Advances in Pharmacology and Therapeutics Journal
Shahid Sadoughi University of Medical Sciences, Yazd, Iran

SHAHID SADOUGHI UNIVERSITY OF MEDICAL SCIENCES

Original Article

Drugs Prescribing Pattern Among Patients with Cancer in Yazd, Iran (2020): A Cross-Sectional Study

Running Title: Drug Prescribing Pattern Among Patients with Cancer

Golnaz Afzal[1], Eftekhar Morabbi[2]*, Mohsen Nabi Meybodi[3]

[1] Department of Clinical Pharmacy, School of Pharmacy, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran.
[2] Department of Clinical Pharmacy, School of Pharmacy, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran.
[3] Department of Pharmaceutics, School of Pharmacy, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran

ARTICLEINFO

Received: 06/22/2025
Accepted: 08/16/2025

***Corresponding author**
Department of Clinical Pharmacy, School of Pharmacy, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran.
Tel: +98-9022747040

E-mail
baran.a801@yahoo.com

Abstract

Background: Evaluating chemotherapy prescription patterns is crucial due to the increasing use of nutritional supplements and adjuvants alongside chemotherapy, leading to heightened drug interactions and side effects.

Aim: This study aimed to assess chemotherapy prescription patterns, nutritional supplements, and adjuvant of patients with cancer in Yazd, Iran.

Materials: This cross-sectional study was performed on the prescriptions of all cancer patients referred to Shahid Chamran Teaching Pharmacy, affiliated with the Faculty of Pharmacy, Shahid Sadouqi University of Medical Sciences, Yazd, Iran, from September to October 2021. The prescribed chemotherapy drugs, generic chemotherapy drugs, essential drug list (EDL) chemotherapy drugs, injectable chemotherapy drugs, and supplement types in each prescription were recorded. SPSS Version 22 and various statistical tests were employed for analysis.

Results: On average, each prescription included 2.37 ± 1.22 prescribed chemotherapy drugs, 1.89 ± 1.28 chemotherapy drugs by generic name, 2.21 ± 1.29 chemotherapy drugs from EDL, and 1.99±1.39 injectable chemotherapy drugs. Monotherapy accounted for 29.4% of prescriptions; the remainder was combination chemotherapy. Oral drugs comprised 10.8%, while the rest were injectables. Cyclophosphamide had the highest frequency among chemotherapy drugs, while alkylating agents dominated. Dexamethasone and granisteron were the most common adjuvants. Major polypharmacy prevalence was significant (P-value = 0.001).

Conclusion: The average prescription included a significant number of drugs compared to international standards, with over half exhibiting major polypharmacy. Despite American guidelines discouraging supplement use, 20% of prescriptions included dietary supplements.

Keywords: Chemotherapy, Drug prescription, Drug supplement, Polypharmacy

Citation: Afzal G, Morabbi E, Nabi Meybodi M. Drugs Prescribing Pattern Among Patients with Cancer in Yazd, Iran (2020): A Cross-Sectional Study. Adv Pharmacol Ther J. 2025;5(2): 90-102.

Introduction

Cancer is one of the most common causes of morbidity and mortality worldwide, which is recognized as a big problem and a global threat (1). According to the World Health Organization statistics, cancer is the second most common cause of death globally. That is estimated to cause 9.6 million deaths, or 1 in every 6 in 2018 (2,3).

Cancer treatment includes different methods that depend on the type, stage, and clinical condition of the patient. A wide range of chemotherapy drugs are prescribed to treat cancer in different stages of the disease (4). To reduce these side effects, some patients may use complementary medicines simultaneously, which may have their risks. Some complementary drugs can interact with chemotherapy drugs, reducing or increasing anticancer effects or side effects (5).

The incorrect pattern of drug prescription can cause an increase in the patient's financial burden, drug complications, and even mortality. Recently, studies on the pattern of prescribing drugs have become a powerful tool for evaluating health-oriented systems (4, 6).

Evaluating prescribing patterns is critical due to different treatment regimens and response rates to various treatment regimens. Studies performed on drug utilization studies (DUS) are used as an efficient tool for evaluating drug therapy, recognizing the existing limitations, balancing costs, responding to treatment, and improving treatment quality (6, 7). Appropriate strategies can be taken towards optimizing cancer drug therapy by enhancing therapeutic efficacy and reducing the side effects caused by it by evaluating and comparing the drug prescription patterns with standard criteria (8).

The risk of drug interactions and repeated drug use can increase since cancer patients use several kinds of drugs with different therapeutic goals, such as chemotherapy drugs, supportive drugs, nutritional supplements, and drugs for other underlying diseases. Moreover, some studies showed that taking some drugs and nutritional supplements can adversely affect the effectiveness of chemotherapy drugs (9, 10).

Irrational drug prescribing is one of the widespread problems at all levels of health care, which causes negative results, including various drug-related problems such as polypharmacy (prescribing a large number of drugs), drug side effects, more demand for drug monitoring and unwanted increase in treatment costs (11).

One of the negative consequences of irrational drug prescriptions is polypharmacy, which refers to five or more medications in one prescription. Polypharmacy has been associated with many adverse clinical outcomes, such as an increased possibility of drug side effects, drug interactions that can decrease the effects of the drug or increase the toxicity caused by it, and a decrease in the patient's cooperation in taking medicines (12).

