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Pattern of chemotherapy-related adverse effects among adult cancer patients treated at Gondar University Referral Hospital, Ethiopia: a cross-sectional study

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Background: Adverse drug reactions (ADRs) are a global problem and constitute a major clinical problem in terms of human suffering. The high toxicity and narrow therapeutic index of chemotherapeutic agents makes oncology pharmacovigilance essential. The objective of the present study was to assess the pattern of ADRs occurring in cancer patients treated with chemotherapy in a tertiary care teaching hospital in Ethiopia.

Methods: A cross-sectional study over a 2-year period from September 2013 to August 2015 was conducted on cancer patients undergoing chemotherapy at Gondar University Referral Hospital Oncology Center. Data were collected directly from patients and their medical case files. The reported ADRs were assessed for causality using the World Health Organization's causality assessment scale and Naranjo's algorithm. The severities of the reported reactions were also assessed using National Cancer Institute Common Terminology CTCAE version 4.0. The Pearson's chi-square test was employed to examine the association between two categorical variables.

Results: A total of 815 ADRs were identified per 203 patients included in the study. The most commonly occurring ADRs were nausea and vomiting (18.9%), infections (16.7%), neutropenia (14.7%), fever and/or chills (11.3%), and anemia (9.3%). Platinum compounds (31.4%) were the most common group of drugs causing ADRs. Of the reported ADRs, 65.8% were grades 3–4 (severe level), 29.9% were grades 1–2 (mild level), and 4.3% were grade 5 (toxic level). Significant association was found between age, number of chemotherapeutic agents, as well as dose of chemotherapy with the occurrence of grades 3–5 toxicity.

Conclusion: The high incidence of chemotherapy-related ADRs among cancer patients is of concern. Setting up an effective ADR monitoring and reporting system (onco-pharmacovigilance) and creating awareness among health care professionals regarding the importance of ADR reporting may help prevent the problem.

Keywords: adverse drug reactions, causality, chemotherapy, Ethiopia, pharmacovigilance

Introduction

Cancer is among the three leading causes of death in developing countries and the disease incidence is quickly increasing over time in those countries.[1] Once thought of as a "western" disease, cancer is an impending public health problem across the continent of Africa.[2] A globalization of unhealthy lifestyles, particularly cigarette smoking and the adoption of many features of the modern Western diet (high fat, low fiber content), along with increased life expectancy, are the major causes of higher incidence of cancer in developing countries.[3,4] For the treatment of cancer, various

modalities like surgery, chemotherapy, radiation therapy, immunotherapy, and monoclonal antibody therapy are used, and the choice of therapy depends on the location and grade of the tumor, the stage of the disease, and the general state of the patient.[5,6] The field of cancer chemotherapy has been revolutionized in the past few decades with curative treatment being discovered for formerly fatal malignancies.

Adverse drug reaction (ADR) is any undesirable effect of a drug beyond its anticipated therapeutic effects occurring during clinical use. The World Health Organization (WHO) defines an ADR as "any response to a drug, which is noxious, unintended and occurs at doses used in man for prophylaxis, diagnosis or therapy".[7] ADRs are identified as the fifth leading cause of death in the USA, with an estimated incidence of 6.7% among patients who died due to ADRs, and they constitute a major clinical problem in terms of human suffering and increased health care costs.[8] Antineoplastic agents are well studied and are extremely beneficial in cancer treatment, but they are used with caution due to their high toxicity and narrow therapeutic window.[9] Many of the adverse effects of antineoplastic agents are an extension of their therapeutic action disturbing all fast dividing cells, and antineoplastic agents have become one of the major causes of complications of cancer treatment that affect the patient's survival, treatment outcomes, and morbidity and mortality rates. ADRs are so common in oncology that they came around to being accepted as a foreseeable component of the cancer therapy.[10] Thus, onco-pharmacovigilance was developed for monitoring ADRs which are derived from different antineoplastic drugs.[11] Alopecia, nausea and vomiting, myelosuppression, cardiac toxicity, hemorrhagic cystitis, mucositis, hot flushes, electrolyte imbalance, and deep vein thrombosis are among some of the most common ADRs due to cancer chemotherapy.[12] In a study done regarding the preferred information sources and needs of Ethiopian cancer patients, the majority of respondents (63.3%) reported the side effects of chemotherapy and their management as the most important information only next to the diagnosis and stage of cancer,[13] and patients were not satisfied with the information provided to them. This may potentiate the occurrence of ADRs from chemotherapy as patients may not refrain from activities that would increase the likelihood and/or severity of ADRs. Taking into consideration the narrow therapeutic index of these drugs, early recognition of drug toxicity helps to amend the course of drug therapy to diminish toxic effects.[14] In Ethiopia, there is a paucity of data regarding the safety profile of cancer chemotherapy, largely owing to lack of an organized and efficient ADR monitoring and reporting program. The objective of the present study was to evaluate the pattern of ADRs occurring in cancer patients treated with chemotherapy in a tertiary care hospital in northern Ethiopia.

