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Oral anti-cancer agents delivered in private pharmacies in Algeria and Zambia.

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LIST OF ABBREVIATIONS

ADRs	Adverse Drug Reactions
CIACC	Coalition to Improve Access to Cancer Care
DNA	Deoxyribonucleic acid
HICs	High Income Countries
IV	Intravenous
LMICs	Low- and Middle-Income Countries
OAA	Oral Anticancer Agents
RNA	Ribonucleic acid
SSA	Sub-Saharan Africa
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

TABLE OF CONTENTS

ACKNOWLEDGMENT	3
DEDICATION	4
LIST OF ABBREVIATIONS	5
TABLE OF CONTENTS	6
LIST OF FIGURES.....	8
SUMMARY	8
CHAPTER 1: INTRODUCTION	11
1.1. Background Information.....	11
1.2. Pathophysiology	11
1.3 Problem Statement and Justification	12
1.4 Objectives	13
1.4.1 General objective.....	13
1.4.2 Specific Objectives.....	13
1.5 LITERATURE REVIEW	14
1.5.1 Epidemiology of Cancer.....	14
1.5.2 Treatment of Cancer.....	15
1.5.3 Oral anti-cancer agents.....	16
1.5.4. Role of community pharmacist	19
1.5.5. Knowledge and attitude towards oral anti-cancer agents.....	20
1.5.6 Cancer and Oral anti-cancer agents	22
CHAPTER 2: METHODS	25
2.1. Study type	25
2.2. Study Duration.....	25
2.4. Inclusion and Exclusion Criteria	25
2.4.1. Inclusion Criteria.....	25
2.4.2. Exclusion Criteria.....	25
2.5. Sample Size Determination	25

2.6. Data Collection	25
2.7. Data Analysis.....	25
2.8. Ethical Consideration	26
CHAPTER 3: RESULTS	27
3.1 Socio-demographic Data	27
3.2 Oral anti-cancer drugs dispensation	30
3.3 Safety measures	34
3.4. Follow-up.....	36
CHAPTER 4: DISCUSSION	39
4.1. Socio-demographic Data	39
4.2. Oral anti-cancer agents dispensation	39
4.2.1 Cost Per Dose, Prescriptions Per Month	39
4.2.2 Knowledge of Pharmacists about Oral anti-cancer agents	40
4.3. Practice of handling Oral anti-cancer agents	40
4.4. Availability of Oral anti-cancer Drugs	41
4.5 Follow Up.....	41
CHAPTER 5: CONCLUSION.....	42
5.1. Conclusion	42
5.2. Study Limitations	42
5.3. Recommendations	42
REFERENCES.....	43
APPENDIX 1: QUESTIONNAIRE.....	49
APPENDIX 2: COMMONLY AVAILIABLE ORAL ANTI-CANCER DRUGS.....	52
2.1 ZAMBIA.....	52
2.2 ALGERIA.....	56
APPENDIX 3: SUMMARY.....	59

LIST OF FIGURES

Figure 1. Distribution of pharmacists by gender	28
Figure 2. Distribution of pharmacists by Age	28
Figure 3. Pharmacist respondents by country.....	28
Figure 4. Work Area Designation	29
Figure 5. Duration of Practice as a Pharmacist	29
Figure 6. Type of work contract.....	29
Figure 7. Do you have easy access to current information on oral anti-cancer agents?.....	30
Figure 8. Are you familiar with the current doses of oral anti-cancer agents?.....	30
Figure 9. Cost Per Dose.....	31
Figure 10. Oral Anti-Cancer Drugs Delivered Per Month	31
Figure 11. Common Oral Anti-Cancer Drugs Mostly Provided.	32
Figure 12. Under what circumstances do you dispense oral anti-cancer agents?.....	32
Figure 13. Do you know the pathology of patients to whom you deliver oral anti-cancer agents?	33
Figure 14. What would you say are the most common challenges of accessing oral anti-cancer agents by patients?.....	34
Figure 15. Do you take time explaining to patients on anti-cancer agents?.....	34
Figure 16. How much time do you take to explain to your patients or caregivers about the oral anti-cancer drugs you dispense to them?	35
Figure 17. Do you take time to explain to your patients or their caregivers about the disposal of expired or unused products of oral anti-cancer agents?	35
Figure 18. Are you able to manage side effects of oral anti-cancer drugs?.....	36
Figure 19. Do you follow up patients to whom you deliver oral anti-cancer agents?.....	36
Figure 20. How many patients do follow up in a period of one month?.....	37
Figure 21. What are the follow up methods you use?	37
Figure 22. What are the main concerns you discover after following up patients?.....	38
Figure 23. What challenges do you face in following up patients on oral anti-cancer drugs?.....	38

ABSTRACT

Introduction

According to the World Health Organization (2022), cancer is a leading cause of death worldwide, accounting for almost 10 million deaths. Cancer represents a large group of diseases in which cells proliferate at an abnormally rapid rate and may even extend beyond their usual sites through metastasis, invading other parts and organs of the body (WHO, 2022). The Worldwide Cancer data revealed that breast and lung cancer are not unusual cancers worldwide, contributing 12.5% and 12.2% of the whole quantity of recent instances diagnosed in 2020, even as colorectal cancer was the third most not unusual cancer, with 1.9 million new cases in 2020, contributing 10.7% of recent cases (Sanjotha, 2022).

While the global burden of cancer is significant, cancer is brought on by both environmental (such as tobacco, infectious diseases, UV rays) and genetic (such as mutational) factors (Klein, 2018). Lifestyle changes and detection practices have contributed to higher frequencies of lung, breast, and prostate cancer than in the past, with prostate cancer in males and breast cancer in females becoming the most commonly diagnosed cancer in many Sub-Saharan African countries (Jemal et al., 2012). About 50% of cancers can be preventable through risk factor mitigation and the establishment of effective prevention strategies (WHO, 2022).

Treatment options for cancer are vast and varied; among the treatment options is oral chemotherapy. In this context, oral chemotherapies constitute a real advance in the field of oncology. This route of administration improves the patient's quality of life and allows them to live normally. Pharmacists can make valuable contributions to patients' health with this advancement in oncology. Concerning cancer, pharmacists can serve as health advocates, making meaningful impacts to support patients in treating and lowering their risk of developing cancer. Community pharmacists are front liners in the healthcare sector (Scarpitta, 2019). They provide health services by dispensing drugs, educating patients on their side effects, and disposing of drugs.

The community pharmacy sector also recognizes this burden and has begun to deliver oral anti-cancer drugs through community pharmacists (Paoletta, 2019). The pharmacotherapy of cancer is rapidly changing; systemic therapy now involves using intravenous (IV) drugs, many administered orally and dispensed by community pharmacists.

With the increasing burden of cancer globally and more in LMICs, including Algeria and Zambia, this research focuses on pharmacists' knowledge, attitude, and practice in dispensing oral anti-cancer agents in Algeria and Zambia in private pharmacies.

Materials and Methods

This cross-sectional study involved disseminating a self-administered hardcopy questionnaire and one hosted on Google Forms from January to May 2023. The survey contained multiple-choice and free-text questions. The structured questionnaire had four sections. We recruited at least 50 pharmacists in Algeria and 30 pharmacists from Zambia.

Results

A sample population of 80 participants was involved, of which there were as many males as there were females 50%. The study also included dominant age groups and work experiences ranging from less than one to more than ten years in Algeria and Zambia. Antimetabolites were Zambia and Algeria's most commonly prescribed anti-cancer agents. Additionally, about 93.3% and 46% of pharmacists working in Zambia and Algeria respectively have easy access to the latest information on anti-cancer agents. However, only 54% in Algeria and 60% in Zambia were not familiar with current doses.

Conclusion

Cancer remains a global public health concern. Empowering pharmacists in the proper dispensation and practice of oral anti-cancer drugs is cardinal for proper management of cancer.

CHAPTER 1: INTRODUCTION

1.1. Background Information

According to the World Health Organization (2018), cancer is a broad group of diseases that starts in almost any organ or tissue of the body when abnormal cells grow autonomously and metastasize. The National Cancer Institute (2012) also defines cancer as a disease characterized by uncontrolled cell growth and division. Metastasis is when cancer cells go beyond their usual boundaries to invade adjoining body parts and spread to other organs. Cancer can also be called a neoplasm or malignant tumor (National Cancer Institute, 2012).

1.2. Pathophysiology

Cancer may be caused by both environmental (such as tobacco, infectious diseases, UV rays) and genetic (such as mutational) factors (Klein, 2018). Gene modifications that regulate the regular division and development of cells are the root cause. The body typically eliminates cells with damaged DNA before they develop into cancer. However, because of these variables, the body's capacity to do so declines. Cancer can develop practically anywhere in the millions of cells that make up the human body. Human cells often divide (via a process known as cell growth and multiplication) to create new cells as the body requires them. New cells replace old ones when they die due to aging or damage (National Cancer Institute, 2021). However, this systematic process fails, causing damaged or aberrant cells to proliferate when they should not. Tumors, which are tissue masses, can develop from these cells. Tumors may or may not be malignant (benign). Cancerous tumors can move to distant parts of the body to produce new tumors, invade neighboring tissues, or both (a process called metastasis). Malignant tumors are another name for cancerous tumors. In contrast, many malignancies develop solid tumors, and blood cancers like leukemia's typically do not (National Cancer Institute, 2021).

1.3 Problem Statement and Justification

Algeria and Zambia are among the nations with a high burden of cancer, more especially among people with poor access to proper health care. Cancer is the primary cause of morbidity and mortality in many parts of the world. Studies done in the UK reviewed that Pharmacists' were essential for improving patient care and preventing significant toxicity and should be defined as a standard of care in guidelines regulating the dispensing of chemotherapy doses of cancer drugs (Lea et al., 2010). Additionally, a study of 33 pharmacies in Northern England found that 642 patients presented at community pharmacies with 'red flag' cancer symptoms (Jay, 2015). Community pharmacists are front liners as they provide essential health services and are usually the first point of contact with the public or community.

Oral anti-cancer agents have increased significantly since their introduction in the 1940s (Weingart, 2008). In 1995, only six oral anticancer chemotherapies were available. However, by 2007 more than 12 anti-cancer agents were in use, and between 2015 and 2017, more than 23 anti-cancer agents were approved by the US Food and Drug Administration (FDA) (Klaus, 2018).

A survey of 352 community pharmacists in Canada found that 13.6% of respondents felt they had received adequate oncology education at the undergraduate level, 19.0% had attended a continuing education event relating to oncology in the past two years, 24.0% were familiar with the standard doses of anti-cancer agents, and only 9.0% felt comfortable educating patients (Abbott, 2014). Similarly, in Ireland, two-thirds of community pharmacists surveyed felt they did not have sufficient information to dispense prescriptions for oral anticancer agents safely, and three-quarters felt the current Irish system placed patients at risk (Hammond, 2012).

An earlier study showed that more than half of patients flushed unused or expired medication into the toilet, and only 22.9% reported returning medication to a pharmacy for disposal (Seehusen, 2016). Another report found that 38% of the patient respondents disposed of medications in the toilet, sink, or trash (Leal, 2010). Based on the improper practices of pharmacists and patients reported when handling oral anticancer chemotherapy drugs and disposing of other medications, there is evident a knowledge gap in handling oral anticancer agents.

This study aims to understand pharmacists' current knowledge, awareness, practices, and attitudes in handling oral anticancer agents. By identifying potential gaps in knowledge among pharmacists and practice barriers of pharmacists to provide patient education on this topic, we aim to optimize educational efforts and develop a regional best practice model for the safe handling and disposal of oral anticancer drugs.

Considering the current research gaps on the topic, this research will investigate the types of oral chemotherapy delivered in private pharmacies and the role of pharmacists in oncology patient care. The study will further look at the challenges patients and pharmacists face in accessing and delivering anti-cancer agents respectively.

1.4 Objectives

1.4.1 General objective.

To determine the anti-cancer agents delivered to private pharmacies in Algeria and Zambia.

