts of the body.

Epidemiology

Over two million breast cancer cases are diagnosed yearly, making it the most common tumor (Joe & Burstein, 2023). It is also the primary cause of death among women worldwide. According to data from the IARC, 2.3 million women had breast cancer diagnoses, and 685,000 passed away due to the disease. Globally, developed countries account for almost half of all cases. The "Western lifestyle," known for its poor diet, nicotinic habits, high levels of stress, and lack of physical activity, is primarily to blame for this trend. (Bellanger et al., 2020; Ghosn et al., 2020) From 1999 to 2007,

the annual incidence rate fell by 1.8 percent. This incidence decrease is likely due to the end of screening's peak prevalence. (Joe & Burstein, 2023)

Screening (CDC, 2022; Joe & Burstein, 2023)

Breast cancer screening involves checking a woman's breasts for cancer before she experiences any signs or symptoms of the disease. The USPSTF suggests that women aged 50 to 74, who are at average risk of developing breast cancer, should have a mammogram every two years. Women aged 40 to 49 should discuss with their healthcare provider when and how often they should get a mammogram. Women considering starting mammography before age 50 should consider the potential advantages and disadvantages of screening tests. (Siu, 2016)

Breast Cancer Screening Tests

- Mammogram: A mammogram is an X-ray of the breast that is used to detect breast cancer before it can be felt or cause symptoms. It is the best way for many women to find breast cancer early when it is easier to treat. Regular mammograms can decrease the risk of dying from breast cancer. For most women who need screening, mammograms are the most efficient way to detect breast cancer today.

- Breast Magnetic Resonance Imaging (MRI): A breast MRI is a medical test that utilizes magnets and radio waves to produce images of the breast. It is typically utilized with mammograms to screen women at a higher risk of developing breast cancer. However, it is not commonly recommended for women at an average risk of developing breast cancer, as the images generated by breast MRIs can often appear abnormal even when no actual cancer is present.

- Automated Breast Ultrasound Technique (ABUS): An ultrasound technique is increasingly used as a supplement in assessing patients with dense glandular breasts. ABUS can detect additional cancers in women where mammography alone might not be enough due to their dense breasts. Since no ionizing radiation is used with ultrasound, ABUS is a quick, painless, and efficient way to image dense breasts. (Bene et al., 2021)

Other Screening Exams:

- Clinical Breast Exam: A clinical breast exam is performed by a doctor or nurse who feels for lumps or other changes in the breast with his or her hands.
- Breast Self-Awareness: A self-examination of the breasts performed mainly by women. Individuals use their hands and eyes to ascertain changes in their breasts' appearance and feel to help increase their awareness.

Symptoms of Breast Cancer:

Breast cancer can show signs and symptoms that differ from person to person, and sometimes there may be none. However, some warning signs include a lump in the breast or underarm, thickening or swelling of the breast, breast irritation or dimpling, redness or flaky skin in the nipple or breast area, nipple pain or pulling, nipple discharge that is not breast milk and may contain blood, any change in breast size or shape, and breast discomfort in any area. (NHS, 2019)

Risk Factors of Breast Cancer

Breast cancer is a multifaceted illness influenced by both environmental and genetic factors. Certain common risk factors for breast cancer are recognized, including advanced age, a family history of breast cancer, personal history of breast cancer, hormonal exposure (e.g., through hormonal replacement therapy or early onset of menstruation), physical inactivity, alcohol consumption, obesity, and exposure to ionizing radiation. However, possessing one or more of these risk factors does not ensure the development of breast cancer, and many individuals with multiple risk factors do not develop the disease. (Babiker et al., 2020)

Stages of Breast Cancer

The AJCC has stated its eighth edition of the breast cancer staging as follows (Teichgraeber et al., 2021)

Table 1. Breast cancer TNM anatomical stage group

Stage	TNM
Stage 0	Tis, N0, M0
Stage IA	T1, N0, M0
Stage IB	T0, N1mi, M0
	T1, N1mi, M0
Stage IIA	T0, N1, M0
	T1, N1, M0
	T2, N0, M0
Stage IIB	T2, N1, M0
	T3, N0, M0
Stage IIIA	T0, N2, M0
	T1, N2, M0
	T2, N2, M0
	T3, N1, M0
	T3, N2, M0
Stage IIIB	T4, N0, M0

	T4, N1, M0
	T4, N2, M0
Stage IIIC	Any T, N3, M0
Stage IV	Any T, Any N, M1

Treatment

The treatment of breast cancer can be classified into two categories depending on the state of the tumor.

1. Non-Invasive Breast Cancer Treatments

Surgery options are preferred in this type of tumor, such as mastectomy which means the complete removal of the breast, or lumpectomy, which is performed by removing the tumor and the surrounding normal tissues. Radiation therapy is followed after that in all cases.

2. Invasive Breast Cancer Treatments

- Surgery

Similar to non-invasive BC, surgery is usually considered when the cancer patient is at stage I or II. It is easier to remove the entire breast (mastectomy) or lumpectomy, which involves removing the breast tumor with a margin of surrounding healthy tissue.

- Radiotherapy

Radiation therapy has been used in cancer treatment since 1895 (Grubbé, 1933). The use of radiation happens after the surgery is done to ensure no tumor cells are left. Studies have shown that using radiotherapy in conservative surgeries decreased breast cancer recurrence, and patients benefited the most (Darby et al., 2011). One of the major side effects of radiation therapy is cardiotoxicity; thus, minimizing the exposure of the heart and lungs is crucial (Cheng et al., 2017). Another thing to note is that radiation therapy resistance can occur in the late stages of breast cancer. (Delaney et al., 2005)

- Chemotherapy

Breast cancer chemotherapy includes several cytotoxic drug families, such as alkylating agents, antimetabolites, and tubulin inhibitors (Nabholtz & Gligorov, 2005). Cyclophosphamide is a nitrogen mustard alkylating agent that causes DNA strand breaks (Penel et al., 2012). Anthracyclines (doxorubicin, daunorubicin, epirubicin, and

idarubicin) inhibit macromolecular biosynthesis through DNA intercalation (Gewirtz, 1999). Taxanes, such as docetaxel and paclitaxel, bind to microtubules and prevent their disassembly, resulting in cell cycle arrest and apoptosis (Moos & Fitzpatrick, 1998).

Chemotherapy can be used in the neoadjuvant or adjuvant setting to treat metastatic breast cancer.