Furthermore, sometimes, the drug side effects caused by polypharmacy lead to a vicious cycle of increasing the need for the health system, treatment monitoring, and finally, increasing the cost of new treatments (11). Also, medication prescribing errors are among the most significant risk factors affecting patient safety worldwide. Minimizing the risk of medication errors should be the priority of strategic planning in health

  DOI: https://doi.org/10.18502/aptj.v5i2.19458

care. Since chemotherapy drugs are high-alert medications, it is important to pay attention to the pattern of prescribing this drug category and check for possible errors at the time of prescription (13). Medication errors are rising as one of the most important concerns of healthcare systems worldwide. Therefore, the causes of medication errors should also be investigated to take the necessary measures to prevent and reduce these errors (14).

Although there is no comprehensive definition for medication errors, the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defines a medication error as any preventable event that may cause or lead to inappropriate medication use or patient harm (15).

Considering the growing prescribing of nutritional supplements (including vitamins, minerals, and herbal supplements) in the prescriptions of cancer patients, the significant economic burden of treatment, the possibility of drug interactions, and reducing the effects or increasing the side effects of chemotherapy drugs, the present study aimed to determine the pattern of prescribing chemotherapy drugs and nutritional supplements for people with cancer in the educational pharmacy of Shahid Chamran, Yazd, between Septe.

Methods

This cross-sectional study was performed on the 1000 prescriptions of all cancer patients referred to Shahid Chamran Teaching Pharmacy, affiliated with the Faculty of Pharmacy, Shahid Sadoughi University of Medical Sciences, Yazd, Iran, in 2020.

To ensure a representative sample that reflects the characteristics of the population, a sample size of 1000 was determined based on population size and the desired level of precision. This sample size was chosen to provide sufficient statistical power to detect meaningful patterns or associations within the population of interest.

After approval of the project by the research committee of the university and ethics committee approval, cancer patients referring to the pharmacy for prescription medicine were included in the study based on the entry and exit criteria and the census method. Prescriptions with no antineoplastic medications or written by specialties other than oncology-related fields, radiotherapists, and orologists were excluded from the study. The pharmacist collected and recorded the information using the checklist, including the demographic information of the participants and the medication information of all the prescriptions. This information includes age, gender, type of insurance coverage, and doctor specialty.

To determine the prescription pattern of chemotherapy drugs, information about the number of prescribed drugs per prescription, the most common chemotherapy drug prescribed, the number of supplements and vitamins, and the most common drugs prescribed to manage the side effects of chemotherapy (adjuvant drug), including corticosteroids, anti-nausea, and gastric acid suppressants, was investigated.

Results

The present study was conducted on 1000 prescriptions of cancer patients (mean age: 59.7 ± 12.4 years); the age of this population is estimated to be between 58.92 and 60.46 years with 95% confidence. According to gender, 588 patients (58.8%) were female and 412 patients (41.2%) were male. The highest frequency of patients was found in the age range of 60 to 80 years, with a frequency of 462 people (46.2%). The highest frequency distribution of the specialty of the prescribing physician was adult oncology specialists with 963 people (96.3%), and the lowest frequency was related to pediatric oncology specialists with 1 person (0.1%). The average number of prescribed chemotherapy drugs per prescription was 2.37 ± 1.22 (1 to 7).

Table 1. The average number of prescribed chemotherapy drugs, prescribed chemotherapy injectable drugs, prescribed chemotherapy drugs with generic names, and prescribed chemotherapy drugs with EDL names according to gender

Gender type of medicine	Female (mean ±SD)	Male (mean ±SD)	IQR	95% Confidence Interval for Mean
Prescribed chemotherapy drug	2.28±1.13	2.50±1.34	2	(2.29,2.44)
Prescribed chemotherapy injectable	1.82±1.31	2.22±1.47		(1.90,2.07)
Prescribed chemotherapy with generic names	1.79±1.17	2.03±1.41		(1.81,1.97)
Prescribed chemotherapy with EDLnames	2.13±1.19	2.32±1.42		(2.12,2.29)

The chemotherapy drugs prescribed were divided into three categories based on polypharmacy: 294 patients (29.4%) were prescribed monotherapy of chemotherapy drugs, 638 (63.8%) were prescribed between 2 and 4 drugs, and 68 (6.8%) were prescribed polypharmacy.

Also, chemotherapy drugs, injectable chemotherapy drugs, chemotherapy drugs with generic names, and chemotherapy drugs with EDL names were prescribed more for men than women, as shown in **Table 1.**

On average, the number of chemotherapy drugs, generic chemotherapy drugs, EDL chemotherapy drugs, and Injectable chemotherapy drugs in each prescription was 2.37 ± 1.22, 1.89 ± 1.28, 2.21 ± 1.29, and 1.39 ± 1.99, respectively.