1.4.2 Specific Objectives

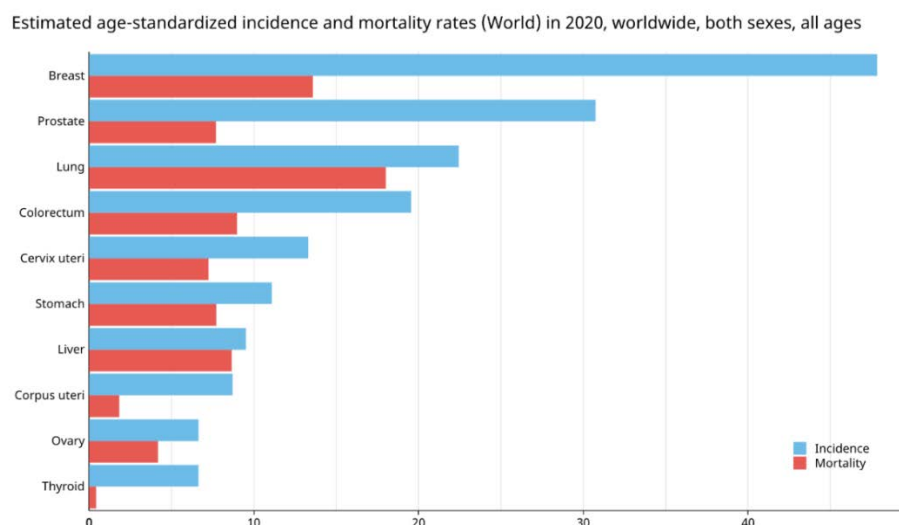
1. Assess the pharmacist's knowledge of oral anti-cancer agents
2. Determine the safe dispensing practices of oral anti-cancer agents
3. Assess the type of oral anti-cancer agents offered in pharmacies
4. Determine the average cost of oral anti-cancer agents delivered in pharmacies

1.5 LITERATURE REVIEW

1.5.1 Epidemiology of Cancer

By 2005, approximately 60% of worldwide deaths were due to chronic diseases, including cancer. The majority (80%) of these were from Low- and Middle-Income Countries (LMICs) (Strother et al., 2013), and these have affected younger populations the most, leading to a higher loss of life-years compared to High-Income Countries (HICs) (WHO, 2011 and Abegunde, 2011). Despite having a lower incidence rate of cancers for all sites, including colorectal, breast, prostate, and lung cancer, LMICs continue to have higher mortality rates (Torre, 2016). High mortality rates in LMICs are due to decreases in diagnostic techniques and advanced access to therapy than in HICs (Torre, 2016).

Cancer is a well-known public health concern in Africa, with about 715,000 new cases and 542,000 deaths in 2008 alone (Jemal et al., 2012). More than two-thirds of cancer deaths occur in low- and middle-income countries (Kyu, 2019). An assessment of oral cancer in Sub-Saharan Africa by Hille (2016) revealed that more than 847,000 new cancer cases and 591,000 cancer deaths representing 6% and 7.2% of the world total, respectively, were estimated in the 54 African countries and up to three-quarters of these numbers were from Sub-Saharan Africa. These numbers are expected to double by 2030 because of the aging and growth of the population (Jemal et al., 2012; Ngwa, 2022). Lifestyle changes and detection practices have contributed to higher frequencies of lung, breast, and prostate cancer than in the past, with prostate cancer in males and breast cancer in females becoming the most commonly diagnosed cancer in many Sub-Saharan African countries (Jemal et al., 2012). Although there has been a rising incidence and mortality rate in Africa, little priority in research and healthcare services has been targeted at cancer (Hamdi et al., 2021).



<https://gco.iarc.fr/>

There were an estimated 18.1 million cancer cases around the world in 2020. Of these, 9.3 million cases were in men and 8.8 million in women (World et al., 2022). The Worldwide Cancer data revealed that breast and lung cancers were the most common cancers worldwide, contributing 12.5% and 12.2% of the total number of new cases diagnosed in 2020, while colorectal cancer was the third most common cancer, with 1.9 million new cases in 2020, contributing 10.7% of new cases.

GLOBOCAN 2020 estimates that 58 418 cancer cases occur in Algeria (Ferlay,2020). In Algeria, new cancer and mortality costs might increase significantly between 2015 and 2035 to about 75,000 and 46 000 in keeping with the year. Breast cancer is the typical sort of cancer that supersedes cancers of the alternative organs in Algeria. Most cancers account for 10% of all deaths in Algeria, even though this is lower than that for cardiovascular illnesses (Fitzmaurice,2015).

In Zambia, as in most developing countries, the burden of non-communicable diseases is increasing rapidly (Ayernor, 2012). GLOBOCAN estimates that 13,8310 cancer cases occur in Zambia annually (Ferlay,2020). A study conducted in Zambia from 2007 to 2014 revealed a total of 21,512 cancers, of which 7,560 (35.14%) were males, and 13,952 (64.86%) were females; cervical cancer is the most prevalent cancer in Zambia, followed by prostate cancer, breast cancer, and Kaposi's sarcoma in that order (Kalubula,2021).

1.5.2 Treatment of Cancer

With the increasing cancer incidence and mortality, urgent action is needed in Sub-Saharan Africa to curb cancer (Ngwa, 2022). In their review, Ngwa et al. (2022) recommended approaches and critical actions to reduce the region's cancer crisis. Plans must include a predictable and reliable supply of medication, among other strategies. Hamdi et al. (2021) also stressed the need to have such recommendations tailored for the different regions of Africa depending on their specific needs and disease profiles.

The treatment of cancer largely depends on the type of cancer and the clinical stage of the cancer. Clinical staging of the cancer is the measure of the spread of the cancer to other parts of the body (CDC, 2022). CDC has listed surgery, chemotherapy, radiation therapy, hormonal therapy, immunotherapy, and stem cell (bone marrow) transplant as the common types of cancer treatment.

1.5.3 Chemotherapy

One of the primary treatments used to treat cancer is chemotherapy as a stand-alone therapy, in tandem with radiotherapy, and after surgery. Outpatient clinics primarily administer chemotherapy, which is beneficial for disease management. The bloodstream transports chemotherapy medications used orally or intravenously throughout the body. Chemotherapeutic drugs' Increase the risk of side effects and potential toxicity to normal cells as it acts on both cancer and non-cancer cells that divide quickly (Lehne, 2016).

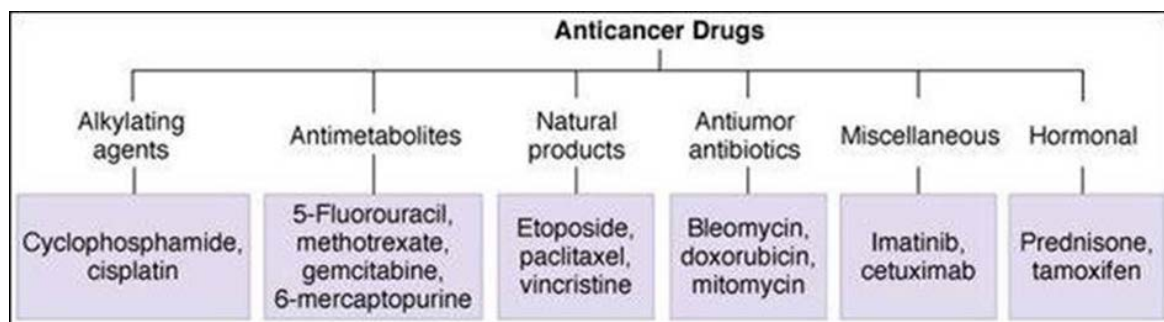
Evidence-based medicine (EBM) has recently become more widely used in clinical settings. It helps practitioners and patients decide on the best course of treatment in particular clinical situations, such as chemotherapy for cancer (Ariyoshi Y, 2000). Progress in the study of tumor cell biology, the creation of new anticancer medications, fundamental research into drug resistance, biochemical regulation, and other areas have all contributed to advancements in cancer chemotherapy. Soon, several innovative molecularly focused medications will be effective anticancer medications (Tukagoshi, 2003).

Anticancer drugs have been developed extensively since the middle of the 20th century. Moreover, by 2008, significant advances in the management of cancers had been made (Burney and Al - Moundhri, 2008). According to previous pre-clinical and clinical research, combining two or more medications was occasionally more beneficial than just one, which led to an increase in the cure rates for several types of human malignancies. The concept of biochemical modulation has recently been employed to develop new therapy plans for managing digestive organ cancer (Tsukagoshi, 1999).

1.5.3.1 Classification of Oral Anti-Cancer Drugs

Chemotherapeutic agents are typically categorized into classes based on how they function. They could be divided into groups based on when they occur during cell division. Chemotherapeutic drugs prevent cancer cells from proliferating by interfering with DNA synthesis and mitosis, which either causes the cells to stop growing (cytostatic drugs) or kill them (cytotoxic agents). According to their mechanisms of action, all contemporary chemotherapeutic medications can be divided into numerous groups:

- DNA-modifying substances (such as alkylating agents and alkylating-like agents),
- Anti-metabolites (which mimic the function of purines or pyrimidines as DNA building blocks)
- Spindle poisons (usually plant alkaloids and terpenoids that prevent cell division by impairing microtubule function)
- Topoisomerase inhibitors (which prevent DNA transcription and replication)
- Cytotoxic antibiotics (such as anthracycline, which inhibit DNA and RNA synthesis)



<https://images.app.goo.gl/xEQ16EvMW88qRpch9>

1.5.3.1.1. Cytotoxic agents

The many agents in this class can be differentiated by their modes of operation. Some will interfere with the replication of DNA and/or protein synthesis directly, while others will affect nucleic acids indirectly by interfering with their metabolism, and yet others will interfere with the spindle generated during cell division.

1.5.3.1.2 Antimetabolites

These substances will obstruct the production of nucleic acid. These substances change the action of enzymes necessary for cell metabolism and protein production by substituting artificial metabolites in crucial components. The DNA, RNA, and protein synthesis that takes place during the S (synthesis) phase of cell division is when this interference is most noticeable. Inhibitors and competitive chemicals necessary for the production of nucleic bases can also be antimetabolites.

1.5.3.1.3 Alkylating Agents

They disrupt DNA replication by forming aberrant base pairings and cross-links. Additionally, DNA strands may split, and the production of enzymes and nucleic acids may be suppressed. Alkylation stops transcription and replication, which causes cell death. The majority of alkylating substances have an impact on both resting and dividing cells and are not cycle-specific.

1.5.3.1.4 Chemotherapy Side Effects

By 1999, supportive medicines against adverse drug reactions (side effects) became available, and using these therapies was anticipated to improve cancer patients' quality of life (QOL). Studies of novel drug classes, such as those directed at novel molecular targets, have advanced as we enter the twenty-first century (Tsukagoshi, 1999).

Both cytotoxic and cytostatic activities are present in the several anticancer medications used in cancer chemotherapy. However, they can harm the cancer cells and the patient's healthy tissue and cells because they do not have selective toxicity. These drugs' ability to harm normal cells is mainly dose-related. However, the method and timing of administration also matter. Each substance affects the organs, tissues, and cells uniquely. Side effects are the harm that these agents do to healthy cells. Treatment is challenging due to the multiple problems that cause the patient's misery and a noticeably decreased quality of life. There have been several side effects documented, examples include Cardiovascular toxicity, Hematological toxicity, Digestive Toxicity.

Some have obvious causes, and their prevention and treatment are doable under some circumstances. From the perspective of the numerous side effects of anticancer medicines and the patient's complications, the incidence, causes, evaluation, severity, therapy, and prevention are discussed.

The long-term prognosis for cancer patients has improved due to recent advancements in chemotherapy. In such cases, controlling cardiovascular complications, which relate to the illness and the unfavorable effects of cancer treatments, is becoming more and more clinically significant. Chemotherapy-induced cardiotoxicity, also known as chemotherapy-related cardiac dysfunction, is one of cancer treatments' most alarming cardiovascular side effects (CTRCD). According to the severity of structural abnormalities and the degree of reversibility, they are two types of CTRCD: Type 1 is irreversible and dose-dependent with structural abnormalities, whereas type 2 is reversible after treatment and dose-independent without structural abnormalities. Trastuzumab and anthracyclines are two medications that

can cause type 2 and type 1 CTRCD, respectively, even though both medications are likely to cause cardiotoxicity due to their combined effects. The knowledge that anti-VEGF medications and tyrosine kinase inhibitors (TKIs) can also cause CTRCD is developing, especially in individuals with cardiovascular comorbidities and risk factors. Establishing diagnostic techniques with risk prediction and evidence-based therapy strategies against CTRCD in cancer patients and survivors will address unmet requirements to explain epidemiologic and pathophysiologic features of CTRCD and address diagnostic gaps (Akazawa, 2017).

The neoplastic disease burden is rising in underdeveloped countries as the AIDS pandemic spreads (Orem, 2004). It is challenging to administer intravenous chemotherapy and supportive care in situations with limited resources (Otieno, 2002). The development of straightforward, less myelotoxic treatment strategies for cancer is required in resource-constrained environments (Orem, 2005). In the pre-highly active antiretroviral therapy scenario, dose-modified oral chemotherapy is effective, has outcomes equivalent to those in the United States, has an acceptable safety profile, and is practical in sub-Saharan Africa (Walter, 2009).