Materials and methods

Study setting and design

A cross-sectional study over a 2-year period from September 2013 to August 2015 was conducted on cancer patients undergoing chemotherapy at Gondar University Referral Hospital (GURH) Oncology Center. GURH is located in Gondar town, Northwest Ethiopia, 738 km away from Addis Ababa. It is one of the oldest teaching hospitals in the country with a range of specialists including pediatrics, surgery, gynecology, and psychiatry, and has a recently established oncology center which is the second oncology center established in the country and the only chemotherapy center located in the Amhara region.

Data collection and management

The data regarding ADRs were directly collected from patients and their case files and/or medical charts using the standard data collection format. During the study, those patients who had been diagnosed with any type of cancer, were 18 years or older, had at least 6 months duration of cancer diagnosis, developed at least one ADR during or after the treatment period, and had no other serious debilitating comorbidity were included in the study. Patients who developed ADR because of intentional or accidental poisoning (overdose) and those with a history of drug abuse were excluded from the study. Sociodemographic and clinical details of the patients were carefully recorded. Details of the medications given, the occurrence and nature of ADR, and any relevant laboratory investigation values were also noted. The reported ADRs were assessed for causality using both the WHO causality assessment scale and Naranjo's algorithm.[15,16] The WHO causality assessment scale determines the causal relationship of a suspected drug to the ADR in question, and causality is categorized into "certain", "probable", "possible", "unlikely", "conditional/unclassified", and "unassessable/unclassifiable". The Naranjo's Algorithm, a questionnaire designed by Naranjo et al, consists of 10 objective questions with three types of responses – yes, no, or do not know. The severities of the reported reactions were also assessed using National Cancer Institute Common Terminology CTCAE version 4.0 (CTCAE).[17]

Data entry, analysis, and interpretation

Data were cleaned, entered, and analyzed using SPSS version 20 statistical package. Descriptive analyses were performed to summarize patient, tumor, and treatment characteristics. The incidence of the specific categories (hematologic and

nonhematologic) and types of National Cancer Institute Common Terminology CTCAE version 4.0 (NCI CTCAE) grade 1–5 toxicity were calculated. The Pearson's chi-square test was employed to examine the association between two categorical variables.

Ethical considerations

Ethical approval and clearance were gained from the institutional review board of the College of Medicine and Health Sciences, University of Gondar, with the ethical approval number of UOG/508/2015. Permission was also obtained from the oncology ward of Gondar University Referral Hospital Oncology Center. All participants provided oral informed consent prior to conducting the study. Participants' information obtained from the questionnaires was kept confidential.

Results

Patient, tumor, and treatment characteristics

Of 384 patients who received chemotherapy during the study period, 203 case files developing ADRs were included in the study and analyzed**.** More than half of the patients (58.6%) were females and the rest (41.4%) were males, with a female to male ratio of 1.41:1. The mean age of patients was 43.3±18.4 years, and the majority of patients were 41–50 years of age (79 patients, 38.9%) or 31–40 years of age (42 patients, 20.7%). The most common types of cancer diagnosed in patients of both sexes were hematologic malignancies (39.9%; 22 Hodgkin's lymphoma, 46 non-Hodgkin's lymphoma, 9 Burkit's lymphoma, and 4 unspecified hematologic malignancies), breast cancer (33%), gynecologic malignancies (8.9%; 11 cervical and 7 ovarian cancers), and gastrointestinal malignancies (7.4%; 11 colorectal and 4 pancreatic cancers). Other sociodemographic and clinical characteristics of patients are depicted in Table 1.