- o Neo-Adjuvant Chemotherapy

NACs are used in cancer patients before they go for the operation to minimize the tumor's spread and increase the chance of the operation's success. This method may not work on all cancer patients; its success rate depends on the subtype of cancer, which plays a significant role. Subtypes like TNBC and HER2+ have more sensitivity to NAC than others. (Burguin & Diorio, 2021)

- o Adjuvant Chemotherapy

AC therapy is the drug of choice in breast cancer. An anthracycline and a taxane are used in standard chemotherapy treatment. The most common regimens are four cycles of cyclophosphamide and doxorubicin followed by four cycles of paclitaxel. The previous combination of therapies is administered to the patients, followed by either weekly paclitaxel for 12 weeks or docetaxel every three weeks for four cycles. (Das et al., 2021) Chemotherapy is a treatment for breast cancer with a significant disadvantage, which is the occurrence of side effects. Early side effects of chemotherapy include fatigue, hair loss, low blood counts, muscle pain, problems with thinking and memory, and nerve damage. Chronic or late side effects of chemotherapy can include heart damage, developing second cancer, early menopause, infertility, and psychological effects. Although surgery, radiation therapy, and chemotherapy are all complementary treatments for breast cancer patients, they may not effectively treat all types of breast cancer molecular subtypes since they do not respond similarly to radiation or chemotherapy. Therefore, personalized therapies are necessary in treating breast cancer.

- • Hormone Therapy

Hormone therapy is a type of treatment that is used for breast cancers that have hormone receptors, such as estrogen and progesterone. These types of cancers need these hormones to grow, and hormone therapy aims to reduce or block their effects. Hormone therapy can be achieved through various mechanisms, including inhibiting hormone

production, inhibiting hormone action at the receptor level, or decreasing hormone availability in the body. Some common hormone therapy medications include aromatase inhibitors, selective estrogen receptor modulators, and gonadotropin-releasing hormone agonists. These medications are usually administered orally or through injections. Hormone therapy can be effective in early-stage breast cancer. It can improve survival in advanced diseases but can also have side effects, such as menopausal symptoms, osteoporosis, and cardiovascular risks. Individual patient's characteristics should be carefully considered before starting therapy.(El Sayed et al., 2019)

- Targeted Therapy

The advancement of targeted therapies has revolutionized breast cancer treatment by offering new and more effective options for patients. Targeted therapy is a cancer treatment focusing on specific molecules or pathways that contribute to the growth and spread of cancer cells. This approach selectively targets these molecules to attack cancer cells while minimizing damage to normal cells effectively. In breast cancer, targeted therapies can inhibit the activity of proteins that drive the growth of cancer cells, such as human epidermal growth factor receptor 2 (HER2) or estrogen receptor (ER).

Trastuzumab is a well-known targeted therapy that treats HER2-positive breast cancer. This type of breast cancer overexpresses HER2 protein, which leads to increased growth and spread of cancer cells. Trastuzumab is a monoclonal antibody that binds to HER2 and inhibits its signaling, thus blocking cancer cell growth. Another targeted therapy, lapatinib, blocks the activity of the HER2 receptor and its downstream signaling pathways.

Endocrine therapy, also known as hormone therapy, is another targeted therapy used to block estrogen's action on breast cancer cells. This therapy is effective for positive estrogen receptor (ER) cancer patients. Fulvestrant is an example of an endocrine therapy that is a selective estrogen receptor degrader (SERD) that reduces the number of functional ERs, thus blocking the action of estrogen on breast cancer cells.

Targeted therapies are often combined with other treatments, such as chemotherapy or radiation therapy, to improve treatment efficacy and reduce side effects. Trastuzumab and chemotherapy, for example, have improved overall survival compared to chemotherapy alone in HER2-positive breast cancer. The use of targeted therapies

depends on the presence of specific genetic markers on the cancer cells, such as HER2 overexpression or ER positivity, so accurate testing and diagnosis are essential for appropriate patient selection. (Burguin & Diorio, 2021; El Sayed et al., 2019)

2.2.1   Colon Cancer

Colon cancer, also known as colorectal cancer, is a type of cancer that affects the colon, rectum, and anal canal. The development of a colorectal neoplasm occurs through a multistep process involving genetic and phenotypic changes in the normal bowel epithelium. This results in uncontrolled cell growth, proliferation, and tumor formation. Several changes, including genomic instability, activation of oncogene pathways, mutation or silencing of tumor-suppressor genes, impaired DNA mismatch repair, and activation of growth factor pathways, mark colorectal tumorigenesis. (C. V DiPiro et al., 2017)

Epidemiology

Colorectal cancer is prevalent worldwide, with men being affected third most often and women being affected second most often. According to the International Agency for Research on Cancer (IARC), in 2020, there were over 1.9 million new cases of colorectal cancer and over 930,000 deaths from it. (Morgan et al., 2023)

The incidence rates are highest in Australia, New Zealand, Europe, and North America. In contrast, the lowest rates are seen in Africa and South-Central Asia. These differences in incidence rates may be attributed to genetic factors as well as differences in diet, environment, socioeconomic status, and access to colorectal cancer screening. (Macrae, 2022)

Risk Factors of Colon Cancer (NIH, 2020)

Various factors, including age, genetics, diet, lifestyle, and medical history, influence colon cancer risk. The most common risk factors for colon cancer are age, family history of colon cancer or hereditary colon cancer syndromes such as Lynch syndrome and familial adenomatous polyposis (FAP), genetic mutations like MLH1, MSH2, or MSH6 gene, having polyps, chronic inflammatory conditions such as ulcerative colitis and Crohn's disease, consuming a diet high in red and processed meats and low in fruits and vegetables, physical inactivity, tobacco use, and heavy alcohol consumption. However,

having one or more risk factors does not necessarily mean a person will develop colon cancer. While some individuals with one or more risk factors never get the disease, others may develop it even in the absence of any identifiable risk factors.

Symptoms of Colon Cancer

The symptoms of colon cancer depend on the whereabouts of the cancer and its stage. The most common signs and symptoms are:

- Constipation that gets worse
- Blood in the stool
- A decrease in the thickness of the stool
- Anorexia
- Unexplained weight loss
- In people over 50, vomiting and nausea

It is estimated that approximately 50% of people with colon cancer do not experience any symptoms. Additionally, individuals in the early stages of colon cancer may not have any symptoms. The symptoms can vary depending on the location and size of the tumor in the large intestine. (Rose, 2020)

Screening of Colon Cancer.