1.5.4. Role of community pharmacist

Community pharmacists are part of the front liners within the healthcare sector (Scarpitta, 2019). They provide essential services and are commonly the first point of contact with the general public or community. Patients regularly visit pharmacies for fitness facts and have long sought advice from pharmacists concerning signs and signs of diseases, and cancer is not an exception. They are a critical member of the healthcare team and make significant contributions to the transport of public fitness care (Mensah, 2019). Their roles include educating, following up on patients, and preventing diseases. Because pharmacists' roles have advanced into a more affected person-focused approach in recent years, pharmacists comprise cancer control tasks into their exercise (Scarpitta, 2019). The community pharmacy sector also recognizes this burden and has begun to deliver oral anti-cancer agents through community pharmacists (Paoletta, 2019). The pharmacotherapy of cancer is rapidly changing; systemic therapy now involves using intravenous (IV) drugs, many administered orally and dispensed by community pharmacists. The role of community pharmacists in oral anti-cancer agents is becoming increasingly important due to the application of a multidisciplinary approach in oncology and the adoption of safeguards for outpatient chemotherapy (Yokoyama et al., 2018; Weingart et al., 2007).

1.5.5. Knowledge and attitude towards oral anti-cancer agents

Approximately 10% of chemotherapy agents are administered orally, with anticipated annual growth of this practice. Community pharmacy practitioners are estimated to potentially serve a more prominent role in the management of patients with cancer (Margaret, 2012). The growing use of oral anti-cancer necessitates that pharmacists remain updated on safe practices and effective counseling. A survey of community pharmacists indicated that pharmacists are interested in learning more about oral anti-cancer drugs (O'Bryant, 2008). However, the survey identified some critical areas of concern. Pharmacists admitted discomfort with dispensing cancer therapy, especially when they infrequently dispensed these agents. The survey identified knowledge deficits in safe handling, counseling, and dosing. These deficits highlight the need for education. Pharmacists in community practice need to become more familiar with safe dispensing practices of cytotoxic agents than specialty-based oncology practitioners. Therefore, additional education is required to improve the knowledge of community-based practitioners to dispense and properly counsel patients receiving oral anti-cancer safely.

In a study conducted by Sarah (2022), it revealed that only a minority of pharmacists expressed an excellent understanding of the chemotherapy cycles (19.6%) and familiarity with targeted anti-cancer therapy (14.3%), side effects (22.2%), and dosing of oral chemotherapy drugs (14.4%). These inadequacies underline community pharmacists' low familiarity and comfort with dispensing and educating patients on oral chemotherapy's effective and safe use. Furthermore, almost half of the pharmacists (49.8%) agreed or strongly agreed to be comfortable answering questions regarding cancer treatments. More than half of respondents (52.2%) feel comfortable educating patients on oral chemotherapy. Half of the respondents (49.6%) disagreed that their current pharmacy had the tools to handle oral chemotherapy (Ghandi,2008). According to Nehad et al. (2023), many community pharmacists must gain foundational knowledge regarding oral anti-cancer agents.

In a study conducted by Laura (2014) in Haute-Normandie, it was revealed that only about half of the 51 pharmacists spent more than four minutes advising patients on their anti-cancer agents and educating patients about the safe handling of anti-cancer drugs; this is probably because most pharmacists do not feel comfortable. The study also revealed that only 6% of pharmacists declared to have received sufficient education on oral chemotherapies during their university training or professional practice. Furthermore, about 28% of the 51 pharmacists know about the chemotherapy protocols and targeted therapies, and about 76% rarely know the doses and side effects. However, most pharmacists were willing to handle

Oral anti-cancer agents and were optimistic about receiving further education on dispensing Oral anti-cancer agents. Hence, efforts are needed to improve pharmacy education on oral anti-cancer drugs and cancer care and continuous training for pharmacists in their community settings.

1.5.6 Cancer and Oral Chemotherapies

1.5.6.1 Global Perspective

The past two decades have considered an explosion in the number of oral chemotherapy agents available for cancer patients. Unlike conventional intravenous chemotherapy agents, these target specific biological processes in the cancer cells and inhibit the growth of cancer cells (Andrews, 2012). In the next few years, there will be a shift in the administration routes from IV to oral, and this will require different care models so that treatment efficacy and safety are guaranteed (Moreira et al., 2022).

Oral anti-cancer agents holds the future of oncology and makes up 25% to 35% of cancer drugs in development (Stokes et al., 2017; Neuss et al., 2013). The increasing availability of oral chemotherapy in the last two decades has made not only patients and families rethink the hospital-centric model of care through traditional IV chemotherapy but also clinicians (Moreira et al., 2022). By 2015, at least 40 oral chemotherapy agents were available in the US Shields et al. (2015), while the German market had at least 44 oral anticancer drugs by 2019, according to a study by Schlicht et al. (2019).

In the last two decades, oral cancer therapy drugs have become available (O'Neill et al., 2002), and the number of patients undergoing oral therapies is growing (Neuss et al., 2001). Oral therapy has transformed cancer treatment through better disease outcomes, patient survival, and ease of treatment administration (Boner et al., 2001). Patients overwhelmingly choose oral delivery when given a choice between oral and intravenous medicines, citing the ease of at-home administration and decreased pain and stress associated with intravenous treatments (Eek et al., 2016). Although oral medicines offer a higher quality of life (QoL) than intravenous therapies, problems with this treatment include poor adherence, adverse effects, and false perceptions of convenience (Weingart et al., 2008).

It is crucial to understand patients' symptom burden, adherence, and distress in a clinical setting because patients on oral therapy do not receive the same level of oversight and monitoring as those on intravenous treatment (Barton, 2011 and Aisner, 2007), which could have a detrimental effect on adherence (Bedell, 2003).

With the development of oral chemotherapy, there has been an increase in outpatient chemotherapy which is convenient. However, patients may eventually develop adverse drug reactions (ADRs) at home (Yokoyama et al., 2018). The role of community pharmacists in oral chemotherapy is becoming increasingly important due to the application of a multidisciplinary approach in oncology and the adoption of safeguards for outpatient chemotherapy (Yokoyama et al., 2018; Weingart et al., 2007). For example, a retrospective study conducted by Yokoyama et al. revealed that a community pharmacist received up to 84 patients treated with oral chemotherapy, and 21 different oral anticancer drugs were administered, with 296 counseling sessions done for one year. Further, the study revealed that more counseling sessions per patient were conducted for patients on antimetabolites (59.8%) and molecular-targeted agents (29.7%). Ibrahim et al. (2014) state that cancer patients expect better pharmaceutical care. Furthermore, maintaining the quality of life and improving clinical outcomes are essential objectives in outpatient oral chemotherapy (Yokoyama et al., 2018).

Despite the convenience of oral anticancer drugs, safety concerns, including adherence issues, surround this paradigm shift from IV to oral anticancer drugs Shields et al. (2015). In this case, adherence is the extent to which patients take medications as prescribed by their healthcare providers (Kelly et al., 2006). Reported are Mean non-adherence rates of up to 54%, which can endanger treatment success rates (Marin et al., 2010; Greer et al., 2016). The timing of taking oral chemotherapy also poses an adherence challenge. Patients take up special responsibility for following mealtimes instructions because food can affect drug absorption (Deng et al., 2018). Therefore, the pharmacist is essential in ensuring that patients achieve maximum drug adherence.

1.5.6.2 Regional Perspective

The AIDS crisis and the consequent rise of HIV/AIDS-related cancers burden Africa. Practical ways of therapeutic intervention can be highly beneficial. One such strategy is dose-modified oral chemotherapy for non-Hodgkin lymphoma associated with AIDS. The neoplastic disease burden is rising in underdeveloped countries as the AIDS pandemic spreads (Orem, 2004). It is challenging to administer intravenous chemotherapy and supportive care in situations with limited resources (Otieno, 2002).

Low- and middle-income nations (LMICs) account for over 70% of cancer-related fatalities (WHO, 2018). The International Agency for Research on Cancer states. South Africa: According to Globocan 2020, there were 107,464 cancer cases in 2018, rising to 177,773 by 2040. With 15,491, 13,152, and 7354 instances, respectively, of breast, prostate, and colorectal cancer in South Africa in 2020, these are among the top 10 cancers (Staff Writer, 2020)

1.5.6.3 Local Perspective

Zambia is dealing with an increasing burden of non-communicable diseases like the rest of the world (NCDs). As a percentage of causes of death in the nation, NCDs such as cancer, type II diabetes, cardiovascular disease, and respiratory illness are rising. WHO estimates from 2008 show that NCDs were responsible for 27% of all fatalities in the nation, with cancer accounting for a significant share of them (WHO, 2018). According to the global cancer observatory (2020), Zambia recorded 13 831 new cancer cases. Unfortunately, despite having a solid healthcare system, awareness and capacity for prevention, diagnosis, and care for cancer in Zambia remains limited (Ministry of Health Zambia, 2016). Zambia has limited facilities that offer chemotherapy drugs. The knowledge, attitude, and practice of oral chemotherapy in Zambia remain unknown as there is a lack of current literature.

Similarly, to that, cancer is a burden in Algeria. According to the global cancer observatory, 2020, Algeria recorded 58 418 new cancer cases. The growing burden of cancer requires a shift in the actual pipeline of oncology treatment, as oral chemotherapy will be the main component of cancer treatment in the next few years (Moreira, 2022). Some key elements influence the spread of oncology medications between the European market and the primary site of patient delivery in Algeria (Aissaoui et al., 2015). As oncology drugs account for approximately half of the pharmaceutical budget, strengthening national capacities and methods to assess actual performance and cost-effectiveness should be more critical than ever on the agenda of the national health authorities.

CHAPTER 2: METHODS

2.1. Study type

This was a semi-qualitative study which utilized a semi-structured questionnaire (**Appendix x**) and a participatory approach.

2.2. Study Duration

This study was conducted from November 2022 to May 2023

2.4. Inclusion and Exclusion Criteria

2.4.1. Inclusion Criteria

This study-recruited participant who met the following criteria:

1. Pharmacists who have been working in private pharmacies in Algeria or Zambia.

2.4.2. Exclusion Criteria

This study excluded participants that met the following exclusion criteria:

1. Non- pharmacists
2. Pharmacists working outside Algeria and Zambia

2.5. Sample Size Determination

A purposive, non-probability sampling of participants reflected the diversity and spectrum of the sample population through a participatory approach.

2.6. Data Collection

A semi-structured questionnaire (**Appendix 3**) had 33 questions divided into four sections. The questionnaire was in English and French. An alternative Google Forms (Google, USA) questionnaire was also in the two languages for participants in distant places. Data collected was on participant demographic characteristics, oral chemotherapy dispensation, safety measures, and participant follow-up.

2.7. Data Analysis

The submitted responses were exported from the questionnaires to Microsoft Excel 2013 for coding and cleaning of the data. Afterward, the data were analyzed using SPSS software Version 23 (SPSS et al., USA). Descriptive statistics were calculated and used to describe the study sample.

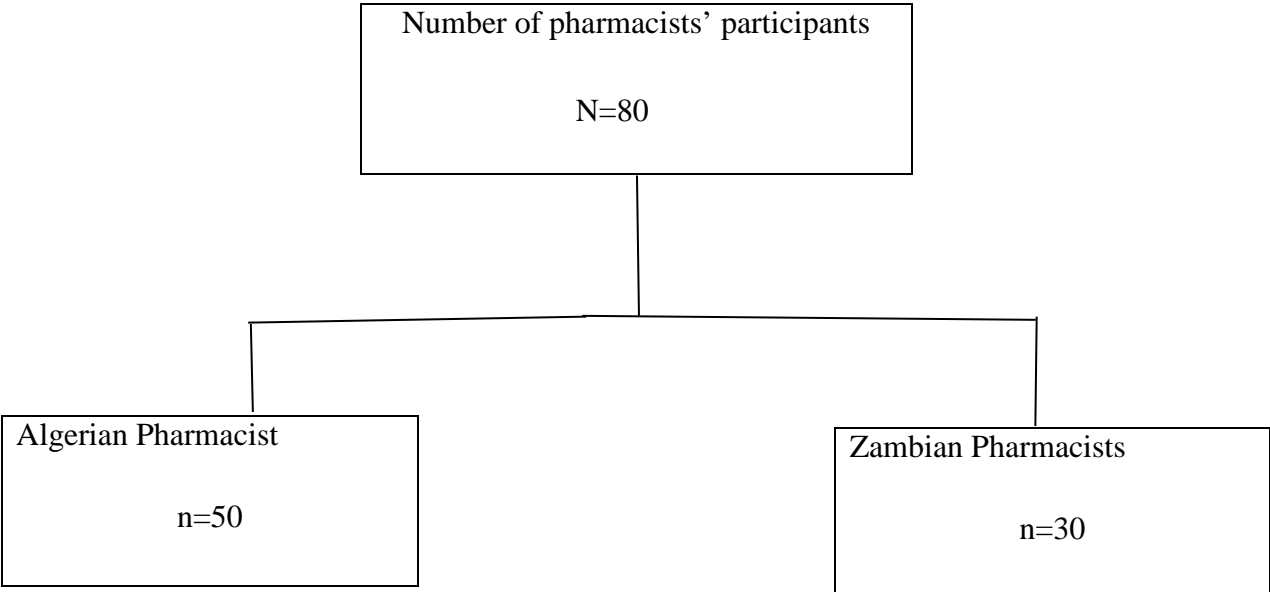
2.8. Ethical Consideration

Participation in the study was voluntary and verbal informed consent was obtained from all participants who participated in the study.