Table 1 Patient, tumor, and treatment characteristics of cancer patients, GURH, Ethiopia (N=203)

Variables	Frequency (%)
Age, years	
18–30	23 (11.3)
31–40	42 (20.7)
41–50	79 (38.9)
51–60	28 (13.8)
>61	31 (15.3)
Sex	
Male	84 (41.4)
Female	119 (58.6)
Marital status	
Unmarried	32 (15.8)
Married	109 (53.7)
Separated, divorced	47 (21.1)
Widowed	15 (7.4)
Educational level	
Illiterate	65 (32.0)
Primary school	71 (35.0)
Secondary school	28 (13.8)
College and university	39 (19.2)
Occupational status	
Student	21 (10.3)
Manual laborer	61 (30.0)
Housewife	52 (25.6)
Government employee	37 (18.2)
Businessmen	32 (15.8)
Cancer type	
Hematologic malignancies	81 (39.9)
Lung cancer	9 (4.4)
Breast cancer	67 (33.0)
Gastrointestinal malignancies	15 (7.4)
Gynecologic malignancies	18 (8.9)
Others	13 (6.4)
Cancer stage	
Staging data available	137 (67.5)
Early (I and II)	51 (37.2)
Late (III and IV)	86 (62.8)
Treatment modality	
Chemotherapy only	141 (69.4)
Chemotherapy and surgery	92 (30.5)
Number of CT agents	
Monochemotherapy	31 (15.3)
Polychemotherapy	172 (84.7)
Number of CT cycles	
1st cycle	29 (14.3)
2nd cycle	47 (23.1)
3rd cycle	54 (26.6)
>3 cycle	73 (36.0)

Abbreviations: CT, chemotherapy; GURH, Gondar University Referral Hospital.

Types of adverse drug reactions

A total of 815 ADRs were identified and recorded in the study subjects. The most commonly occurring ADRs were nausea and vomiting (18.9%), infections (16.7%), neutropenia (14.7%), fever and/or chills (11.3%), and anemia (9.3%). Platinum compounds (cisplatin and carboplatin) (31.4%), nitrogen mustards (cyclophosphamide and ifosphamide) (28.1%), taxanes (21%), antimetabolites (5-fluorouracil) (11%) and antibiotics (doxorubicin) (3.2%) were the most common drugs causing ADRs.

Assessment of causality by WHO causality assessment scale indicated that 67.9% of the reactions were "probable" and 32% were "possible". There were no "certain" ADRs as re-challenge was not attempted in any of the patients. According to Naranjo's algorithm, 68.8% of the reactions were "probable" with a score ranging from 5 to 8 and 31.4% were "possible" with a score ranging from 1 to 4. The causality assessment of individual ADRs by both WHO causality assessment scale and Naranjo's algorithm is shown in Table 2.

The severity of the reported reactions was graded by using the NCI CTCAE. Accordingly, 70.1% of the reported ADRs (both hematologic and nonhematologic) were grades 3–5 (45.1% grade 3, 20.6% grade 4, and 4.3% grade 5) and the rest 29.9% were grades 1–2 (14.5% grade 1 and 15.5% grade 2). The most common grade 3–5 hematologic toxicities were neutropenia (14.7%) and anemia (9.3%), whereas the most common grades 3–5 nonhematologic toxicities were infection (16.7%), nausea and vomiting (18.9%), and thrombosis/embolism (4.8%) (Table 3). Most of the ADRs were identified in females in the >61 years of age group (38.1%), followed by males and females in the 51–60 years age group (24.4%) (Table 4). The proportion of grades 3–4 ADRs for the most common ADRs in the study population is also presented in Figure 1.

The association between patient characteristics and the occurrence of grades 3–5 ADRs was also evaluated by using chi-square test. Accordingly, significant association was found between age, dose, as well as number of chemotherapeutic agents with the occurrence of grades 3–5 toxicity (Table 5).

Discussion

Cancer chemotherapy often causes a host of side effects in the majority of cancer patients; these side effects are quite challenging for patients and providers to manage and often have a negative impact on quality of life.[18] Adequate

Table 2 Causality assessment scales, GURH, Ethiopia (N=203)

ADRs	Number of adverse drug reactions					
	WHO causality assessment scale			Naranjo algorithm		
	Possible	Probable	Total	Possible	Probable	Total
Anemia	5	71	76	0	76	76
Neutropenia	0	120	120	0	120	120
Thrombocytopenia	1	38	39	1	38	39
Nausea and vomiting	150	4	154	150	4	154
Fatigue/tiredness/anorexia	5	40	45	5	40	45
Alopecia	29	2	31	29	2	31
Diarrhea	15	0	15	15	0	15
Fever and/or chills	2	90	92	2	90	92
Infection	6	130	136	6	130	136
Electrolyte imbalance	9	0	9	9	0	9
Malnutrition	30	18	48	28	20	48
Dehydration	0	11	11	0	11	11
Thrombosis/embolism	9	30	39	9	30	39

Abbreviations: ADRs, adverse drug reactions; GURH, Gondar University Referral Hospital; WHO, World Health Organization.