The USPSTF and other medical societies, such as the ACS, ACP, and NCCN, have listed recommended screening tests as follows: (NIH, 2023b)

- Fecal Occult Blood Test (FOBT): This simple at-home test that looks for hidden blood in the stool can indicate colon cancer or other colon issues. The most common ones are Guaiac FOBT (gFOBT) and fecal immunochemical test (FIT).
- Stool DNA test (sDNA): A newer screening test that looks for anomalous DNA in the stool, which can indicate colon cancer or premalignant polyps.
- Colonoscopy: A versatile, illuminated tube is inserted into the anus to investigate the inside of the colon and eliminate any discovered polyps.
- Flexible Sigmoidoscopy (FS): Comparable to colonoscopy, but only investigate the lower part of the colon.
- CT Colonography (Virtual Colonoscopy): This non-invasive test uses a CT scan to generate detailed images of the colon and rectum.

Stages of Colon Cancer.

The stage of colon cancer at the time of diagnosis is the most important predictor of survival and disease relapse. Patients in stages I, II, and III of the disease are considered especially curable and are vigorously treated to cure them.

Patients with stage IV disease are treated to alleviate symptoms, avoid cancer complications, and increase survival. (Chisholm-Burns et al., 2022; NIH, 2023a)

- Stage 0 (Carcinoma in situ): The colon wall's mucosa shows abnormal cells that have the potential to develop into cancer and spread to nearby normal tissue.
- Stage I: The disease has advanced from the mucosa (innermost layer) and reached the submucosa or muscular layer of the colon wall.
- Stage II: Cancer has spread beyond the colon but not into the lymph nodes.
- Stage III: Cancer has spread beyond the colon and into the lymph nodes.
- Stage IV: Cancer has metastasized to other organs or areas such as the lung, ovary, distant lymph node, or liver.

Treatment of Colon Cancer.

The treatment planning process considers factors like performance status, concurrent disease states, lifestyle factors, patient preferences, and patient age while addressing emergency conditions. The approaches to treating colon or rectal cancer have two primary goals: curative therapy for localized disease and palliative therapy for metastatic cancer. (J. T. DiPiro, 2023)

The most crucial therapy for patients with curative intent is surgical resection of the primary tumor. Additional adjuvant chemotherapy or chemotherapy plus radiation therapy may be necessary depending on the extent of the disease and whether the tumor originated in the colon or rectum. Systemic chemotherapy is the mainstay of treatment for most patients with metastases, and radiation therapy may also be helpful for disease palliation of localized symptoms. Asymptomatic patients with metastatic disease may benefit from therapy, and long-term treatment should be considered. Age is not an absolute contraindication for aggressive therapies. (C. V DiPiro et al., 2017)

- Surgery:

Surgery is the most common treatment for colon cancer and may be used with radiation therapy and chemotherapy. The type of surgery used is based on various factors, such as the location and stage of the cancer. Local excision, or polypectomy, is a minimally invasive procedure that removes small polyps or early-stage cancers using a colonoscope. Partial colectomy involves removing the cancerous part of the colon and some healthy tissue and then reconnecting the remaining sections of the colon. Colectomy is a procedure that removes the entire colon and part of the rectum, with the remaining intestines reconnected to form a colostomy or ileostomy. Robotic-assisted colectomy is a minimally invasive procedure that uses a robot-assisted surgical system. Cryosurgery, or cryotherapy, involves freezing and destroying abnormal tissue using a thin metal probe. (Primrose, 2002)

- Radiation therapy:

Radiotherapy has a minimal role in treating colon cancer. It is often used as adjuvant chemotherapy with chemotherapy or surgery in stage II or III rectal cancer. (Chisholm-Burns et al., 2022)

- Chemotherapy:

It is a cancer treatment in which drugs kill cancer cells. It can be administered orally, intravenously, or intramuscularly. Chemotherapy is frequently used with surgery or radiation therapy in colon cancer. Chemotherapy drugs treat colon cancer in various ways, each of which works differently to kill cancer cells. Among the most commonly used chemotherapy drugs for colon cancer are: CAPOX (Capecitabine and oxaliplatin), FOLFIRI (LV, 5-FU, and irinotecan), and FOLFOX-4 (Oxaliplatin, LV, and 5-FU). (Cassidy et al., 2015)

- Targeted therapy:

This treatment targets specific molecules involved in cancer cell growth and spread. Traditional chemotherapy, on the other hand, attacks rapidly dividing cells in the body, both cancerous and normal.

Targeted therapy treats advanced or metastatic colon cancer that has spread beyond the colon. It is also used alone or in combination with chemotherapy or radiotherapy. For colon cancer, there are several types of targeted therapies available, including:

- Vectibix (panitumumab) is a monoclonal antibody that targets the epidermal growth factor receptor (EGFR) on the surface of some colon cancer cells.
- Erbitux (cetuximab) is an EGFR-targeting monoclonal antibody.
- Zaltrap (ziv-aflibercept) is a drug that inhibits the formation of blood vessels that supply nutrients to cancer cells, thereby slowing cancer growth.
- Stivarga (regorafenib) is a kinase inhibitor inhibiting specific enzymes in cancer cell growth and spread.

1.2 Statement of the Problem

Breast and colon cancers are common diseases worldwide and significantly impact the healthcare system and patients' quality of life. Early detection and prevention strategies effectively reduce mortality rates. Still, a lack of awareness and education about risk factors and screening methods hinders progress. As future healthcare providers, pharmacy students should have the knowledge and skills to promote cancer awareness and prevention among the public. However, current educational curricula in many schools and universities do not adequately cover cancer-related topics, leading to misconceptions and a lack of motivation to engage in cancer prevention efforts. Therefore, there is an urgent need to enhance cancer education programs for students to improve cancer knowledge and promote positive health behaviors. A study is being conducted to assess the level of cancer knowledge among pharmacy students at Near East University and Cyprus International University in Northern Cyprus.

1.3 Purpose of the Study

The aim of this study was to assess pharmacy students' knowledge of breast cancer and colon cancer in Northern Cyprus Universities.

1.4 Research Questions

- Do the pharmacy students in NEU and CIU have sufficient and correct breast and colon cancer knowledge?

1.5 Significance of the Study

The study's significance is that it provides various insights into the importance of measuring pharmacy students' awareness and knowledge, thereby assisting in developing appropriate teaching and training strategies to increase their knowledge and proficiency.

CHAPTER II
2. LITERATURE REVIEW

Several articles were used for this literature review; many studies have been done on assessing pharmacy students' breast and colon cancer knowledge. This literature review covers the two types of this study; breast and colon cancer.