Table 2 shows the frequency of prescribed chemotherapy drugs with generic names. Prescribing one generic name of a drug with a frequency of 377 drugs (37.7%) was the most frequent, and prescribing six and seven generic names of drugs with a frequency of 3 drugs (0.3%) was the least frequent **Table 2.**

Table 2. Absolute and relative frequency of prescribed chemotherapy drugs with generic names in the prescriptions

Variable		Frequency(percent)
Frequency of prescribed chemotherapy drugs with generic names	0	96 (9.6%)
	1	376(37.6%)
	2	229(22.9%)
	3	188(18.8%)
	4	70(7%)
	5	35(3.5%)
	6	3(0.3%)
	7	3(0.3%)
Total		1000 (100%)

Generally, 892 (89.2%) of prescribed chemotherapy drugs were administered as an injection, and the rest were administered orally. The most prescriptions were 363 (36.6%) in the form of single drugs **Table 3.**

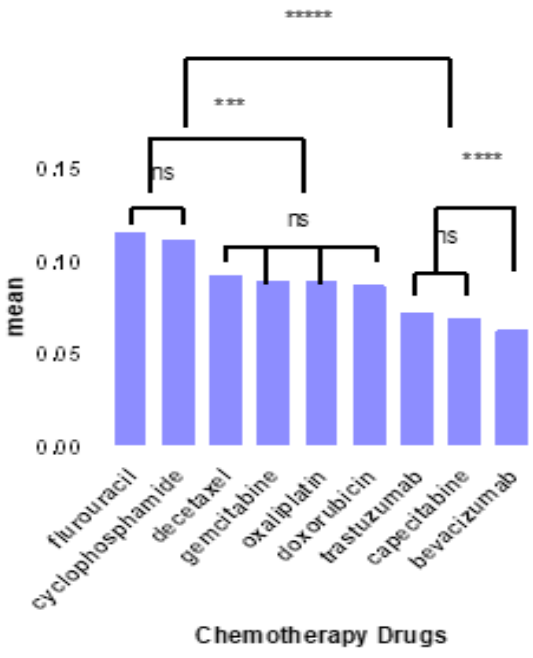
DOI: https://doi.org/10.18502/aptj.v5i2.19458

Table 3. Distribution of absolute and relative frequency of oral and injectable chemotherapy drugs in the prescriptions

Variable		Frequency(percent)
Oral prescribed chemotherapy drugs		108 (10.8%)
Injectable prescribed chemotherapy drugs		892 (89.2%)
Total		1000 (100%)
Injectable prescribed chemotherapy drugs per prescription	1	363 (36.3%)
	2	177 (17.7%)
	3	204 (20.4%)
	4	86 (8.6%)
	5	57 (5.7%)
	6	5 (0.5%)

According to drug names and categories, respectively, the highest frequency of drugs prescribed was related to fluorouracil (from the antimetabolite drug category), with a frequency of 117 copies (11.7%), and cyclophosphamide (from the alkylating agent), with a frequency of 113 copies (11.3%) **Figure 1.**

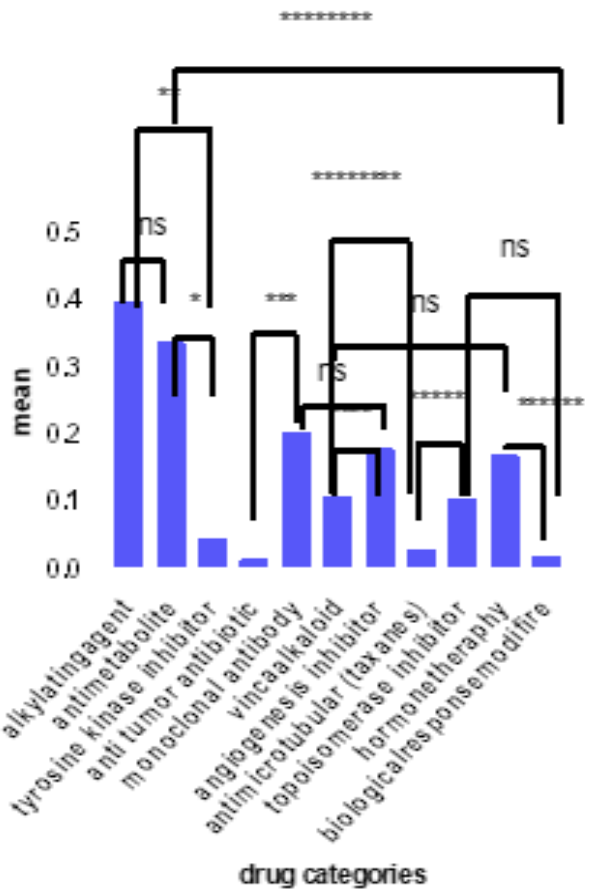
Figure 1. Frequency distribution of the most prescribed chemotherapy drugs



According to drug categories, the examination of the frequency of prescribed chemotherapy drugs showed that the alkylating agent drugs with a frequency of 398 prescriptions (39.8%) and then antimetabolite drugs with 387 prescriptions (38.7%) had the highest frequency **Figure 2.**

In the chart above, the average frequency of each drug category was (0.064, 0.072, 0.073, 0.088, 0.09, 0.09, 0.093, 0.113, 0.115) respectively. Also, the groups with a significant difference are marked with asterisks, and the groups that do not have a significant difference are marked with (ns), which stands for not significant.

Figure 2. The category of prescribed chemotherapy drugs

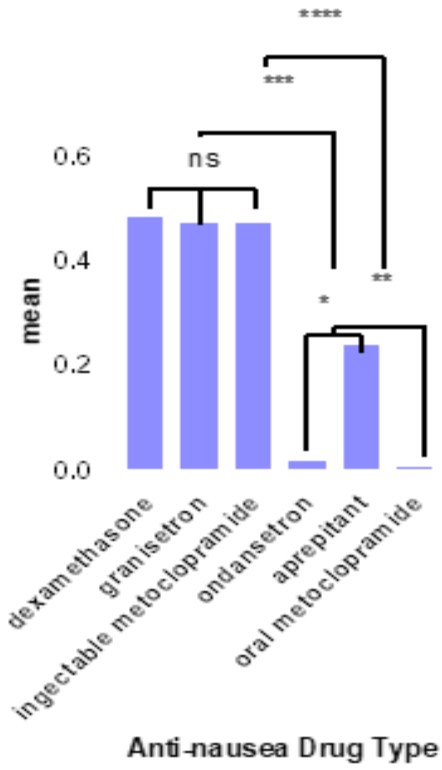


In the chart above, the average frequency of each drug category is (0.021, 0.17, 0.107, 0.031, 0.182, 0.018, 0.204, 0.018, 0.046, 0.339, 0.348). The groups with a significant difference are marked with an asterisk, and those without a significant difference are marked with (ns).