Table 3 Treatment-related ADRs, GURH, Ethiopia (N=203)

Type of ADRs	Grades 1–2 (%)	Grades 3–4 (%)	Grade 1* (%)	Grade 2 (%)	Grade 3* (%)	Grade 4 (%)	Grade 5* (%)	Total (%)
Overall ADRs	244 (29.9)	536 (65.8)	118 (14.5)	126 (15.5)	368 (45.15)	168 (20.6)	35 (4.3)	815 (100)
Hematologic ADRs								
Anemia	21 (27.6)	55 (72.4)	8 (10.5)	13 (17.1)	46 (60.5)	9 (11.8)	0	76 (9.3)
Febrile neutropenia	0	111 (92.5)	0	0	62 (51.6)	49 (40.8)	9 (7.5)	120 (14.7)
Thrombocytopenia	13 (33.3)	26 (66.6)	7 (17.9)	6 (915.4)	15 (38.5)	11 (28.2)	0	39 (4.8)
Nonhematologic ADRs								
Fever and/or chills	81 (88)	11 (11.9)	69 (75)	12 (13)	7 (7.6)	4 (4.3)	0	92 (11.3)
Fatigue/tiredness/anorexia	8 (17.8)	37 (82.2)	0	8 (17.8)	29 (64.4)	8 (17.8)	0	45 (5.5)
Infection	25 (18.4)	93 (68.4)	0	25 (18.4)	51 (37.5)	42 (30.8)	18 (12.2)	136 (16.7)
Dehydration	2 (18.2)	9 (81.8)	0	2 (18.2)	7 (63.6)	2 (18.2)	0	11 (1.3)
Electrolyte imbalance	5 (55.5)	4 (44.5)	2 (22.2)	3 (33.3)	4 (44.4)	0	0	9 (1.1)
Malnutrition	19 (39.6)	29 (60.4)	8 (16.7)	11 (22.9	16 (33.3)	13 (27.1)	0	48 (5.9)
Nausea and vomiting	65 (42.2)	89 (57.8)	23 (14.9)	42 (27.3)	89 (57.8)	0	0	154 (18.9)
Diarrhea	5 (33.3)	10 (66.7)	1 (6.7)	4 (26.7)	7 (46.7)	3 (20)	0	15 (1.8)
Alopecia	0	31 (100)	0	0	16 (51.6)	15 (48.4)	0	31 (3.8)
Thrombosis/embolism	0	31 (79.5)	0	0	19 (48.7)	12 (30.7)	8 (20.5)	39 (4.8)

Note: *According to NCI CTCAE version 4.0.

Abbreviations: ADRs, adverse drug reactions; GURH, Gondar University Referral Hospital; NCI CTCAE version 4.0, National Cancer Institute Common Terminology CTCAE version 4.0

Table 4 Age and sex distribution of ADRs, GURH, Ethiopia (N=203)

Type of ADRs	Sex		Age, years (%)					Total (%)
	Male (%)	Female (%)	18–30	31–40	41–50	51–60	>61	
Overall ADRs	367 (40)	448 (55)	90 (11)	100 (12.3)	115 (14.1)	199 (24.4)	311 (38.1)	815 (100)
Anemia	35 (46)	42 (53.9)	12 (15.8)	9 (11.8)	12 (15.8)	16 (21)	27 (35.5)	76 (9.3)
Neutropenia	46 (38.4)	73 (61.7%)	18 (15)	22 (18.3)	20 (16.6)	28 (23.3)	32 (26.7)	120 (14.7)
Thrombocytopenia	28 (71.8)	11 (28.2)	3 (7.7)	8 (20.5)	9 (23.1)	10 (25.6)	9 (23.1)	39 (4.8)
Fever and/or chills	30 (32.6)	62 (37.4)	5 (5.4)	15 (16.3)	22 (23.9)	18 (19.6)	32 (34.8)	92 (11.3)
Fatigue/tiredness/anorexia	18 (40)	27 (60)	6 (13.3)	4 (8.9)	5 (11.1)	11 (24.4)	19 (42.2)	45 (5.5)
Infection	65 (47.8)	71 (52.2)	14 (10.3)	6 (4.4)	8 (5.9)	32 (23.5)	76 (55.9)	136 (16.7)
Dehydration	7 (63.6)	4 (36.4)	2 (18.2)	1 (9.1)	1 (9.1)	4 (36.4)	3 (27.3)	11 (1.3)
Electrolyte imbalance	8 (88.9)	1 (11.1)	1 (11.1)	0	2 (22.2)	4 (44.4)	2 (22.2)	9 (1.1)
Malnutrition	30 (62.5)	18 (37.5)	5 (10.4)	6 (12.5)	4 (8.3)	10 (20.8)	23 (47.9)	48 (5.9)
Nausea and vomiting	65 (42.2)	89 (57.8)	16 (10.4)	14 (9.1)	20 (13)	41 (26.6)	63 (40.9)	154 (18.9)
Diarrhea	9 (60)	6 (40)	1 (6.7)	4 (26.7)	2 (13.3)	3 (20)	5 (33.3)	15 (1.8)
Alopecia	13 (41.9)	18 (58)	6 (19.3)	5 (16.1)	7 (22.6)	4 (12.9)	9 (29)	31 (3.8)
Thrombosis/embolism	13 (33.3)	26 (66.7)	1 (2.6)	6 (15.4)	3 (7.7)	18 (46.1)	11 (28.2)	39 (4.8)