CHAPTER 3: RESULTS

This section provides a detailed description of the results obtained.

General Description Of The Sample



3.1 Socio-demographic Data

Figure 1-6 below highlight the socio-demographic characteristics of the respondents who participated in this study. This study involved 80 participants of which there were as many males as there were females (50%). The majority (46.7%; N=14) of the respondents in Zambia were aged between 25 and 29 years while that of Algeria were above 34 years (40%; N=32). Sixty-two-point five percent of the respondents resided in Algeria. Most of the respondents had been in practice between one to five years both in Algeria (42%, N= 21) and Zambia (46.7%, N=14) while 70% (N=56) were full-time pharmacists. Work area designation with the highest representation was that in the urban area with a representation of 74% respondents.

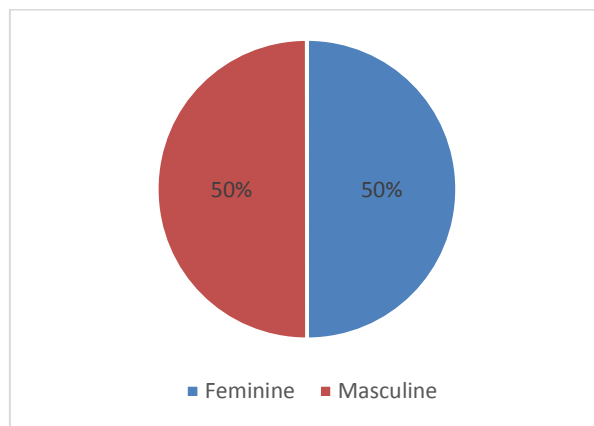


Figure 1. Distribution of pharmacists by gender

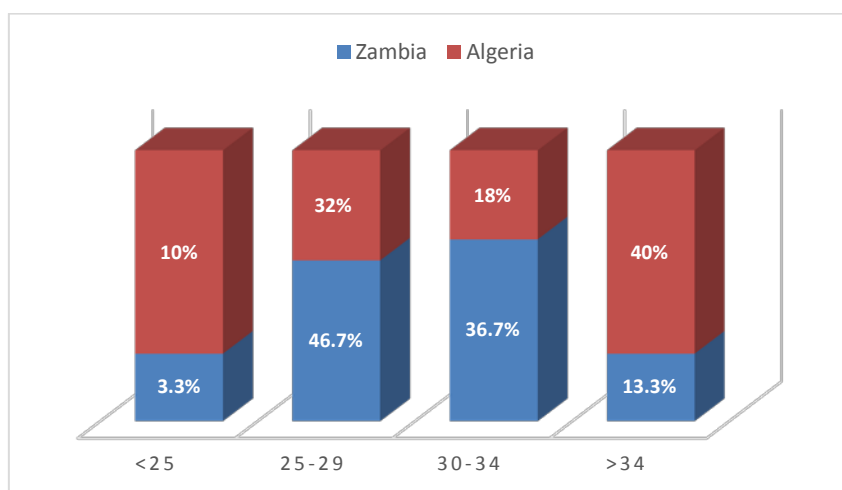


Figure 2. Distribution of pharmacists by Age

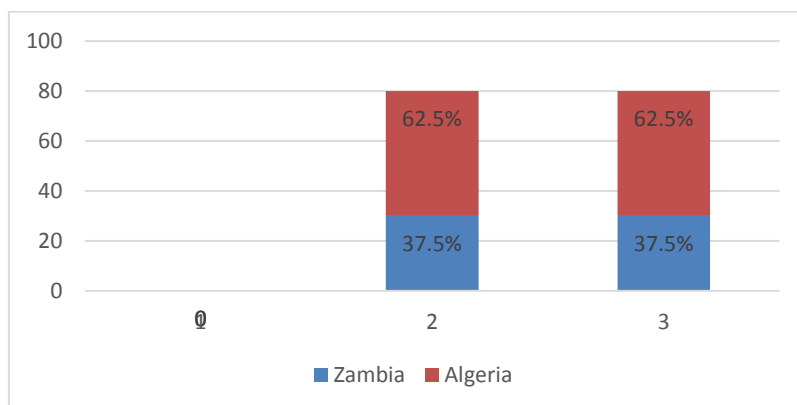


Figure 3. Pharmacist respondents by country

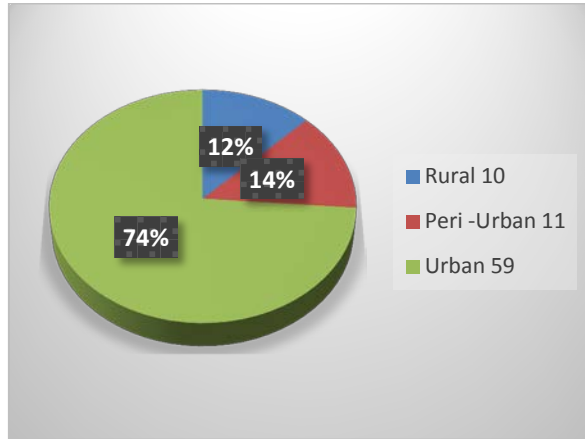


Figure 4. Work Area Designation

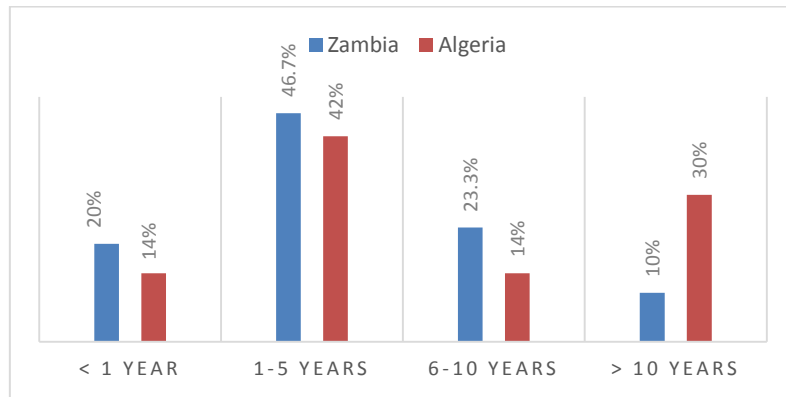


Figure 5. Duration of Practice as a Pharmacist

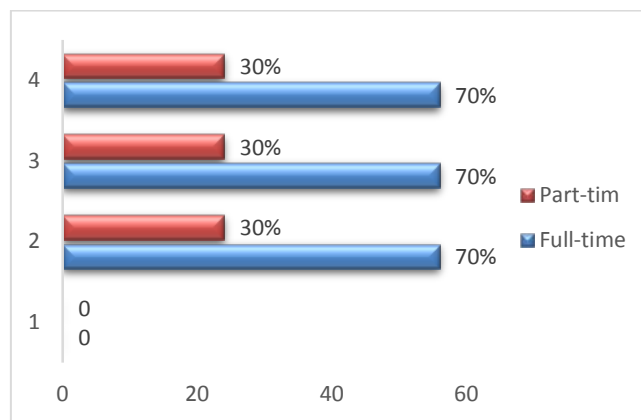


Figure 6. Type of work contract

3.2 Oral Anti-Cancer Dispensation

Figures 7-8 Below illustrates that 93.3%(N= 28) and (46%, N=23) of pharmacists have easy access to current information both in Algeria and Zambia respectively. However, majority of Pharmacists are not familiar with current doses 54%(N=27) and 60%(N=18) in Algeria and Zambia respectively

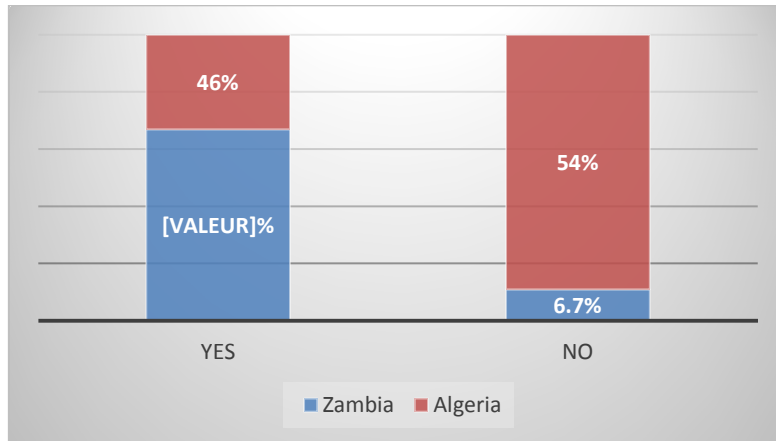


Figure 7. Do you have easy access to current information on oral anti-cancer agents?

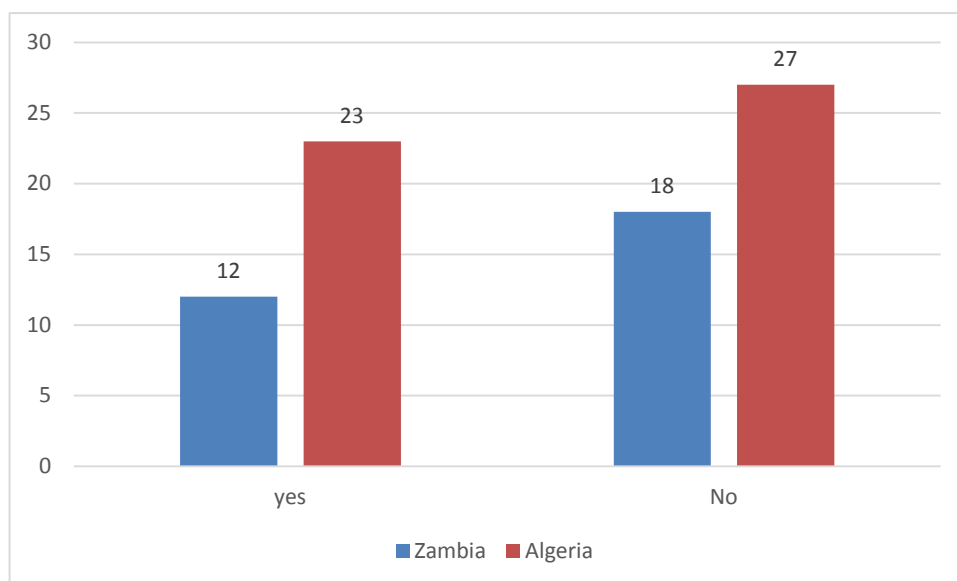


Figure 8. Are you familiar with the current doses of oral anti-cancer agents?

Figure 9-10 illustrated the cost per dose at pharmacies in both Algeria and Zambia was mostly less than \$50 per dose. Only 2.5% (N=2) and 1.25% (N=1) of the respondents from Zambia and Algeria respectively reported costs per dose to be above \$100.Both Algeria and Zambian pharmacists reported that the total number of oral anti-cancer agents they delivered per month was between 1 to 5.