2.1 Breast Cancer Knowledge.

Birsen Altay and colleagues conducted a cross-sectional survey of female university students in Samsun, Turkey, to assess their awareness and understanding of breast and cervical cancer. The researchers used a self-administered questionnaire to collect information and assess the participants' understanding of these malignancies and their habits and awareness. The survey discovered a dearth of understanding regarding breast and cervical cancer among university students in Samsun. (Altay et al., 2015)

Qiao-Ni Zhang and Hui-Xia Lu conducted a study to analyze the attitudes, knowledge, and practices of female college students in Yunnan toward breast cancer and the factors influencing their awareness. They collected data from a random sample of

female college students from two colleges in Dali City using questionnaires. Their research revealed a need for standardized education and awareness initiatives in China to improve college students' understanding of breast cancer. (Zhang & Lu, 2022)

Syed Azizur Rahman et al. did a cross-sectional study at the University of Sharjah in the UAE to evaluate female students' awareness of breast self-examination and breast cancer. Undergraduate students from three universities participated in the study, which used a self-administered questionnaire. The questionnaire asked about sociodemographic variables, breast cancer awareness, risk factors, warning signals, and BSE knowledge and practice. The findings revealed that, while the majority of participants were aware of breast cancer, their awareness of risk factors and warning signals was limited. Furthermore, their understanding of how to perform BSE was found to be particularly low. (Rahman et al., 2019)

Md. Ashraful Islam and colleagues conducted a cross-sectional study to analyze female undergraduate students' awareness, knowledge, and attitudes concerning breast cancer at health and non-health topic colleges associated with a public university. The study attempted to compare current breast cancer understanding to earlier findings. The findings revealed that knowledge of breast cancer had improved, and the importance of awareness campaigns as a source of information for non-health students was recognized. The study also indicated that among non-health college students, the internet and social media had become new sources of information. More efforts should be made to educate this student population about the disease through these mediums. (Islam et al., 2022)

Ashraf Kan'an conducted a cross-sectional study at Zarqa University in Jordan to measure female university students' breast cancer awareness. A self-administered questionnaire was used in the study to assess participants' views toward breast cancer treatment and to compare the level of awareness and attitudes across students in the scientific and humanities faculties. The findings revealed that Jordanian female students lacked breast cancer awareness and treatment attitudes. The author concluded that university courses should be adjusted to incorporate breast cancer subjects to raise awareness. (Kan'an, 2018)

2.2 Colon Cancer Knowledge.

Asma Althobaiti and Hoda Jradi conducted research to assess medical students' knowledge and attitudes. They perceived barriers to colorectal cancer screening practices and risk factors. They employed a self-administered questionnaire that contained demographic information, knowledge assessments, attitude measurements, and barrier assessments for medical students from two Saudi universities. The study aimed to assess medical students' comprehension of colon cancer risk factors, screening recommendations, and attitudes and barriers to screening. The findings revealed that half of the students had inadequate awareness of CRC risk factors and screening procedures and a negative attitude toward screening. The study also found a lack of patient awareness regarding CRC and screening techniques and a dearth of qualified healthcare personnel as hurdles to treatment. (Althobaiti & Jradi, 2019)

Obada Zayegh et al. assessed colorectal cancer screening awareness and knowledge among medical students at the University of Aleppo. The researchers conducted a cross-sectional study with a self-administered questionnaire including demographics, colorectal cancer (CRC) awareness, and knowledge of CRC and its screening modalities. The data revealed that medical students were aware of CRC but had limited knowledge of its screening methods. Clinical students grasped the subject better than pre-clinical students, but academic ratings had variable effects. (Zayegh et al., 2022)

Hulya Ustundag et al. conducted a study to assess health sciences students' knowledge of colorectal cancer risk factors, symptoms, and protective measures. The information was acquired through a questionnaire. The results revealed that the students were aware of risk factors and protective measures. Their awareness of symptoms, however, was less than expected. The authors suggested that students studying health sciences be better educated on the symptoms of colorectal cancer. (Ustundag et al., 2019)

The Syed Sameer Aga et al. study sought to assess colorectal cancer (CRC) knowledge and awareness among health and related students at King Saud University for Health Sciences in Jeddah, Saudi Arabia. The information was gathered through an online self-administered questionnaire and evaluated using demographic distributions. The findings revealed that health and allied students had low awareness and knowledge regarding CRC. The findings point to the need for proactive and robust preventative

medicine campaigns, educational programs, and curriculum changes to better prepare students for the kingdom's rising cancer burden. (Aga et al., 2021)

Kern D. Rocke's study sought to investigate the level and determinants of colorectal cancer awareness and risk factors among university students in Trinidad, a Caribbean territory. The study used a cross-sectional methodology, showing that the student population was unaware of CRC and its risk factors. The author proposed that CRC awareness and healthy lifestyle programs among young adults in the Caribbean region should be improved. (Rocke, 2020)

CHAPTER III
3. METHODOLOGY

3.1 Material and Methods

This study was conducted as a cross-sectional study for 3 months between 1 November 2022, and 31 January 2023, in Northern Cyprus. The aim of this study was to assess pharmacy students' knowledge of breast cancer and colon cancer in Northern Cyprus Universities.

The questionnaire was developed from the information published by the World Health Organization about breast cancer, the information published by the National Cancer Institute about colon cancer and previous studies related to breast cancer and colon cancer topics (Abduelkarem et al., 2015; Alqudah et al., 2021; NIH, 2020; WHO, 2021). In order to ensure the validity of the questionnaire used in this study, the questionnaire was sent to two academicians specialised in oncology and one academician specialised in clinical pharmacy for face validity. The questionnaire was self-administered and was prepared in Turkish and English. The questionnaire was

translated into English using the forward and backward method. The questionnaire was distributed to face-to-face pharmacy students. The approximate time to complete the questionnaire was 5-10 minutes. Verbal consent was received from the participants. Questionnaires that were not completed were excluded from the study. The Raosoft, Inc, Seattle, WA, USA, software calculator with a 5% margin of error, 95% confidence level, 50% response distribution and 2305 population size (Total of CIU and NEU pharmacy students) was used to estimate the required sample size. The recommended sample size was 330 decided by the Raosoft rate.

The questionnaire has three sections. In the first part, there are five questions about the demographic information of the participants. In the second part, there are sixteen questions prepared with a 3-point Likert scale (Yes, No, Not Sure) regarding the knowledge of pharmacy students about breast cancer. In the third part, there are fourteen questions prepared with a 3-point Likert scale (Yes, No, Not Sure) regarding the knowledge of pharmacy students about colon cancer.

According to the breast cancer knowledge questionnaire for Near East University (NEU) and Cyprus International University (CIU) studying pharmacy students, it was determined that the knowledge level of the participants with a score below 10 was poor. Participants with a score equal or higher than 10 were accepted to have good knowledge. 16 score was calculated according to the highest knowledge. If the participants answer "No" to items 1, 2, 8, 10 and 14 in the breast cancer questionnaire, they receive 1 point from the items. If the participants answer "Yes" to all items except items 1, 2, 8, 10 and 14 in the breast cancer questionnaire, they receive 1 point from the items.