The highest frequency of adjuvant in prescriptions was dexamethasone in 491 prescriptions (49.1%), Granisetron in 473 prescriptions (47.3%), and aprepitant in 241 prescriptions (24.1%), respectively. 15 prescriptions (1.5%) contained painkillers and antipyretics. NSAID was prescribed as an analgesic in 11 of these 15 prescriptions, and acetaminophen was prescribed in 4. 27 prescriptions (2.7%) included gastric antacids, and in 23 prescriptions (2.3%), H2 blockers were used as antacids. 27 prescriptions (2.7%) included sedative-hypnotic drugs, which benzodiazepine drugs and non-benzodiazepine drugs were used in 12 (1.2%) and 15 (1.5%) prescriptions, respectively. Iron supplements were prescribed in 201 (20.1%) prescriptions.

Other corticosteroid drugs were prescribed in 274 prescriptions (27.4%), among which Hydrocortisone drug had the highest frequency with 269 prescriptions (26.9%). Among the types of Hydrocortisone forms, injectable Hydrocortisone was the most prescribed. 291 prescriptions (29.1%) included prescribed colony-stimulating factors (CSF), and filgrastim had the highest frequency with 371 prescriptions (37.1%). Metoclopramide, with a frequency of 415 prescriptions (41.5%), was the most commonly prescribed anti-nausea drug.

Figure 3. Anti-nausea drugs prescribed in the studied prescriptions



In the chart above, the average frequency of each drug category was (0.064, 0.072, 0.073, 0.088, 0.09, 0.09, 0.093, 0.113, 0.115) respectively. Also, the groups with a significant difference are marked with an asterisk, and the groups that do not have a significant difference are marked with (ns).

Among all of the prescriptions, 79.8% included no supplements. Herbal supplements were prescribed in 23 prescriptions (2.3%). According to the number of prescribed complementary medicines, 142 (71%) of the prescriptions contained only one complementary medicine, and then the prescriptions with two complementary medicines, 36 (3.6%), were the most prescribed. According to the kind of prescribed supplement, prescriptions with vitamin D, 137 (13.7%), and then prescriptions with group B

  DOI: https://doi.org/10.18502/aptj.v5i2.19458

vitamins, 77 (7.7%), had the highest frequency, and only one prescription (0.1%) included vitamin C supplement **Table 4**.

Table 4. The absolute and relative frequency of prescription supplements in the studied prescriptions

Supplements	Frequency(percent)
Vitamin D	137 (13.7)
Group B vitamins	77 (7.7)
iron and folic acid products	30 (3)
Pmega-3	20(2)
Multivitamins	19(1.9)
Zinc	19(1.9)
Calcium D/Calcium	15 (1.5)
Vitamin E	2(0.2)
Vitamin C	1 (0.1)
Total of prescriptions containing at least one supplement	203 (20.3)

Of 588 women, 166 (28.2%) received a monotherapy regimen and 422 (71.8%) a combination regimen. Also, out of 412 men, 129 people (31.3%) received a monotherapy regimen and 283 (68.7%) a combination regimen, which was not statistically significant (p-value = 0.27).

As shown in Table 5, the distribution of the frequency of prescribing major polypharmacy based on gender was not statistically significant (p-value: 0.95), while it was found to be significant based on prescribing any supplements, chemotherapy adjuvants, and anti-nausea drug (p-value $\leq$ 0.001). The frequency distribution of significant polypharmacy prescribing based on hormonal chemotherapy drugs showed that out of 671 prescribed significant polypharmacy, 117(17.4%) prescriptions included hormonal chemotherapy drugs. Also, out of 329 non-prescribed major polypharmacy, 36 prescriptions (10.9%) included hormonal chemotherapy drugs, which was statistically significant (p-value = 0.007).

Table 5. Comparison of the frequency of major polypharmacy based on gender, prescription of supplements, chemotherapy adjuvants, anti-nausea, and hormonal drugs

Variable		Prescription of major polypharmacy		Total	P-value
		Yes	No		
Gender	Female	67.2%(395)	32.8%(193)	588	0.95
	Male	67.0%(276)	33.0%(136)	412	
Total		67.1%(671)	32.9%(329)	1000	
Prescription of supplement	No	497 (62.7%)	296 (37.3%)	793	<0.001
	Yes	174 (84.1%)	33 (15.9%)	207	
Total		671 (67.1%)	329 (32.9%)	1000	
Prescription of chemotherapy adjuvants	No	33.9% (149)	66.1% (290)	439	<0.001
	Yes	93.0% (522)	7.0% (39)	561	
Total		67.1% (671)	32.9% (329)	1000	
Prescription of anti-nausea drugs	Yes	146 (21.8%)	525 (78.2%)	437 (43.7%)	<0.001
	No	11.6% (38)	291 (88.4%)	563 (56.3%)	
Total		671	329	1000	
Prescription of hormonal chemotherapy drugs	Yes	10.9% (36)	17.4% (117)	153 (15.3%)	0.007
	No	89.1% (293)	82.6% (554)	847 (84.7%)	
Total		329	671	1000	

Discussion

The present study aimed to determine the pattern of prescribing chemotherapy drugs and nutritional supplements in 1000 cancer patients' prescriptions in the teaching pharmacy of Shahid Chamran, Yazd, Iran, between September 2020 and March 2021.