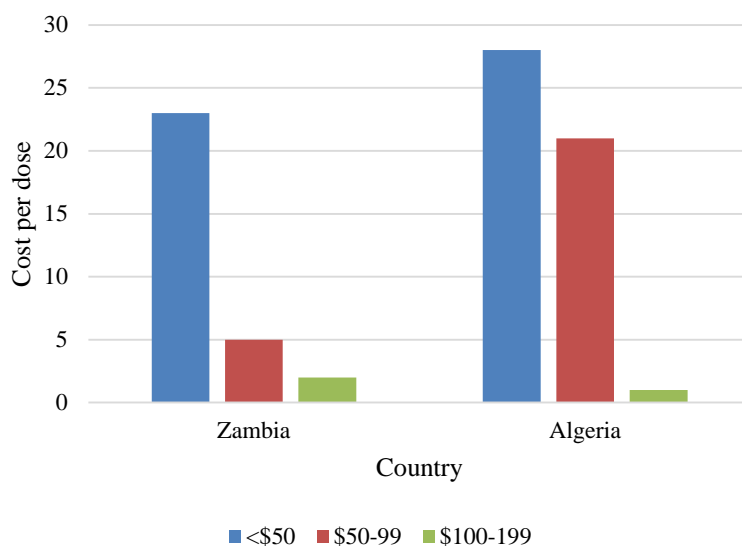


Figure 9. Cost Per Dose

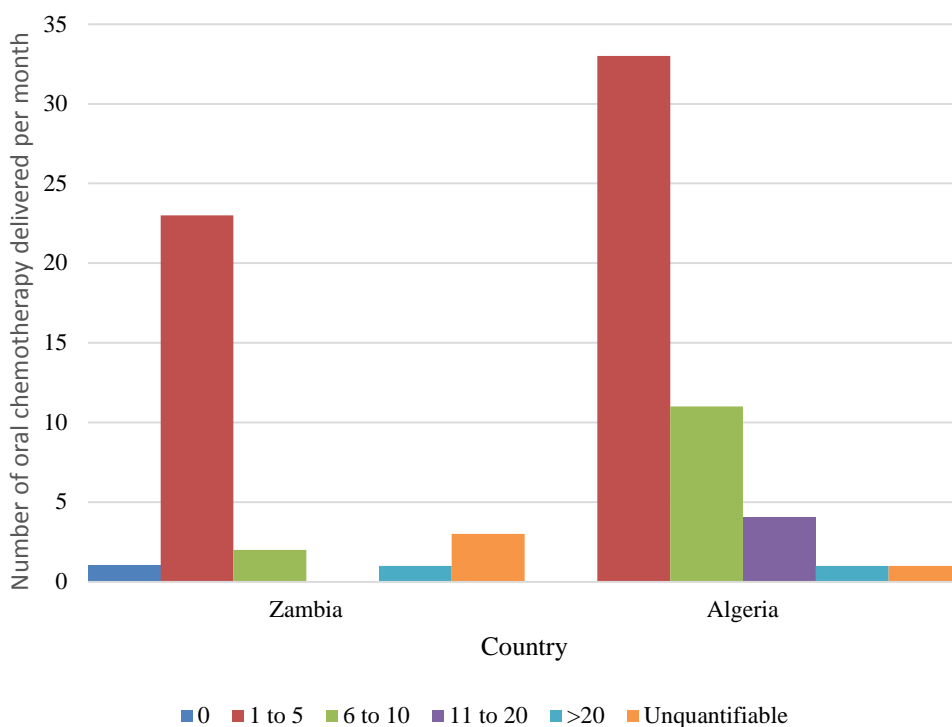


Figure 10. Oral Anti-Cancer Drugs Delivered Per Month

Figures 11 below illustrates some of the most commonly provided oral anti-cancer drugs. The responses obtained revealed that antimetabolite class of drugs ranked the highest (40%; N=32) among the anticancer drugs that were provided at the various pharmacies. In contrast, platinum coordination agents and topoisomerase inhibitors-1 were the least commonly

provided drugs. This could possibly be reflective of barriers to the accessibility of these drugs due to factors such as cost per dose and unavailability of local wholesalers and manufacturers of these drugs. Additionally, other drugs that were miscellaneously reported to be commonly dispatched included, tamoxifen, etoposide and methotrexate.

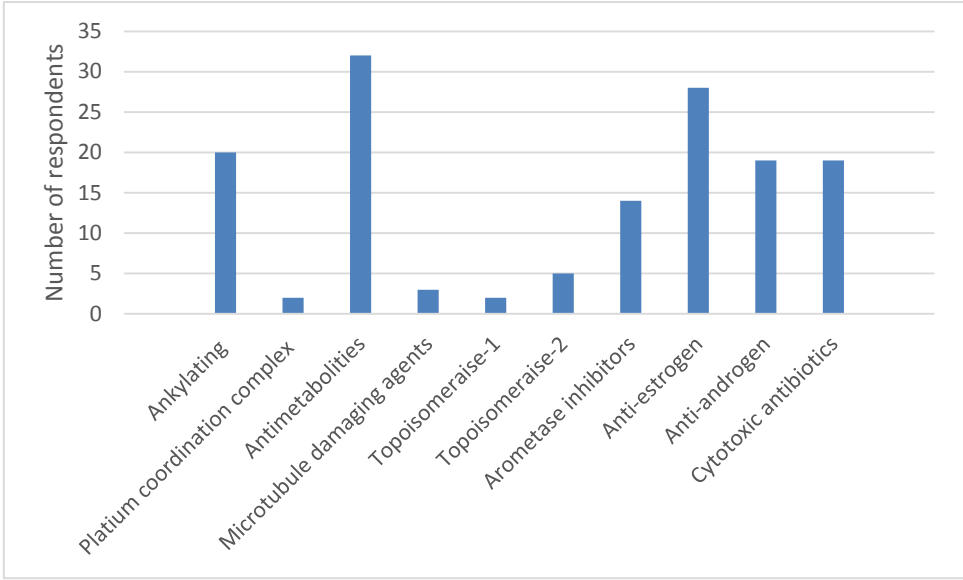


Figure 11. Common Oral Anti-Cancer Drugs Mostly Provided.

Figure 12 and 13 below illustrate that most oral chemotherapy are dispensed to patients during their renewal of treatment and pharmacists in both countries Algeria and Zambia rarely know the pathologies of the patients to whom they administer the drugs with a percentage of 33.75%(N=27) and 60%(N=18) respectively.

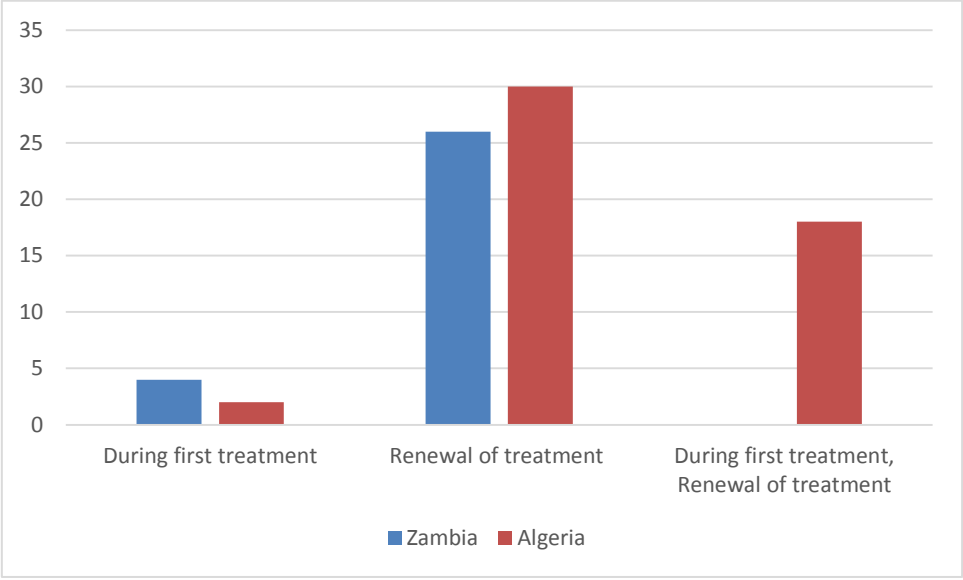


Figure 12. Under what circumstances do you dispense oral anti-cancer agents?

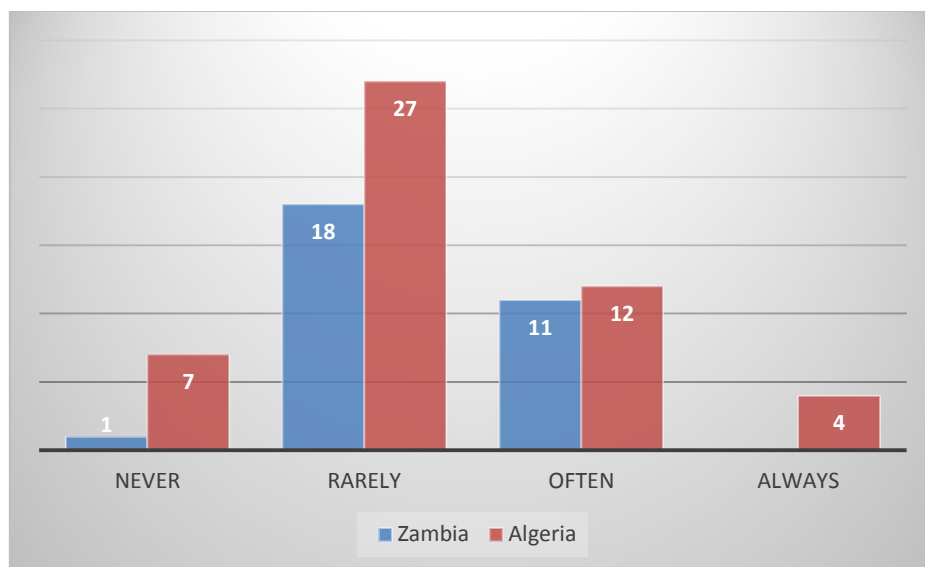


Figure 13. Do you know the pathology of patients to whom you deliver oral anti-cancer agents?

Figure 14 highlight the challenges of accessing anti-cancer agents. Respondents from both countries reported 'oral anti-cancer is expensive' as the most important challenge they face. Other respondents also indicated the fact that these drugs are usually out of stock was yet another unsolved challenge. Moreover, 3.3% (N=1) of the respondents in Zambia also indicated poor knowledge regarding indications for prescribing.

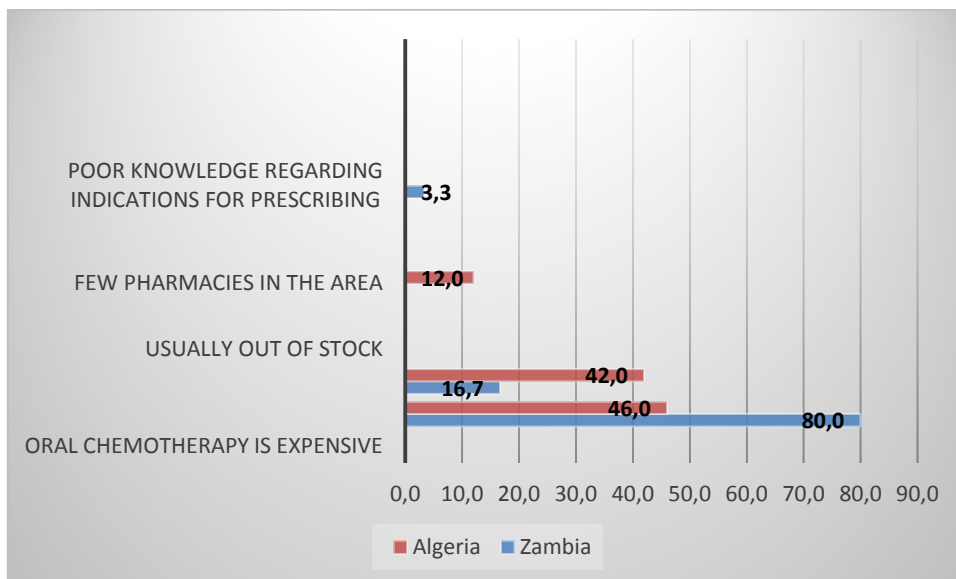


Figure 14. What would you say are the most common challenges of accessing oral anti-cancer agents by patients?

3.3 Safety measures

Figure 15-16 below shows that majority of the respondents N=22 and N=14 from Algeria and Zambia respectively took 1-5 minutes explaining to patients or caregivers about the oral anti-cancer agents. Only one respondent from Algeria indicated to have spent more than 15minutes to explain to the Patients or caregivers. Only 33.3% (N=10) and 40% (N=20) of pharmacists from both Algeria and Zambia rarely took time to explain to patients on oral anti-cancer drugs.

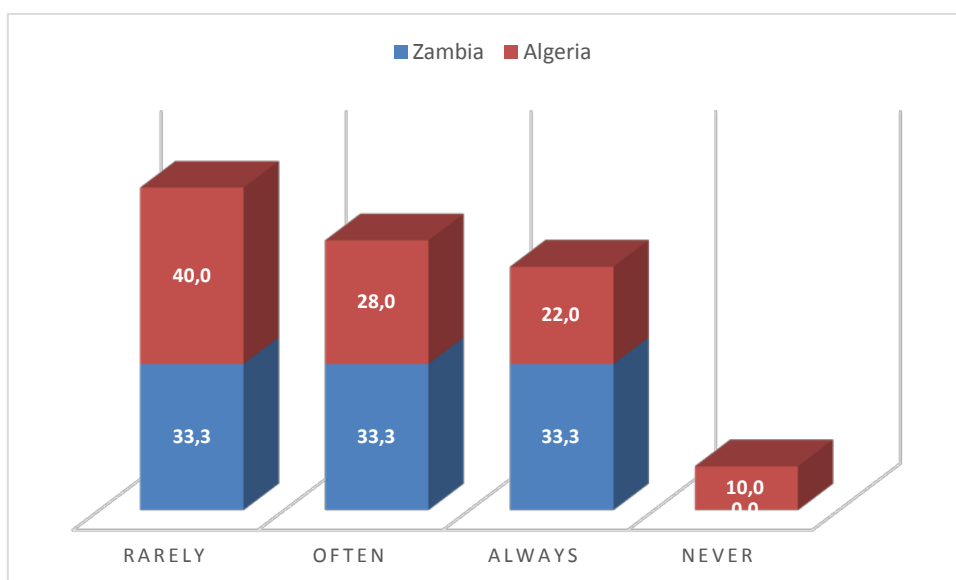


Figure 15. Do you take time explaining to patients on anti-cancer agents?