According to the colon cancer knowledge questionnaire for NEU and CIU studying pharmacy students, it was determined that the knowledge level of the participants with a score below 8 was poor. Participants with a score equal or higher than 8 were accepted to have good knowledge. 14 score was calculated according to the highest knowledge. If the participants answer "No" to the 11th item in the colon cancer questionnaire, they receive 1 point from the item. If the participants answer "Yes" to all items except item 11 in the colon cancer questionnaire, they receive 1 point from the items.

3.2 Statistical Analysis

The data were analysed with SPSS version 25. Demographic information and data on pharmacy students' knowledge about breast cancer and colon cancer were presented as percentage and frequency. Cronbach's Alpha value was calculated for each questionnaire separately to assess internal consistency. This study determined the relationship between social-demographic factors and pharmacy students' knowledge of breast and colon cancer by applying Pearson chi-square test. A p-value less than 0.05 (p < 0.05) was considered significant.

3.3 Ethical Consideration

This study was approved by Near East University Institutional Review Board (YDU/2022/107-1613). The required permissions have been obtained from the dean of the Faculty of Pharmacy of Cyprus International University. Verbal consent was received from NEU and CIU pharmacy students in this study.

CHAPTER IV

4. RESULTS

4.1 Findings and Discussion

Four hundred ninety-four pharmacy students participated in this study. Twenty-three incompletely filled questionnaires were excluded from the study. The participants were 297 (60.1%) females and 197 (39.9%) males. The majority of 172 (34.8%) pharmacy students were 23 years old and over, 127 (25.7%) were 22 years old, and 66 (13.4%) were 21 years old. Only 133 (26.9%) pharmacy students (NEU and CIU) received training on breast cancer. Only 95 (19.2%) pharmacy students (NEU and CIU) received training on colon cancer (Table 2).

Table 2. The Demographic Information of Participants

	NEU of pharmacy students N (%)	CIU of pharmacy students N (%)	Total N (%)
1. Gender			

Male	126 (41.2%)	71 (37.8%)	197 (39.9%)
Female	180 (58.8%)	117 (62.2%)	297 (60.1%)
2. Age			
18 years old	15 (4.9%)	15 (8.0%)	30 (6.1%)
19 years old	20 (6.5%)	15 (8.0%)	35 (7.1%)
20 years old	43 (14.1%)	21 (11.2%)	64 (13.0%)
21 years old	50 (16.3%)	16 (8.5%)	66 (13.4%)
22 years old	85 (27.8%)	42 (22.3%)	127 (25.7%)
23 years old and over	93 (30.4%)	79 (42.0%)	172 (34.8%)
3. In which class are you studying?			
First class	59 (19.3%)	65 (34.6%)	124 (25.1%)
Second class	64 (20.9%)	13 (6.9%)	77 (15.6%)
Third class	73 (23.9%)	16 (8.5%)	89 (18.0%)
Fourth class	76 (24.8%)	25 (13.3%)	101 (20.4%)
Fifth class	34 (11.1%)	69 (36.7%)	103 (20.9%)
4. Have you ever been trained in breast cancer?			
Yes	68 (22.2%)	65 (34.6%)	133 (26.9%)
No	238 (77.8%)	123 (65.4%)	361 (73.1%)
5. Have you ever been trained in colon cancer?			
Yes	39 (12.7%)	56 (29.8%)	95 (19.2%)
No	267 (87.3%)	132 (70.2%)	399 (80.8%)

In terms of knowledge of breast cancer among NEU and CIU pharmacy students, 317 out of 494 had good knowledge, and 177 out of 494 had low knowledge. The total score of NEU pharmacy students' knowledge of breast cancer was 10±3.43. Cronbach's Alpha (0.75) was calculated as an adequate internal consistency for the NEU pharmacy students' knowledge of the breast cancer questionnaire. The total score of CIU pharmacy students' knowledge of breast cancer was 11.40±3.67. Cronbach's Alpha (0.82) was

evaluated as good internal consistency for CIU pharmacy students' understanding of breast cancer questionnaires. (Table 3).

Table 3. Knowledge of NEU and CIU of Pharmacy Students About Breast Cancer

	NEU				CIU			
	Yes N (%)	No N (%)	Not Sure N (%)	Score (Mean ± SD)	Yes N (%)	No N (%)	Not Sure N (%)	Score (Mean ± SD)
1. The male gender is a higher risk factor for breast cancer than the female gender.	66 (21.6%)	202 (66.0%)	38 (12.4%)	0.66±0.47	19 (10.1%)	153 (81.4%)	16 (8.5%)	0.81±0.39
2. Breast cancer is a transmissible disease.	23 (7.5%)	255 (83.3%)	28 (9.2%)	0.83±0.37	5 (2.7%)	167 (88.8%)	16 (8.5)	0.89±0.32
3. Gene mutations can increase the risk of breast cancer, the most dominant being mutations in the genes BRCA1, BRCA2, and PALB-2.	190 (62.1%)	15 (4.9%)	101 (33.0%)	0.62±0.49	132 (70.2%)	4 (2.1%)	52 (27.7%)	0.7±0.46
4. Breast cancers may spread to other areas of the body and trigger other symptoms.	231 (75.5%)	21 (6.9%)	54 (17.6%)	0.75±0.43	168 (89.4%)	9 (4.8%)	11 (5.9%)	0.89±0.31
5. The chemotherapy regimens are very effective in reducing the chances of cancer spread.	230 (75.2%)	27 (8.8%)	49 (16.0%)	0.75±0.43	157 (83.5%)	6 (3.2%)	25 (13.3%)	0.84±0.37
6. Endocrine therapies can cause symptoms of menopause but are generally well tolerated.	137 (44.8%)	17 (5.6%)	152 (49.7%)	0.45±0.5	99 (52.7%)	9 (4.8%)	80 (42.6%)	0.53±0.5
Symptoms of Breast cancer								
7. A change in the size, shape, or appearance of a breast is one of the symptoms of breast cancer.	234 (76.5%)	21 (6.9%)	51 (16.7%)	0.76±0.42	159 (84.6%)	14 (7.4%)	15 (8.0%)	0.85±0.36
8. A change in nipple appearance is not one of the symptoms of breast cancer.	58 (19.0%)	167 (54.6%)	81 (26.5%)	0.55±0.5	43 (22.9%)	113 (60.1%)	32 (17.0%)	0.6±0.49