This study was done only in Yazd. One limitation is that prescription inclusion was restricted to only one pharmacy in Yazd. However, this pharmacy, which has a significant share of chemotherapy medication dispensing in Yazd, was considered the study setting. Our results showed that 1, 2, and 3 chemotherapy drugs were prescribed by their generic name in 376 prescriptions (37.6%), 229 (22.9%), and 188 (18.8%), respectively. Although prescribing one chemotherapy drug with generic names with 376 drugs (37.6%) had the highest frequency, prescribing 6 and 7 with generic names with the frequency of 3 drugs had the lowest frequency (0.3%). 29.4% of prescriptions were monotherapy, and the rest were combination chemotherapy. Generally, 892 (89.2%) of prescribed chemotherapy drugs were administered as an injection, and the rest were administered orally. Zoledronic acid and cyclophosphamide from chemotherapy drugs and alkylating drugs and antimetabolites from drug categories had the highest frequency. In this study, the highest frequency is related to adjuvant drugs, dexamethasone and Granisteron, respectively.

In a study by Beedimani and coworkers, in India, dexamethasone with 12% of prescriptions had the highest frequency, which is consistent with our results (17). In another similar study, dexamethasone was prescribed for all patients (18). In a study by Kumar and coworkers, the frequency of prescribed monotherapy drugs was 43%, while in the present study, it was 29% (19). In another study conducted in Saudi Arabia, this frequency was 65% (20). In the present study, the number and average number of chemotherapy drugs in each prescription were 6 and 2.37 ± 1.22, respectively. In a study on 5784 prescriptions by Taghizadeh and colleagues in 2018, the number and average number of chemotherapy drugs per prescription were 4.7 and 1.8, respectively, lower than the present study (21). Similar to the study by Taghizadeh and colleagues, in another study conducted in Nepal and India, the average number of chemotherapy drugs per prescription was 1.9 (22, 23). Other studies are much higher. In a study by Mathew and coworkers, the average number of prescription drugs in each prescription was 9.6 (18), and in a study by Mugada and coworkers, this frequency was 8.6 (23). The most common chemotherapy drugs used in studies conducted in different countries are different. For instance, two studies conducted on prescriptions of cancer patients in India in 2014 and 2020 showed that carboplatin is the most commonly used chemotherapy drug (24, 25). A study on 1000 prescriptions in Nigeria in 2021, by Bepari and coworkers in India in 2020, and another study in Saudi Arabia showed that cisplatin was the most prescribed chemotherapy drug (20, 26, 27). Similar to the present study in which cyclophosphamide was the most frequently prescribed drug, Taghizadeh and coworkers reported that this drug was the most prescribed (21). However, there are non-Iranian studies that show that cyclophosphamide is the most widely prescribed chemotherapy drug (18).

  DOI: https://doi.org/10.18502/aptj.v5i2.19458

Additionally, a study conducted in the US in 2017 observed that first-line monotherapy with gemcitabine consistently declined from 2006 to 2015. This decrease indicates increased use of first-line treatment with 5-fluorouracil, leucovorin, irinotecan, oxaliplatin, and gemcitabine + nab-paclitaxel (28).

In the present study, one of five prescriptions included complementary medicine. Medical guidelines and statements published by the American Cancer Society and the Office of Dietary Supplements do not recommend the routine use of dietary supplements for cancer patients (29). According to Global and regional studies, since 1999, doctors and patients increasingly tend to use complementary therapies, including supplements such as vitamins, and based on the reports in 2007 and 2008, approximately 56% to 73% of patients with cancer used vitamin supplements and minerals supplements such as calcium and magnesium (30-32). Regarding prescription supplements, in the present study, about 21% of the prescriptions included at least vitamin D or B. Of course, the American Cancer Society considers it appropriate to use low-dose multivitamin supplements, and vitamin D and calcium are two exceptions that the American Cancer Society recommends that people try to use since it seems to be challenging to obtain the recommended daily amount of these nutrients only through food (29). A study by Agha Mohammadi and colleagues in India showed that 13.6% of the prescriptions included vitamin supplements (33). In a study by Ramsdale and coworkers, vitamin supplements were prescribed for 27% of chemo patients (34).