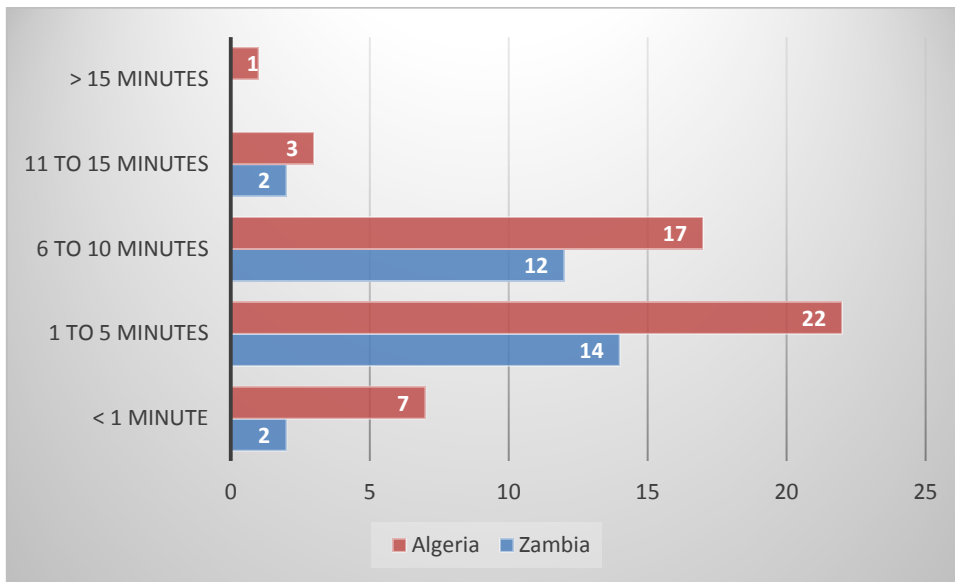


Figure 16. How much time do you take to explain to your patients or caregivers about the oral anti-cancer drugs you dispense to them?

Figure 17-18 below shows that majority of the Zambian respondents 96.7% versus to the Algerian respondents 46% indicated to have given advice to their patients or their caregivers advice on the disposal of expired or unused oral anti-cancer agents. Moreover 12% of the Algerian respondents indicated not to manage to deal with the side effects of oral anti-cancer drugs.

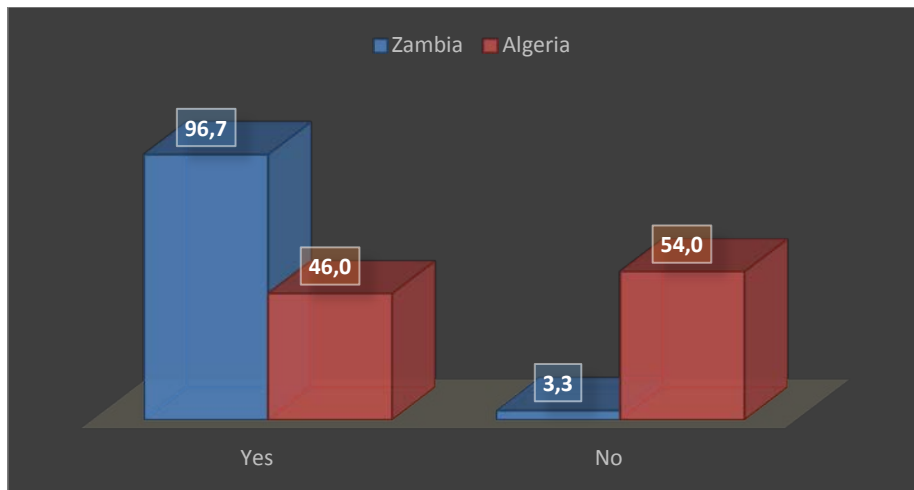


Figure 17. Do you take time to explain to your patients or their caregivers about the disposal of expired or unused products of oral anti-cancer agents?

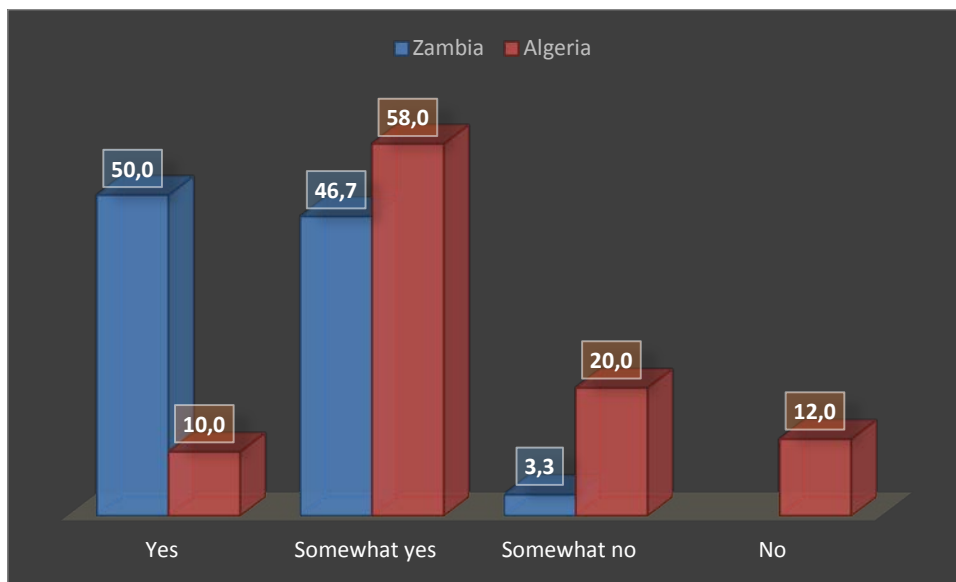


Figure 18. Are you able to manage side effects of oral anti-cancer drugs?

3.4. Follow-up

Figure 19 Highlights that (48%; N=24) and (53%, N=16) of the respondents in Algeria and Zambia seldom follow up patients on chemotherapy.

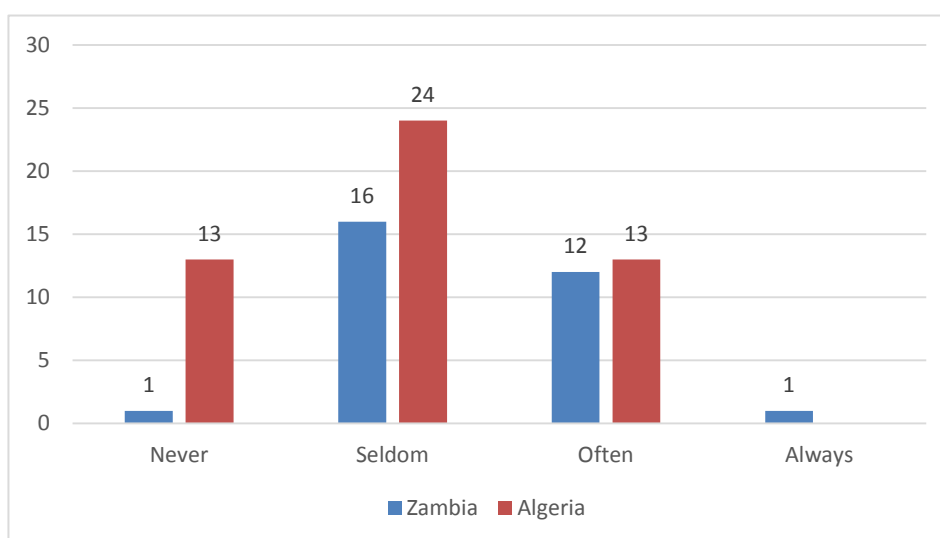


Figure 19. Do you follow up patients to whom you deliver oral anti-cancer agents?

Figure 20-21 shows that (88%; N=44) and (76.6%, N=23) of the participants followed up less than 10 patients per month in Algeria and Zambia respectively. The main follows up method used is by patients' visitation to the facility majority being respondents from Algeria (66%, N=33) but telephone calls were also reportedly frequently used for follow up.

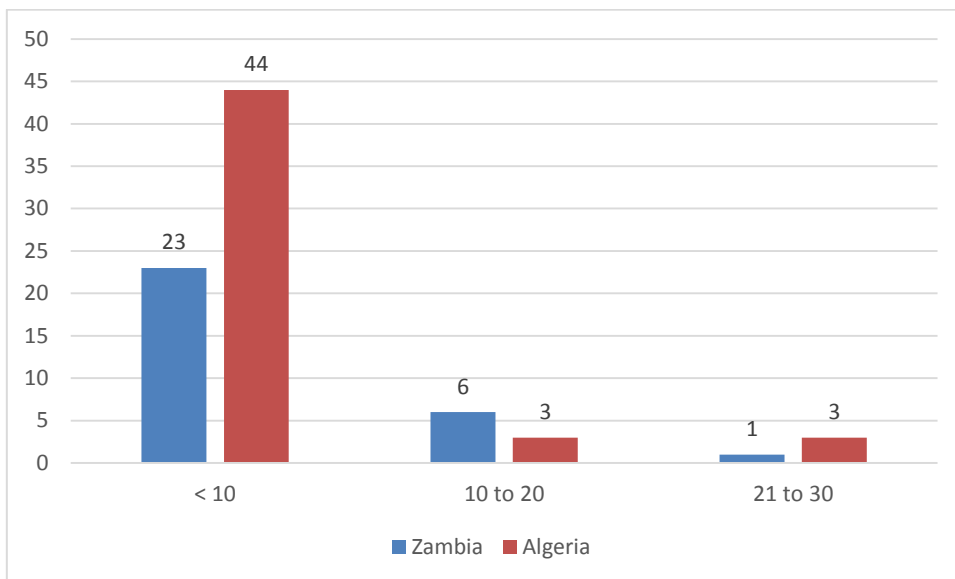


Figure 20. How many patients do follow up in a period of one month?

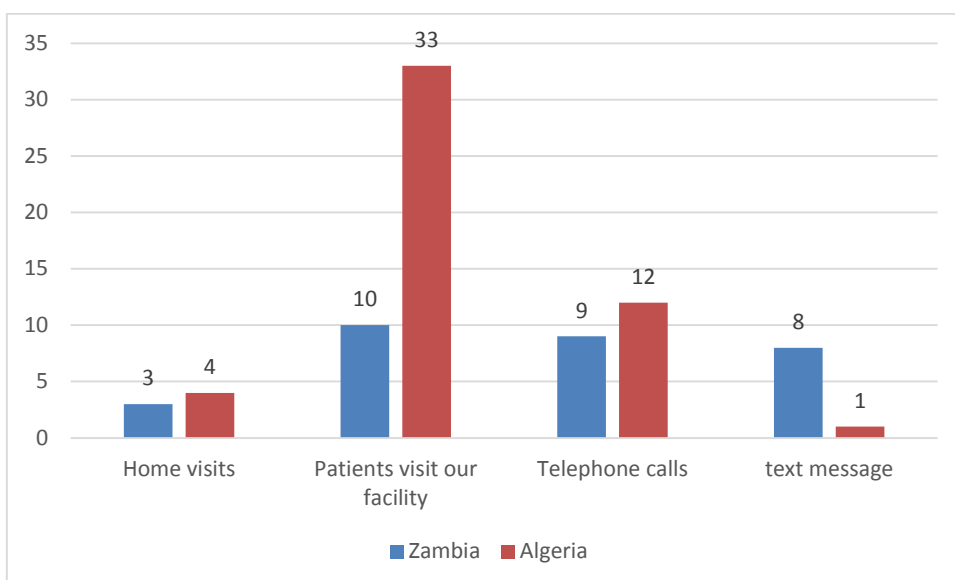


Figure 21. What are the follow up methods you use?

Figure 22 reveals that the main concern discovered after follow up of patient is reported adverse drug reactions (70%, N=35) and (66.7%, N=20) in Algeria and Zambia respectively. However, the minority in both countries reported lost medicines.

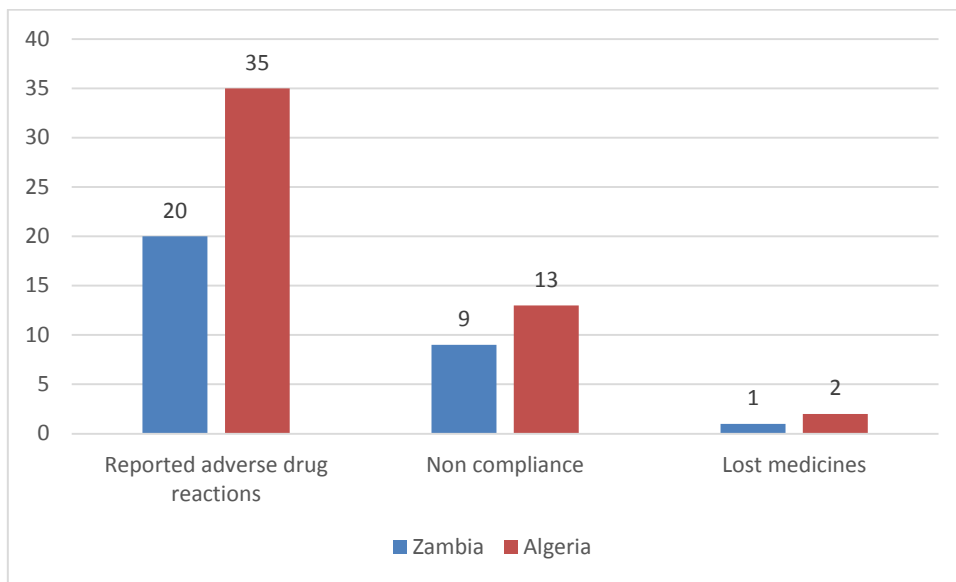


Figure 22. What are the main concerns you discover after following up patients?