9. Abnormal nipple discharge is one of the symptoms of breast cancer.	186 (60.8%	25 (8.2%)	95 (31.0%)	0.61±0.49	136 (72.3%)	17 (9.0%)	35 (18.6%)	0.72±0.45
10. A breast mass or thickening is not a symptom of breast cancer.	45 (14.7%)	209 (68.3%)	52 (17.0%)	0.68±0.47	36 (19.1%)	124 (66.0%)	28 (14.9%)	0.66±0.48
Risk factors of breast cancer								
11. Increasing age is one of the risk factors for breast cancer.	200 (65.4%)	39 (12.7%)	67 (21.9%)	0.65±0.48	141 (75.0%)	17 (9.0%)	30 (16.0%)	0.75±0.43
12. Obesity is one of the risk factors for breast cancer.	138 (45.1%)	58 (19.0%)	110 (35.9%)	0.45±0.5	112 (59.6%)	27 (14.4%)	49 (26.1%)	0.6±0.49
13. Harmful use of alcohol is one of the risk factors for breast cancer.	160 (52.3%)	42 (13.7%)	104 (34.0%)	0.52±0.5	124 (66.0%)	21 (11.2%)	43 (22.9%)	0.66±0.48
14. A family history of breast cancer is not one of the risk factors for breast cancer.	61 (19.9%)	204 (66.7%)	41 (13.4%)	0.67±0.47	42 (22.3%)	129 (68.6%)	17 (9.0%)	0.69±0.47
15. Tobacco use is one of the risk factors for breast cancer.	193 (63.1%)	42 (13.7%)	71 (23.2%)	0.63±0.48	131 (69.7%)	15 (8.0%)	42 (22.3%)	0.7±0.46
16. Postmenopausal hormone therapy is one of the risk factors for breast cancer.	123 (40.2%)	30 (9.8%)	153 (50.0%)	0.4±0.49	99 (52.7%)	10 (5.3%)	79 (42.0%)	0.53±0.5
Total Score	10±3.43				11.40±3.67			

183 (59.8%) NEU pharmacy students had a strong understanding of breast cancer, while 123 (40.2%) NEU pharmacy students had insufficient knowledge of breast

cancer. On the other side, 134 (71.3%) CIU pharmacy students had good knowledge of breast cancer. In comparison, 54 (28.7%) CIU pharmacy students had a low understanding of breast cancer. Gender and knowledge of breast cancer were found to be related (p=0.002 and p=0.028) for NEU and CIU pharmacy students, respectively. For CIU pharmacy students, there was a correlation (p=0.003) between age and knowledge of breast cancer. For NEU and CIU pharmacy students, there was a relationship between class and knowledge of breast cancer (p=0.009 and p=0.0001, respectively). There was no correlation between age and knowledge of breast cancer for NEU pharmacy students. Breast cancer training and knowledge of breast cancer were associated (p=0.0001 and p=0.0001, respectively) for NEU and CIU pharmacy students. (Table 4).

Table 4. Association Between Demographic Factors and Knowledge of Cyprus International University and Near East University Pharmacy Students About Breast Cancer

	Good Knowledge of NEU students	Poor Knowledge of NEU students	P-Value	Good Knowledge of CIU students	Poor Knowledge of CIU students	P-Value
1. Gender						
Male	62 (49.2%)	64 (50.8%)	0.002*	44 (61.9%)	27 (38.1%)	0.028*
Female	121(67.2%)	59 (32.7%)		90 (76.9%)	27 (23.1%)	
2. Age						
18 years old	7 (46.6%)	8 (53.4%)		11 (73.3%)	4 (26.7%)	
19 years old	11 (55%)	9 (45%)		8 (53.3%)	7 (46.7%)	
20 years old	24 (55.8%)	19 (44.2%)	0.335	8 (38%)	13 (62%)	0.003*
21 years old	35 (70%)	15 (30%)		11 (68.75%)	5 (31.25%)	
22 years	46 (54.1%)	39 (45.9%)		32 (76.2%)	10 (23.8%)	

old						
23 years old and over	60 (64.5%)	33 (35.5%)		64 (81%)	15 (19%)	

3. In which class are you studying?

First Class	33 (55.9%)	26 (44.1%)		35 (53.8%)	30 (46.2%)	
Second Class	37 (57.8%)	27 (42.2%)		8 (61.5%)	5 (38.5%)	
Third Class	43 (58.9%)	30 (41.1%)	0.009*	8 (50%)	8 (50%)	0.0001*
Fourth Class	40 (52.6%)	36 (47.4%)		20 (80%)	5 (20%)	
Fifth Class	30 (88.2%)	4 (11.8%)		63 (91.3%)	6 (8.7%)	

4. Have you ever been trained in breast cancer?

Yes	54 (79.4%)	14 (20.6%)	0.0001*	59 (90.7%)	6 (9.3%)	0.0001*
No	129(54.2%)	109(45.8%)		75 (60.9%)	48 (39.1%)	

* p < 0.05 was considered the statistically significant association between demographic factors and knowledge of breast cancer by using the Pearson chi-square test.

Regarding knowledge of colon cancer among NEU and CIU pharmacy students, 298 out of 494 had good knowledge, and 196 out of 494 had insufficient knowledge. The total score of NEU pharmacy students' knowledge of colon cancer was 7.54 ± 3.67. Cronbach's Alpha (0.83) was evaluated as good internal consistency for the NEU pharmacy students' knowledge of the colon cancer questionnaire. The total score of CIU pharmacy students' knowledge of colon cancer was 9.19 ± 4.08. Cronbach's Alpha (0.89) was evaluated as good internal consistency for the CIU pharmacy students' knowledge of the colon cancer questionnaire. (Table 5).

Table 5. Knowledge of NEU and CIU of Pharmacy Students About Colon Cancer

	NEU				CIU			
	Yes N (%)	No N (%)	Not Sure N (%)	Score (Mean ± SD)	Yes N (%)	No N (%)	Not Sure N (%)	Score (Mean ± SD)
1. Colon cancer is a disease in which malignant (cancer) cells form in the tissues of the colon.	224 (73.2%)	16 (5.2%)	66 (21.6%)	0.73±0.44	149 (79.3%)	3 (1.6%)	36 (19.1%)	0.79±0.41
2. Colon cancer may spread from where it began to other parts of the body.	226 (73.9%)	31 (10.1%)	49 (16.0%)	0.74±0.44	157 (83.5%)	5 (2.7%)	26 (13.8%)	0.84±0.37
3. Cancer of the colon is a highly treatable and often curable disease when localized to the bowel.	113 (36.9%)	52 (17.0%)	141 (46.1%)	0.37±0.48	111 (59.0%)	28 (14.9%)	49 (26.1%)	0.59±0.49
4. A carcinoembryonic antigen (CEA) is a strong prognostic biomarker in patients with colon cancer.	76 (24.8%)	25 (8.2%)	205 (67.0%)	0.25±0.43	89 (47.3%)	9 (4.8%)	90 (47.9%)	0.47±0.5
5. CAPOX (Capecitabine and oxaliplatin), FOLFIRI (LV, 5-FU, and irinotecan), FOLFOX-4 (Oxaliplatin, LV, and 5-FU) regimens are often used to treat Colon	93 (30.4%)	28 (9.2%)	185 (60.5%)	0.30±0.46	93 (49.5%)	1 (0.5%)	94 (50.0%)	0.49±0.5

Cancer.