The most prescribed supplements were vitamin D and vitamin B, respectively. Iron supplements were prescribed in 20% of the prescriptions, but in a study by Ramsdale and coworkers, iron supplements were prescribed in 15% of the prescriptions. However, in the present study, the frequency of prescribing painkillers, including NSAIDs and benzodiazepines, was lower than the study by Ramsdale and coworkers (34). In another study, including a questionnaire conducted on cancer patients in 2021, 26% of patients stated that in addition to chemotherapy drugs, they used herbal medicines and supplements(35). Although it seems that, in the present study, the percentage of prescription supplements is not significantly different from similar studies, it should be noted that the measurement tool of the present study is prescribed medicines by doctors and using herbal medicines and supplements without a doctor's prescription was not reported by the patients. Considering this issue, it seems that the supplements used by cancer patients in this study are more than those used in similar studies. For example, in a study on the frequency of complementary medicines in cancer patients 2013, 68% of patients stated these medicines had healing effects (without referring to prescriptions). More importantly, the patients mentioned that only 24% of the complementary medicines were recommended by a doctor, and 76% were recommended by friends, colleagues, and media (36). In about half of the prescribed prescriptions and 1.5% of the prescriptions, anti-nausea drugs and anti-inflammatory drugs were prescribed, respectively. Although acetaminophen is available in Iran, only 0.4% of the prescriptions included this drug. In a

2019 study, Agha Mohammadi and coworkers reported this frequency to be 4% (33). In a study in China in 2016, nearly 89% of chemotherapy prescriptions included anti-nausea drugs. Although the mentioned Chinese study showed a high number of prescribed anti-nausea drugs, another study conducted in Saudi Arabia showed only 21% of prescriptions including anti-nausea drugs (20). A multi-center study conducted in Asian countries in 2015 showed that the most commonly prescribed drug for reducing the side effects of nausea and vomiting is the 5HT-RA drug, of which Granisetron is available in Iran (37). In another study conducted in India, 60% of prescriptions contained ondansetron tablets (27).

Additionally, a study conducted in European countries in 2018 showed that in patients receiving cisplatin-, AC-, and carboplatin-based chemotherapy, NK1RAs were used more frequently than the combination of NK1RA-5-HT3RA-dexamethasone recommended in the guidelines (38).

Among anti-inflammatory and painkiller drugs, NSAID drugs and acetaminophen, respectively, had the highest frequency. Anti-nausea drugs and antibiotic drugs were prescribed more for men, and painkillers and anti-inflammatory drugs were prescribed more for women.

Several studies showed that if a patient takes four chronic drugs, with the use of the fifth drug, the chance of benefiting from the beneficial effects of the drug, as well as the possibility of side effects, will be 25%. In addition, the chance of risk of drug interactions will be very high in such a patient.

The constant use of more than 5 drugs is called polypharmacy, and taking more than 10 drugs is called Hyperpolypharmacy (39).

In a study conducted on 4750 prescriptions in Gilan in 2000, 88% were associated with polypharmacy, and 26% were significant polypharmacy, while in the present study, 67% were significant polypharmacy.

Sobhani and others worked on all prescriptions in a study, but the present study was conducted on the prescriptions for chemotherapy drugs (40). In a recent study conducted on chemotherapy prescriptions in East Asia in 2019, the rate of polypharmacy was 45% (41). In general, in recent studies, the rate of polypharmacy among chemotherapy prescriptions has been reported between 2% and 80% (42). In another study, polypharmacy was observed in 30% of chemotherapy prescriptions (43). In the most recent study, the rate of polypharmacy in chemotherapy prescriptions was 61%, which is close to the frequency of the present study (34). Statistical analysis showed that more polypharmacy, including supplements, was observed in the prescriptions.

Antibiotics were prescribed in 3% of the examined prescriptions. In other studies, up to 60% of prescriptions included antibiotics (26). On the other hand, in other studies performed in India, this frequency was 25.5%, 54%, and even 84% (18, 19, 23). Since access to antibiotics is easy in Iran, and sometimes patients keep antibiotics at home, this low frequency of prescription antibiotics, compared to similar studies, can be the reason for this low frequency of prescription antibiotics.

In the present study, 96.6% of the prescriptions were in accordance with the essential drug list. In some studies, in India, this number was 100%. In a study

  DOI: https://doi.org/10.18502/aptj.v5i2.19458

by Mathew and others, this number was 80% (18). In another Indian study, this number was 81% (23).

Conclusions

On average, monotherapy with chemotherapy drugs was prescribed in 29.4% of prescriptions; the rest were combination chemotherapy. Fluorouracil (from the antimetabolite drug category) and cyclophosphamide (from an alkylating agent) had the highest frequency among chemotherapy drugs. Dexamethasone and then granisterone are the most adjuvant drugs. Although the American guidelines do not recommend supplements for cancer patients, in the present study, 20% of the prescriptions included complementary medicines. Among the supplements, vitamin D and vitamin B, respectively, had the highest prescription frequency. Also, iron was prescribed more, compared to similar studies. Granisetron was the most commonly prescribed anti-nausea drug, and among anti-inflammatory drugs, NSAID drugs were the most frequently prescribed. Significant polypharmacy was observed in 67% of prescriptions, close to the percentage reported in similar studies.

Suggestions

A similar study is suggested in different parts of Iran, as well as private hospitals in Yazd and other cities.

Conflict of interest: The authors state that this study is a student thesis, and they report no competing or conflict of interest regarding this study.

Funding: No.

Acknowledgments: This article is derived from the thesis “Evaluation of drug-prescribing patterns for chemotherapy and supplement nutrition in patients with cancer in Yazd, Iran: a cross-sectional study," supervised by Assistant Professor Dr. Golnaz Afzal and submitted by Eftekhar Morabbi.

Ethical considerations: The study proposal was approved by the ethics committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran (Code: IR.SSU.MEDICINE.REC.1400.165). The researchers were committed to the principles of the Declaration of Helsinki in all stages. Ethical principles related to the confidentiality of participants' information were also considered. No changes will be made in the patient's treatment process, and no financial costs will be imposed on the patients.

The study was approved by the Research Ethics Committee of Shahid Sadoughi University of Medical Sciences with the Approval ID: IR.SSU.MEDICINE.REC.1400.165. The obtained data remained confidential.