Figure 23 illustrates the main challenge that was reported to be experienced in following up patients was the distance of patients from the pharmacist (64%, N=32) and (60%, N=18) in Algeria and Zambia respectively. Secondly, we noted the unwillingness by patients to be followed up after delivery of drugs.

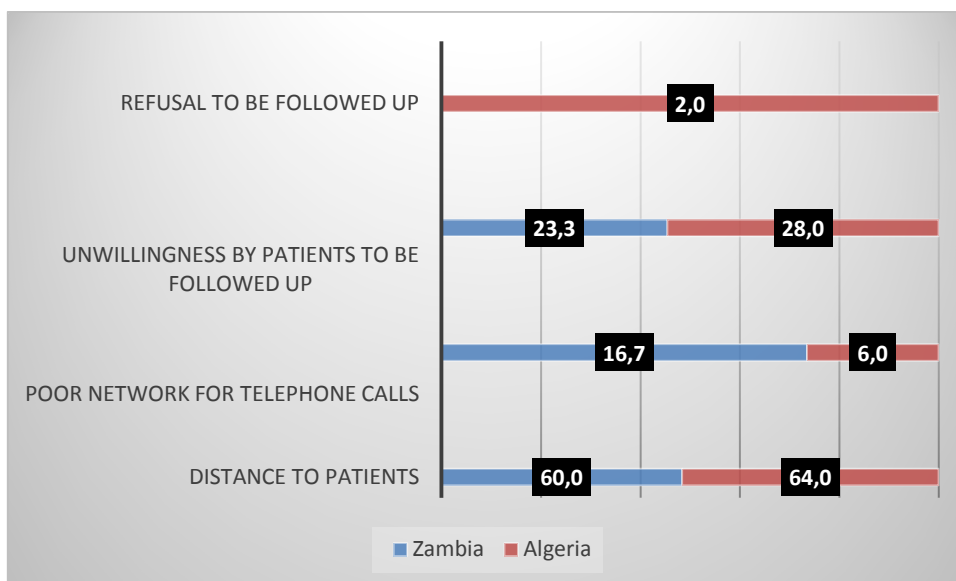


Figure 23. What challenges do you face in following up patients on oral anti-cancer drugs?

CHAPTER 4: DISCUSSION

We conducted a cross-sectional multicentric cap-type study, which included pharmacists working in Algeria and Zambia with the main objective of determining the knowledge, attitude and practice with regard to oral chemotherapy drugs.

The study revealed that; Antimetabolites were Zambia and Algeria's most commonly prescribed oral chemotherapy agents. Additionally, about 93.3% and 46% of pharmacists working in Zambia and Algeria respectively have easy access to the latest information on oral anti-cancer agents. The study showed that respondents from both Algeria and Zambia were not familiar with current doses of oral anti-cancer agents. Despite the easy access to current information, this study also revealed knowledge gaps of pharmacists in handling these drugs.

4.1. Socio-demographic Data

The participants to whom were respondents to the questionnaire involved 80 pharmacists, of whom there were as many males as females, 50%. The study also included dominant age groups and respondents with different work experiences. Sixty-two-point-five percent of the respondents resided in Algeria of which the urban was predominant, thus the more responses from there. These demographic findings are similar to the study done in Haute-Normandie on oral chemotherapy in which the total number of participants was 51 with a repartition of masculine/feminine in the order of 33%/67% (Laura, 2011).

4.2. Oral Dispensation

4.2.1 Cost Per Dose, Prescriptions Per Month

This study revealed that antimetabolites were Zambia and Algeria's most commonly prescribed oral anti-cancer agents. Cost per dose and the number of oral chemotherapy drugs delivered per month were parameters used. A systematic review of 13 studies reviewed that the wide variations in prices and availability of oral anti-cancer agents across brands make it almost impossible to apply the rule of generalization (Ocran Mattila et al., 2021). This variation can be attributed, in part, to differences in healthcare infrastructure, resources, and cancer stage and type (Gustafson & Kettle, 2015). Despite the paucity of literature to detail the most commonly used drugs in the two countries, it is apparent that the cost per dose is a significant predictor of prescribing anti-cancer drugs. A very marginal proportion of the respondents reported prescribing anti-cancer drugs that cost more than \$100. However, significant differences were noted in the cost groups from respondents of the two countries.

4.2.2 Knowledge of Pharmacists about Oral Anti-cancer Agents

Pharmacists' access to updated information on oral anti-cancer agents and their knowledge of anti-cancer doses were parameters used to assess pharmacists' knowledge. Zambian pharmacists, 93.3% reported to have easy access to current information compared to Algeria with 46%. However, 54% and 60% in Algeria and Zambia respectively were not familiar with current doses. Despite the easy access to current information, this is not reflected in their knowledge of oral anti-cancer doses. These responses are consistent with the study conducted by Sarah (2022), which revealed that a minority of pharmacists expressed an excellent understanding of the chemotherapy cycles (19.6%) and familiarity with targeted anticancer therapy (14.3%), side effects (22.2%), and dosing of oral chemotherapy drugs (14.4%). Similarly, a survey of 352 community pharmacists in Canada found that 13.6% of respondents felt they had received adequate oncology education at the undergraduate level, 19.0% had attended a formation relating to oncology in the past two years, 24.0% were familiar with the standard doses of oral anticancer chemotherapy drugs, and only 9.0% felt comfortable educating patients (Abbott, 2014). These inadequacies underline community pharmacists' low familiarity and comfort with dispensing and educating patients on oral anti-cancer agents effective and safe use. Other studies revealed that correct knowledge about anti-cancer agents among pharmacists translated to correct practicing behaviors and conduct (Egbewande et al., 2022).

4.3. Practice of Handling Oral Chemotherapy Drugs

The community pharmacist's role is to educate patients on safe handling and disposing of anti-cancer drugs. This study revealed that the majority of the Zambian respondents, 96.7%, compared to the Algerian respondents, 46%, indicated advising their patients or caregivers on eliminating expired or unused oral anti-cancer drugs. Our finding in Algeria correlates with a study done in Haute-Normandie, which revealed that more than half of the pharmacists surveyed stated not giving safety instructions for handling oral anti-cancer drugs to patients (Laura, 2014). These deficits highlight the gap in the practice of safe dispensing practices of cytotoxic agents by community pharmacists.

4.4. Availability of Anti-Cancer Drugs

The cost of anti-cancer agents is the most significant barrier to oral anti-cancer drugs among respondents representing both countries. However, this problem is sorted out by social assurance in Algeria, as reported by the pharmacists during the investigation. Second to the cost of anti-cancer agents was the unavailability of the prescribed anti-cancer drugs due to their frequent running out of stock. This unavailability could be explained by a demand/supply mismatch, as the absence of local wholesalers and manufacturers of these drugs was a significant concern. A 2017 Ugandan cross-sectional study of 359 participants revealed that 35% and 41% of the patients delayed initiating cancer treatment and missed consultation appointment along their care journey, respectively, due to the cost of anti-cancer agents and adjunct costs like transportation and accommodation (Nakaganda et al., 2021). The presence of local wholesalers and manufacturer has positive health and financial implications. The non-local pharmaceutical industry need more local competitors, as the buyers are at the mercy of a single or limited provider (Wales, 2014). Based on the responses obtained, it was clear that demand for these drugs was not an impediment.

4.5 Follow Up

Pharmacists play a crucial role in the follow-up of patients receiving oral anti-cancer drugs in Zambia and Algeria. They are responsible for ensuring proper medication use, monitoring treatment response, managing side effects, and providing patient education. However, they encounter various challenges in these settings (Porteous, 2008). This study revealed that 48% and 53% of the respondents in Algeria and Zambia seldom followed up patients on anti-cancer drugs. In addition, less than 10 patients reported to have been followed up in both countries in a period of one month. One of the primary challenges is the limited availability of trained oncology pharmacists (Wales, 2014). Zambia and Algeria, like many other LMICs, may need more healthcare professionals with specialized knowledge in oncology pharmacy. This scarcity restricts the capacity to provide comprehensive follow-up care and support to patients on oral chemotherapy drugs (Kaae, 2019). Overcoming these challenges requires effective interprofessional collaboration, patient education, and technology integration to enhance communication and information sharing. By addressing these challenges, pharmacists can contribute significantly to optimizing patient outcomes and ensuring oral anti-cancer drugs' safe and effective use. A study by Laura (2014) revealed that advice to patients regarding their medications and therapeutic follow-up by community pharmacists was scarce.

CHAPTER 5: CONCLUSION

5.1. Conclusion

Part of the aim of this study was to assess the pharmacists' knowledge of oral anti-cancer drugs. This study established a gap in the knowledge about oral anti-cancer drugs. However, it is also clear that more than knowledge is needed to translate to effective pharmaceutical practice. Numerous other substantial determinants to proper pharmaceutical practice include cost of oral anti-cancer drugs, absence of local manufacturers and running out of stock. Similarly, this study did not identify any cultural barriers impeding oral anti-cancer drug use. Cancer remains a global public health concern. Empowering pharmacists in the proper dispensation and practice of oral anti-cancer agents is cardinal for proper management of cancer. In conclusion, there is also a need to carry out a more extensive study to obtain a broader scope of oral anti-cancer agents delivered by private pharmacies in Zambia and Algeria.

5.2. Study Limitations

1. The major limitation of this study was the difficulty in accessing and getting hold of pharmacists working in private pharmacies, especially in distant and remote places.
2. The relatively small sample size may underestimate the burden of the problem because only pharmacists available to provide information got captured in our data collection. Other pharmacists who met the inclusion criteria but were unwilling to respond were not considered by default.
3. The accuracy of most of the information collected depended on the memory recall of the respondents.

5.3. Recommendations

1. Since this study serves as a reference for further studies, we also recommend a further study on the safe practices and financial considerations in using oral anti-cancer drugs.
2. Organize training sessions in oncology targeting drug interactions, new drugs, and managing the main side effects of oral anti-cancer drugs as well as ensure follow-up.

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APPENDIX 1: QUESTIONNAIRE

My names are **Chabala Kaonga** and I am pursuing a Doctorate Study “Doctor **in Pharmacy**’ at the **University of Tlemcen in Algeria**. I am carrying out a research study on “**oral anti-cancer agents delivered in private pharmacies in Algeria and Zambia**”. I am kindly requesting you to complete this questionnaire for the purpose of collecting information that will be useful in completing this research study. All information given is only intended for academic purposes and will be treated confidentially.

DEMOGRAPHIC INFORMATION

1. Sex
 - Male
 - Female
2. Age
 - Below 25 years
 - 25 to 29 years
 - 30 to 34 years
 - 35 years old _
3. Duration of practice as a pharmacist
 - Less than one year
 - One to five years
 - Six to 10 years
 - More than 10 years
4. Country
 - Algeria
 - Zambia
5. Work area designation
 - Rural
 - Periurban
 - Urban
6. Type of work contract
 - Full-time
 - Part-time

ORAL CHEMOTHERAPY DISPENSION

7. Are you familiar with the current doses of oral anti-cancer drugs?

Yes

No

8. Do you have easy access to current information on oral anti-cancer drugs?

Yes

No

9. Do you have knowledge of chemotherapy cycle?

Yes

No

10. How many prescriptions are dispensed in your pharmacy per day?

Less than 50

50 to 99

100 to 199

200 and above

11. How many oral anti-cancer drugs do you deliver per month?

0

1 to 5

6 to 10

11 to 20

more than 20

Unquantifiable

12. What are the most common classes of oral anti-cancer drugs you provide?

Alkylating agents

platinum coordination

Antimetabolites

Microtubule damaging agents

Topoisomerase – 2 inhibitor

Topoisomerase – 1 inhibitor

Cytotoxic antibiotics

Miscellaneous

13. What is the cost per dose of most oral anti-cancer drugs in your pharmacy?

Less more than \$50

\$50-99

\$100-199

More than \$200

14. What would you say are the most common challenges of accessing oral anti-cancer drugs by patients?

Oral chemotherapy is expensive

Usually out of stock

Few pharmacies in the area

Other. Specify

15. Under what circumstances do you dispense oral anti-cancer drugs?

During first treatment

Renewal of the treatment

16. Do you know the pathology of patients to whom you deliver oral anti-cancer drugs?

Never

Seldom

Often

Always

SAFETY MEASURES

17. Do you take time to explain to your patients or their caregivers about the oral anti-cancer drugs you dispense to them?