Symptoms of Colon cancer

6. Blood (either bright red or very dark) in the stool is one of the symptoms of colon cancer.	197 (64.4%)	21 (6.9%)	88 (28.8%)	0.64±0.48	145 (77.1%)	11 (5.9%)	32 (17.0%)	0.77±0.42
7. Weight loss for no known reason is one of the symptoms of colon cancer.	181 (59.2%)	28 (9.2%)	97 (31.7%)	0.59±0.49	143 (76.1%)	10 (5.3%)	35 (18.5%)	0.76±0.43
8. Diarrhea, constipation, or feeling that the bowel does not empty all the way are one of the symptoms of colon cancer.	169 (55.2%)	29 (9.5%)	108 (35.3%)	0.55±0.5	126 (67.0%)	19 (10.1%)	43 (22.9%)	0.67±0.47
9. A change in bowel habits is one of the symptoms of colon cancer.	175 (57.2%)	17 (5.6%)	114 (37.3%)	0.57±0.5	129 (68.6%)	10 (5.3%)	49 (26.1%)	0.69±0.47
Risk factors of colon cancer								
10. Smoking cigarettes is one of the risk factors for colon cancer.	202 (66.0%)	29 (9.5%)	75 (24.5%)	0.66±0.47	131 (69.7%)	17 (9.0%)	40 (21.3%)	0.7±0.46
11. Having a personal history of chronic ulcerative colitis or Crohn's disease for 8 years or more is not one of the risk factors for colon cancer.	87 (28.4%)	111 (36.3%)	108 (35.3%)	0.36±0.48	67 (35.6%)	66 (35.1%)	55 (29.3%)	0.35±0.48

Statement							
12. Having a family history of colon or rectal cancer in a first-degree relative (parent, sibling, or child) is one of the risk factors for colon cancer.	213 (69.6%)	16 (5.2%)	77 (25.2%)	0.7±0.46	145 (77.1%)	8 (4.3%)	35 (18.6%)	0.77±0.42
13. Being obese is one of the risk factors for colon cancer.	140 (45.8%)	37 (12.1%)	129 (42.2%)	0.46±0.5	117 (62.2%)	15 (8.0%)	56 (29.8%)	0.62±0.49
14. Having three or more alcoholic drinks per day is one of the risk factors for colon cancer.	186 (60.8%)	27 (8.8%)	93 (30.4%)	0.61±0.49	126 (67.0%)	9 (4.8%)	53 (28.2%)	0.67±0.47
Total Score	7.54±3.67				9.19±4.08			

171 NEU pharmacy students (56.9%) strongly understood colon cancer, while 135 (44.1%) had inadequate knowledge. On the other hand, 127 (67.5%) CIU pharmacy students strongly understood colon cancer, whereas 61 (32.5%) had inadequate knowledge. Gender and knowledge of colon cancer were related (p=0.002) for NEU pharmacy students but not CIU pharmacy students. For CIU pharmacy students, there was a correlation between age and knowledge of colon cancer (p=0.002), and there was no correlation between age and knowledge of colon cancer for NEU pharmacy students. For NEU and CIU pharmacy students, there was a correlation between class and knowledge of colon cancer (p=0.001 and p=0.0001, respectively). For NEU and CIU pharmacy students, there was a correlation between colon cancer training and knowledge (p=0.0001 and p=0.0001, respectively) (Table 6).

Table 6. Association Between Demographic Factors and Knowledge of Cyprus International University and Near East University of Pharmacy Students About Colon Cancer

	Good	**Poor**	**P- Value**	**Good**	**Poor**	**P- Value**

	Knowledge of NEU students	Knowledge of NEU students		Knowledge of CIU students	Knowledge of CIU students	
1. Gender						
Male	57 (45.2%)	69 (54.8%)	0.002*	47 (66.2%)	24 (33.8%)	0.757
Female	114(63.3%)	66 (36.7%)		80 (68.4%)	37 (31.6%)	
2. Age						
18 years old	8 (53.3%)	7 (46.7%)		8 (53.3%)	7 (46.7%)	
19 years old	9 (45%)	11 (55%)		7 (46.6%)	8 (53.4%)	
20 years old	25 (58.1%)	18 (41.9%)		10 (47.6%)	11 (52.4%)	
21 years old	34 (68%)	16 (32%)	0.144	7 (43.75%)	9 (56.25%)	0.002*
22 years old	39 (45.9%)	46 (54.1%)		32 (76.2%)	10 (23.8%)	
23 years old and over	56 (60.2%)	37 (39.8%)		63 (80%)	16 (20%)	
3. In which class are you studying?						
First Class	34 (57.6%)	25 (42.4%)		30 (46.2%)	35 (53.8%)	
Second Class	38 (59.4%)	26 (40.6%)		9 (56.25)	4 (43.75%)	
Third Class	32 (43.8%)	41 (56.2%)	0.0001*	10 (62.5%)	6 (37.5%)	0.0001*
Fourth Class	37 (48.7%)	39 (51.3%)		16 (64%)	9 (36%)	
Fifth	30 (88.2%)	4 (11.8%)		62 (89.8%)	7 (10.2%)	

Class						
4. Have you ever been trained in colon cancer?						
Yes	32 (82%)	7 (18%)	0.0001*	55 (99%)	1 (1%)	0.0001*
No	139(52%)	128(48%)		72 (54.5%)	60 (45.5%)	

* p < 0.05 was considered the statistically significant association between demographic factors and knowledge of colon cancer by using the Pearson chi-square test.

CHAPTER V

5. DISCUSSION

This study aimed to evaluate pharmacy students' knowledge in Northern Cyprus on breast and colon cancer and explore the impact of demographic factors and oncology training on their knowledge. This is the first study to investigate pharmacy students' understanding of these two types of cancer in this region.