Statistical analysis: The Statistical Package for the Social Sciences software (SPSS, version 22 for Windows; SPSS Inc., Chicago, IL) was used to perform all statistical analyses. Descriptive statistics (namely, mean, standard deviation, frequency, and percentage) were computed to summarize the prescription pattern data. The Chi-square test was applied to analyze relationships between categorical variables. A significance level of 0.05 was considered.

Authors' contribution: Conceptualization: G.A, E.M Supervision: G.A, M.N.M Writing – original draft: G.A, E.M Writing – review & editing: G.A,

M.N.M, E.M. All authors have read and agreed to the published version of the manuscript.

References

1. Rahbaralam Z, Mannani D, Dehghani A, Akbari H, Fatemi A, Bazrafshan M-R, et al. The Epidemiological Trend of Breast Cancer in the South of Fars Province in Iran. Indian Journal of Gynecologic Oncology. 2023;21(1):17.
2. Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. CA: a cancer journal for clinicians. 2023;73(1):17-48.
3. World Health Organization (WHO). Cancer 2023. Available from: https://www.who.int/health-topics/cancer#tab=tab_1.
4. Sepehri GR, Dadolahi Y. Characterization of drug prescribing practices among dentists in Kerman province, 2001. 2006.
5. Ford CD, Killebrew J, Fugitt P, Jacobsen J, Prystas EM. Study of medication errors on a community hospital oncology ward. Journal of oncology practice. 2006;2(4):149-54.
6. Ashokkumar R, Srinivasamurthy S, Kelly JJ, Howard SC, Parasuraman S, Uppugunduri CRS. Frequency of Chemotherapy Medication Errors: A Systematic Review. Journal of Pharmacology and Pharmacotherapeutics. 2018;9(2):86-91.
7. Payne DJ, Gwynn MN, Holmes DJ, Pompliano DL. Drugs for bad bugs: confronting the challenges of antibacterial discovery. Nature reviews Drug discovery. 2007;6(1):29-40.
8. Johnson B, Mariotti A, Neidle EA, Yagiela JA, Dowd FJ. Pharmacology and therapeutics for dentistry-E-book: Elsevier Health Sciences; 2010.
9. Rodriguez R, Vidrio H, Campos-Sepulveda E, editors. Medicalization of pharmacology teaching: an urgent need in the medical curriculum. Proceedings of the Western Pharmacology Society; 2009.
10. Marek CL. Avoiding prescribing errors: A systematic approach. The Journal of the American Dental Association. 1996;127(5):617-23.
11. Katzung B, Katzung B. The Eicosanoids: Prostaglandins, Thromboxanes, Leukotrienes, & Related Compounds. Basic & clinical pharmacology 14th edition Editor: Betram G Katzung,(ed) McGraw-Hill, New York, NY. 2018.
12. Eftekhari Gol R, Mousa Farkhani E, Yousefi B. Assessment of drug prescriptions based on WHO indicators in Family Physician Program in Razavi Khorasan Province, Iran. Journal of Mashhad Medical Council. 2015;19(1):6-10.
13. Sarahroodi S. Polypharmacy vs. Deprescribing. Medical Science Journal of Islamic Azad Univesity-Tehran Medical Branch. 2021;31:0-.
14. Ranchon F, Salles G, Späth H-M, Schwiertz V, Vantard N, Parat S, et al. Chemotherapeutic errors in hospitalised cancer patients: attributable damage and extra costs. BMC cancer. 2011;11:1-10.
15. Walsh KE, Dodd KS, Seetharaman K, Roblin DW, Herrinton LJ, Von Worley A, et al. Medication errors among adults and children with cancer in the outpatient setting. J Clin Oncol. 2009;27(6):891-6.
16. Organization WH. WHO policy perspectives on medicines. Promoting rational use of medicines: core components Geneva. 2002;1.
17. Beedimani RS, Uz Zaman S, Potturi SC, Kumar KS. Prescribing pattern of anticancer drugs in the medical oncology department of a tertiary care teaching hospital. 2019.
18. Mathew M, Mateti UV, Saj N, Philip ML, Shetty V. Drug utilization evaluation of anticancer drugs in a charitable hospital. Indian Journal of Medical and Paediatric Oncology. 2019;40(01):105-10.
19. Kumar BS, Maria S, Shejila C, Udaykumar P. Drug utilization review and cost analysis of anticancer drugs used in a tertiary care teaching hospital. Indian Journal of Pharmaceutical Sciences. 2018;80(4):686-93.
20. Bepari A, Sakre N, Rahman I, Niazi SK, Dervesh AM. The Assessment of Drug Utilization Study of Anticancer Drugs Using WHO Prescribing Indicators in a Government Tertiary Care Hospital of the Hyderabad - Karnataka Region of India. Open Access Maced J Med Sci. 2019;7(7):1203-8.
21. Taghizadeh-Ghehi M, Amouei A, Mansouri A, Kohneloo AJ, Hadjibabaie M. Prescribing Pattern and Prescription-writing Quality of Antineoplastic Agents in the Capital City of a Middle-income Developing Country. J Res Pharm Pract. 2018;7(1):46-50.
22. Khan GM, Thapa R, Adhikari D, Rajbhandari M, Dwa P, Shrestha SK, et al., editors. EVALUATION OF CANCER PREVALENCE AND CYTOTOXIC MEDICATION PRESCRIBING IN CENTRAL REGION OF NEPAL2013.
23. Vinodkumar Mugada AP, Mounika Munagala. Drug Utilization Evaluation of Anticancer Drugs in a Tertiary Care Teaching Hospital: a Descriptive Observational Study: ssue: 10; 2016. 098-101 p.
24. Kulkarni MD, Hussaini SA, Padwal SL, Khandelwal PN, Doifode SM, More PP. Drug utilization review of anticancer drugs in cancer outpatient department of the Government Medical College, Aurangabad. International Journal of Basic & Clinical Pharmacology. 2017;3(5):879-83.
25. Pandiamunian J, Nithiya D, Shanmugasundaram S. Recommending form of anticancer drugs in oncology unit of a tertiary care teaching hospital. International Journal of Research in Pharmaceutical Sciences. 2021;12(2):1201-7.
26. A. Biambo A, O. Adibe M, M. Aliyu U, Samaila A, Usman N, V. Ukwe C. Anticancer Drugs Utilisation for Cancer Chemotherapy in a Nigerian Health Care Facility.