Never

Seldom

Often

Always

18. If you take time to explain, how much time do you spend explaining to them?

Less than 1 minute

1 to 5 minutes

6 to 10 minutes

11 to 15 minutes

More than 15 minutes

19. Do you advise patients and caregivers on the disposal of unused or expired oral anti-cancer products?

Yes

No

20. Do you feel comfortable advising your patients on anti-cancer drugs?

Yes

Somewhat yes

Somewhat no

No

21. Are you able to manage the side effects of anti-drugs?

Yes

Somewhat yes

Somewhat no

No

FOLLOW-UP

22. Do you follow up patients to whom you deliver oral anti-cancer agents?

Never

Seldom

Often

Always

23. How many patients do follow up in a period of one month?

Less than 10

10 to 20

21 to 30

more than 30

24. What are the follow up methods you use?

Home visits

Patients visit our facility

Telephone calls

text message

E-mail

Other. Specify

25. What are the main concerns you discover after following up patients?

Reported adverse drug reactions

Non compliance

Lost medicines

. _ Specify :

26. What challenges do you face in following up patients on oral anti-cancer agents?

Distance to patients

Poor network for telephone calls

Unwillingness by patients to be followed up

. _ Specify

Appendix 2: Molecules of oral chemotherapy commonly available pharmacies

2.1 Zambian pharmacies

SPECIALTY	ICD	PHARMACOLOGICAL Class	THERAPEUTIC INDICATIONS
AROMASIN	Exemestane	steroidal aromatase inhibitor	<ul style="list-style-type: none"> •Adjuvant treatment of early stage invasive breast cancer expressing estrogen receptors in postmenopausal women following initial adjuvant therapy of 2 to 3 years duration with tamoxifen •Treatment of breast cancer at an advanced stage in postmenopausal women naturally or artificially after failure of treatment with antiestrogens
CASODEX	Bicalutamide	Non-steroidal anti-androgen	<p>Metastasized prostate cancer, in association with medical or surgical castration</p> <p>Locally advanced prostate cancer, as treatment alone or as adjuvant treatment to radical prostatectomy or radiotherapy</p>
CELLTOP	Etoposide	Topoisomerase II inhibitor	<p>Small cell lung cancers, embryonic testicular carcinomas, placental choriocarcinomas, neuroblastomas, breast cancers</p> <ul style="list-style-type: none"> • Malignant Hodgkin's and non-Hodgkin's lymphomas • Acute leukemias

ENDOXAN	cyclophosphamide	Alkylating agent	<ul style="list-style-type: none"> • Adjuvant and metastatic treatment of breast adenocarcinoma • Treatment of ovarian cancers, bronchial cancers, in particular small cell cancers, testicular seminomas and embryonal carcinomas, bladder cancers, sarcomas, neuroblastomas, malignant Hodgkin's and non-Hodgkin's lymphomas, multiple myelomas, acute leukemias in particular lymphoid • At low doses, treatment of rheumatoid arthritis, Wegener's granulomatosis, certain severe forms of acute systemic lupus erythematosus, cortico-resistant autoimmune nephropathy
NOLVADEX	Tamoxifen	Anti-estrogen	<ul style="list-style-type: none"> • Breast cancer: adjuvant treatment or treatment of advanced forms with local and/or metastatic progression
PURINETHOL	mercaptopurine	Anti-puric	<ul style="list-style-type: none"> • Acute lymphoblastic leukemias • Acute myeloblastic leukemias • Chronic myeloid leukemias
TEMODAR	Temozolamide	alkylating agents	<ul style="list-style-type: none"> • brain tumors such as glioblastoma and anaplastic astrocytoma

XELODA	Capecitabine	Anti-pyrimidine	<ul style="list-style-type: none"> • Stage III colon cancer (Dukes stage C) after resection as adjuvant therapy • Metastatic colorectal cancer in first line and monotherapy • Locally advanced or metastatic breast cancer as monotherapy or in combination with docetaxel after failure of chemotherapy that included an anthracycline • Advanced gastric cancer, first line, in combination with platinum-based chemotherapy
Xtandi	Enzalutamide	Non-steroidal anti-androgen	<ul style="list-style-type: none"> • Prostate cancer
Methotrexate	Methotrexate	Anti-metabolite	<ul style="list-style-type: none"> • used to treat cancers (breast cancer, leukemia, lung cancer, lymphoma, gestational trophoblastic disease, and osteosarcoma), autoimmune diseases, and ectopic pregnancies.

2.2 Algerian pharmacies

SPECIALTY	ICD	PHARMACOLOGICAL Class	THERAPEUTIC INDICATIONS
ARIMIDEX	Anastrozol	Nonsteroidal aromatase inhibitor	<ul style="list-style-type: none"> • Hormone receptor positive breast cancer, either in adjuvant therapy or at an advanced stage, in postmenopausal women
AROMASIN	Exemestane	steroidal aromatase inhibitor	<ul style="list-style-type: none"> • Adjuvant treatment of early stage invasive breast cancer expressing estrogen receptors in postmenopausal women following initial adjuvant therapy of 2 to 3 years duration with tamoxifen • Treatment of breast cancer at an advanced stage in postmenopausal women naturally or artificially after failure of treatment with antiestrogens
CASODEX	Bicalutamide	Non-steroidal anti-androgen	<p>Metastasized prostate cancer, in association with medical or surgical castration</p> <ul style="list-style-type: none"> • Locally advanced prostate cancer, as treatment alone or as adjuvant treatment to radical prostatectomy or radiotherapy
FEMARA	Letrozole	Nonsteroidal aromatase inhibitor	<ul style="list-style-type: none"> • Adjuvant treatment of early stage breast cancer in postmenopausal women with positive hormone receptors • Extension of adjuvant tamoxifen therapy beyond 5 years • First-line treatment of advanced hormone-dependent breast cancer in postmenopausal women • Late-stage therapy after relapse

			or progression on anti-oestrogen therapy
GLIVEC	Imatinib	Potent tyrosine kinase inhibitor	<ul style="list-style-type: none"> • Chronic myeloid leukemia (CML) chromosome Philadelphia (bcr-abl) positive (Ph+) in the chronic phase as first-line therapy in adults and children when bone marrow transplantation cannot be considered or after failure of interferon alpha, in accelerated phase or in blast crisis • Myelodysplastic/myeloproliferative syndromes (SMD/SMP) associated with rearrangements of the gene for PDGFR (platelet-derived growth factor receptor) • Advanced hypereosinophilic syndrome (HES) and/or chronic eosinophilic leukemia (CEL) associated with FIP1L1-PDGFRalpha rearrangement • Malignant Gastrointestinal Stromal Tumors Kit (CD 117) positive unresectable and/or metastatic • Unresectable and/or relapsed and/or metastatic dermatofibrosarcoma protuberans
NOLVADEX	Tamoxifen	Anti-estrogen	• Breast cancer: adjuvant treatment or

			treatment of advanced forms with local and/or metastatic progression
PURINETHO L	mercaptopurine	Anti-puric	<ul style="list-style-type: none"> • Acute lymphoblastic leukemias • Acute myeloblastic leukemias • Chronic myeloid leukemias
XELODA	Capecitabine	Anti-pyrimidine	<ul style="list-style-type: none"> • Stage III colon cancer (Dukes stage C) after resection as adjuvant therapy • Metastatic colorectal cancer in first line and monotherapy • Locally advanced or metastatic breast cancer as monotherapy or in combination with docetaxel after failure of chemotherapy that included an anthracycline • Advanced gastric cancer, first line, in combination with platinum-based chemotherapy

SUMMARY

Introduction: Cancer is a non -communicable global public health concern, which needs proper management and treatment. Community pharmacists play a major role to educate patients in the proper management and treatment of oral anti-cancer agents in cancer patients. This study focuses to analyze the level of competency and knowledge about dispensing oral anti-cancer drugs.

Objective: Assess pharmacists' knowledge and practice in the dispensing of oral chemotherapy drugs. In addition, assess the type and average cost of oral chemotherapy delivered in private pharmacies.

Materials and Methods: This is a cap cross-sectional study carried out on 80 pharmacists from Algeria and Zambia.

Results: A sample population of 80 participants was involved, of which there were as many males as there were females 50%. The study also included dominant age groups and work experiences ranging from less than one to more than ten years in Algeria and Zambia. Antimetabolites were Zambia and Algeria's most commonly prescribed oral anti-cancer agents. Additionally, about 93.3% and 46% of pharmacists working in Zambia and Algeria respectively have easy access to the latest information on oral anti-cancer drugs. However, only 54% in Algeria and 60% in Zambia were not familiar with current doses.

Conclusion: Cancer remains a global public health concern. Empowering pharmacists in the proper dispensation and practice of oral anti-cancer agents is cardinal to the proper management of cancer.

Key words: Oral anti-cancer agents, adverse drug reaction, cancer, community pharmacists, oral route

Introduction : Le cancer est un problème de santé publique mondial non transmissible, qui nécessite une prise en charge et un traitement appropriés. Les pharmaciens d'officine jouent un rôle majeur pour éduquer les patients sur la bonne gestion et le traitement des agents anticancéreux oraux chez les patients cancéreux. Cette étude se concentre sur l'analyse du niveau de compétence et de connaissances sur la distribution de médicaments anticancéreux oraux.

Objectif : Évaluer les connaissances et la pratique des pharmaciens en matière de délivrance de médicaments anticancéreux oraux. De plus, évaluer le type et le coût moyen des anticancéreux oraux délivrés dans les pharmacies privées.

Matériels et méthodes : Il s'agit d'une étude transversale cap réalisée sur 80 pharmaciens d'Algérie et de Zambie.

Résultats : Un échantillon de population de 80 participants a été impliqué, dont il y avait autant d'hommes que 50 % de femmes. L'étude a également inclus des groupes d'âge dominants et des expériences professionnelles allant de moins d'un an à plus de dix ans en Algérie et en Zambie. Les antimétabolites étaient les anticancéreux oraux les plus couramment prescrits en Zambie et en Algérie. En outre, environ 93,3 % et 46 % des pharmaciens travaillant respectivement en Zambie et en Algérie ont facilement accès aux dernières informations sur les médicaments anticancéreux oraux. Cependant, seulement 54 % en Algérie et 60 % en Zambie ne connaissaient pas les doses actuelles.

Conclusion : Le cancer reste un problème mondial de santé publique. L'autonomisation des pharmaciens dans la dispensation et la pratique appropriées des agents anticancéreux oraux est essentielle à la bonne gestion du cancer.

Mots clés : Anticancéreux oraux, effet indésirable médicamenteux, cancer, pharmaciens d'officine, voie orale

دورًا المجتمع صيادلة يلعب. مناسبين وعلاجًا رعاية تتطلب معدية غير عالمية عامة صحية مشكلة السرطان :مقدمة مرضى في الفموي للسرطان المضادة للعوامل المناسب والعلاج المناسبة الإدارة حول المرضى تثقيف في رئيسيًا طريق عن للسرطان المضادة الأدوية توزيع حول والمعرفة المهارة مستوى تحليل على الدراسة هذه تركز. السرطان الفم.

قم ، ذلك إلى بالإضافة. الفم طريق عن للسرطان المضادة الأدوية صرف في الصيدلة وممارسة معرفة تقييم :الهدف. الخاصة الصيدليات في صرفها يتم التي الفم سرطان أدوية تكلفة ومتوسط نوع بتقييم

وزامبيا الجزائر من صيدليًا 80 على أجريت مقطعية دراسة هذه :والطرق المواد

الدراسة تضمنت كما. النساء من % 50 إلى يصل منهم الرجال عدد وكان ، مشاركًا 80 من عينة إشراك تم :النتائج. وزامبيا الجزائر في سنوات عشر من أكثر إلى سنة من أقل من تتراوح التي العمل وخبرات المهيمنة العمرية الفئات حوالي يتمتع ، ذلك إلى بالإضافة. والجزائر زامبيا في شيوغًا الفم سرطان علاج عقاقير أكثر الأيض مضادات كانت أدوية عن المعلومات أحدث إلى الوصول بسهولة التوالي على والجزائر زامبيا في العاملين الصيدلة من %46 و %93.3. الحالية الجرعات يعرفوا لم زامبيا في %60 و الجزائر في فقط %54 فإن ، ذلك ومع. الفم سرطان

العوامل وممارسة السليم الاستغناء في الصيدلة تمكين إن. عالمية عامة صحية مشكلة يمثل السرطان يزال لا :الخلاصة. للسرطان الناجحة للإدارة ضروري أمر الفم طريق عن للسرطان المضادة

، المجتمع صيادلة ، السرطان ، للأدوية الضارة الآثار ، الفم طريق عن للسرطان المضادة الأدوية :المفتاحية الكلمات الفم طريق