Our findings reveal a significant knowledge gap among pharmacy students at NEU and CIU in some aspects of breast and colon cancer. The study highlights the impact of demographic factors, such as age, gender, class, and accessibility to proper oncology training, on students' knowledge and perspective toward these diseases.

We obtained an excellent response rate of 95.5%, with most respondents being females. This is similar to a study in Nigeria, where the response rate was 97%, but most students were males (Saulawa et al., 2022). The results showed that 73.1% of NEU

students and 80.8% of CIU students did not receive proper oncology training, consistent with a study conducted in Greece. (Papanikolaou, 2012)

Our study also indicates that female students displayed better breast and colon cancer knowledge than male students in both universities. However, pharmacy students at both universities understood these cancers well (more than 50%).

Furthermore, we found that educational intervention improved pharmacy students' knowledge and awareness of breast and colon cancer. This was particularly evident among students who received training, as they were less likely to make mistakes and better understood the diseases. The oncology pharmacy course is included in the curricula of both universities. However, this course is offered as an elective course. As seen in our research, the small number of students taking oncology pharmacy (Have you received training in oncology?) among all students participating in the research limits the expected benefits. Including the Oncology Pharmacy course as a compulsory course in the curriculum would be advantageous.

Our study also revealed that as students progressed through their academic levels, their knowledge improved, and they made fewer mistakes in the survey. Although we could not make a detailed comparison since this course was an elective course and a limited number of students took these courses, the results revealed the importance of pharmacy students having access to courses on cancer and cancer treatments from a clinical perspective.

Our study could indirectly infer some barriers and obstacles preventing students from achieving higher results in oncology, such as a lack of interest in oncology, the difficulty of the field, or inadequate cancer materials. Despite the various obstacles that may be present, the students should strive to achieve higher results in oncology in order to assist the medical community in its endeavors further. The students should not let these obstacles hinder their progress toward higher results in oncology, as this is a critical area of research and development that can potentially lead to breakthroughs and improvements in cancer treatment. Overcoming these barriers is crucial, as pharmacists play a critical role in fighting cancer by dispensing drugs and developing new treatments.

To improve the knowledge and awareness of pharmacy students, educational interventions and cancer training programs should be implemented early, preferably

during the first or second year of study. Such programs should be designed to cover the most critical aspects of breast and colon cancer, including risk factors, diagnosis, treatment protocols, and the latest research trends.

Furthermore, universities should provide adequate resources for pharmacy students, such as cancer resources, access to specialized oncology training, and research opportunities, to encourage them to learn and improve their knowledge. Creating an encouraging educational atmosphere that promotes conversation and debate between students and lecturers can also aid in the removal of hurdles and impediments.

Given pharmacists' growing role as patient advisors, they must be educated about the symptoms and warning signs of breast and colon cancer, as well as the risk factors. Early detection of cancer enables early intervention, delaying or halting the progression of cancer and perhaps saving lives. As a result, it is vital to examine if the existing pharmacy curriculum is adequate for increasing students' awareness of breast or colon cancer, or cancer in general, and whether students are equipped to take on their role as future cancer pillars.

A study by Ukwenya AY et al. in Nigeria showed that delayed treatment of symptomatic breast cancer resulted from a lack of awareness (Ukwenya et al., 2008). Another study by Nazer Ali et al. in a private university in Kedah, Malaysia, showed that most pharmacy students did not adequately understand breast cancer risk factors (Ali et al., 2019). On the other hand, in our study, pharmacy students showed good knowledge about breast cancer risk factors and symptoms. Understanding breast cancer's symptoms and risk factors is important, especially in early diagnosis. A high level of pharmacist knowledge will increase the awareness of the community that receives services from these pharmacists.

In another study conducted among university students in Pakistan, students' knowledge scores regarding risk factors and warning signs of colorectal cancer were found to be 59.9% and 40% (Hussain et al., 2021). On the other hand, in the present study, 171 (56.9%) NEU and 127 (67.5%) CIU pharmacy students had good knowledge of colon cancer. As seen in both studies, there is a need for further education on cancer. The mandatory inclusion of oncology pharmacy courses in the curricula will

significantly contribute to the early diagnosis and optimum treatment of these cancer types in public.

5.1 Strengths and Limitations

One of the strengths of this study is that the surveyed pharmacy students covered two large-populated universities, Near East University, and Cyprus International University, which enabled us to get diverse responses from different ethnicities and teaching qualities.

The present study was conducted in only NEU and CIU; therefore, the findings could not be generalizable to all universities in Northern Cyprus. We recommend that a similar study be conducted to cover more pharmacy students and different cancer types of assessments. In addition, many pharmacy students did not want to participate in the study due to the intensity of their courses.

CHAPTER VI
6. CONCLUSION

Most pharmacy students have good knowledge about the risk factors and symptoms of breast cancer and colon cancer. With the increase in the number of pharmacy students studying oncology pharmacy at the undergraduate level and increasing awareness studies in the literature specifically for health students, it will be possible to discuss the results of our research in more depth. We believe pharmacy students in this field should be well-educated with clinical pharmacy principles to reduce and cure the increasing number of cancer cases in recent years.

6.1 Recommendations

As future healthcare professionals, pharmacy students must be knowledgeable about breast and colon cancer awareness. By educating their patients about the importance of regular screenings and adopting healthy lifestyle habits, they can play a crucial role in reducing the incidence and mortality rates of these two types of cancer.

Furthermore, incorporating oncology courses into the curricula of pharmacy students can improve their knowledge and skills in cancer care, leading to better patient outcomes and interprofessional collaboration with oncology healthcare providers. This integration can also enhance the role of pharmacists in the multidisciplinary team approach to cancer treatment.

We urge that a comparable study be undertaken with more pharmacy students and more cancer types of assessments to further substantiate the good influence of oncology courses in pharmacy school. It is also critical to maintain these courses updated and revised in order to keep up with improvements in cancer therapy and care. By doing so, we can ensure that pharmacy students are well-prepared to deliver the best possible care for cancer patients and contribute to advancing cancer treatment and outcomes.

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6.3 Appendix

Plagiarism Report

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EDUCATION

YEAR	GRADE	UNIVERSITY	FIELD
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ACADEMIC EXPERIENCE

PERIOD	TITLE	DEPARTMENT	UNIVERSITY

FIELD OF INTERESTS

FIELDS OF INTERESTS	KEY WORDS
Clinical Pharmacy	Clinical Pharmacy

Foreign Languages	Reading comprehension	Speaking*	Writing*

Arabic	Native	Native	Native
English	Excellent	Excellent	Excellent

COMPUTER KNOWLEDGE

Program	Use proficiency
Word	Very Good
PowerPoint	Very Good
Excel	Good