  DOI: https://doi.org/10.18502/aptj.v5i2.19458

The Nigerian Journal of Pharmacy. 2021;55(2):44-53 | https://doi.org/10.51412/psnnjp.2021.12.
27. Vijayalakshmi D, Bendi SR, Usharani M, Swarna Latha K. Assessment of drug utilization pattern in patients undergoing chemotherapy for various types of metastatic cancers in a tertiary care government hospital. International Journal of Basic & Clinical Pharmacology. 2020;9(9):1331-6.
28. Abrams TA, Meyer G, Meyerhardt JA, Wolpin BM, Schrag D, Fuchs CS. Patterns of chemotherapy use in a U.S.-based cohort of patients with metastatic pancreatic Cancer. Oncologist. 2017;22(8):925–33. https://doi.org/10.1634/theoncologist.2016-0447.
29. Cassileth BR, Heitzer M, Wesa K. The Public Health Impact of Herbs and Nutritional Supplements. Pharm Biol. 2009;47(8):761-7.
30. Burstein HJ, Gelber S, Guadagnoli E, Weeks JC. Use of alternative medicine by women with early-stage breast cancer. N Engl J Med. 1999;340(22):1733-9.
31. Grainger EM, Kim HS, Monk JP, Lemeshow SA, Gong M, Bahnson RR, et al. Consumption of dietary supplements and over-the-counter and prescription medications in men participating in the Prostate Cancer Prevention Trial at an academic center. Urol Oncol. 2008;26(2):125-32.
32. Rock CL. Multivitamin-multimineral supplements: who uses them? Am J Clin Nutr. 2007;85(1):277s-9s.
33. Aghamohammadi H, Shrestha S, Kavousi S, Milton B. Assessment of prescribing pattern of chemotherapy drugs and monitoring of adverse drug reaction in cancer patients. Int J Pharm Sci Invent. 2019;8:42-51.
34. Ramsdale E, Mohamed M, Yu V, Otto E, Juba K, Awad H, et al. Polypharmacy, Potentially Inappropriate Medications, and Drug-Drug Interactions in Vulnerable Older Adults With Advanced Cancer Initiating Cancer Treatment. Oncologist. 2022;27(7):e580-e8.
35. Kanimozhi T, Hindu K, Maheshvari Y, Khushnidha YG, Kumaravel M, Srinivas KS, et al. Herbal supplement usage among cancer patients: A questionnaire-based survey. J Cancer Res Ther. 2021;17(1):136-41.
36. Tuna S, Dizdar O, Calis M. The prevalence of usage of herbal medicines among cancer patients. J buon. 2013;18(4):1048-51.
37. Yu S, Burke TA, Chan A, Kim HK, Hsieh RK, Hu X, et al. Antiemetic therapy in Asia Pacific countries for patients receiving moderately and highly emetogenic chemotherapy--a descriptive analysis of practice patterns, antiemetic quality of care, and use of antiemetic guidelines. Support Care Cancer. 2015;23(1):273-82.
38. Aapro M, Scotte´ F, Escobar Y, et al. Practice patterns for prevention of chemotherapy-induced nausea and vomiting and antiemetic guideline adherence based on real-world prescribing data. Oncologist. 2021;26(6):e1073–82.
39. Sarahroodi S. Polypharmacy vs. Deprescribing. Medical Sciences Journal. 2021;31(0):0-.
40. Sobhani A, Shodjai H. Prevalence of Polypharmacy and Correlations with Sex, Age and Drug Regimen in Insurance Prescription. Journal title. 2001;10(37):90-7.
41. Hong S, Lee JH, Chun EK, Kim KI, Kim JW, Kim SH, et al. Polypharmacy, Inappropriate Medication Use, and Drug Interactions in Older Korean Patients with Cancer Receiving First-Line Palliative Chemotherapy. Oncologist. 2020;25(3):e502-e11.
42. Mohamed MR, Ramsdale E, Loh KP, Arastu A, Xu H, Obrecht S, et al. Associations of Polypharmacy and Inappropriate Medications with Adverse Outcomes in Older Adults with Cancer: A Systematic Review and Meta-Analysis. The Oncologist. 2019;25(1):e94-e108.
43. Alkan A, Yaşar A, Karcı E, Köksoy EB, Ürün M, Şenler F, et al. Severe drug interactions and potentially inappropriate medication usage in elderly cancer patients. Support Care Cancer. 2017;25(1):229-36.