Abbreviations: ADRs, adverse drug reactions; GURH, Gondar University Referral Hospital.

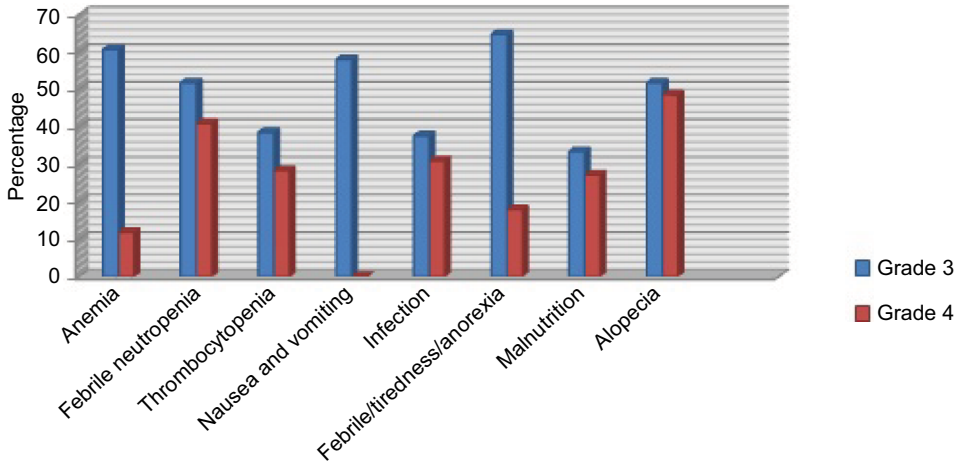

Figure 1 Proportion of grades 3–4 ADRs for the most common ADRs in the study population (n=203). According to NCI CTCAE version 4.0.
Abbreviation: ADRs, adverse drug reactions; NCI CTCAE version 4.0, National Cancer Institute Common Terminology CTCAE version 4.0.

management practices can prevent and mitigate this adverse effect and increase the quality of life of oncology patients.[19] Therefore, documentation and reporting of ADRs becomes a crucial element in clarifying the side-effect profile of a drug.[7] In this study, we evaluated the pattern of ADRs occurring in cancer patients receiving chemotherapy.

We found that the majority of patients were females (58.6%) among the 203 study participants, which is consistent with findings in other studies.[20] However, another study identified no difference between male and female in the incidence of ADRs.[21] The increased incidence of ADRs in females may be attributed to the alteration occurring in the pharmacokinetics of the drugs due to hormonal changes during different stages of life, like puberty and pregnancy. It may be also due to the inclusion of more females in the source population in this study. Adverse drug reactions occurred most often in the >61 years age group (38.15%) followed by the 51–60 years age group (24.4%). In general, the incidence of ADRs is higher in elderly patients, as found in other studies.[22,23] The reason could be that in elderly patients, the metabolizing capacity and the excretory functions are generally diminished, leading to accumulation of drugs in the body and thus increasing the risk of ADRs.[24,25] Nausea and vomiting (18.9%) were found to be the most common ADRs in our study. Two other studies also reported nausea and vomiting as the most common ADRs and two of the most worrisome side effects for patients.[26,27] Chemotherapy-induced nausea and vomiting (CINV) are the most common and troublesome adverse effects of cytotoxic chemotherapy and can greatly impact patients' quality of life.[28] As a result, CINV is one of the major reasons for disruption or delay in treatment, which is often due to patient noncompliance.[29] These drugs may induce vomiting by both

Table 5 Association between patient characteristics and occurrence of grades 3–5 ADR according to NCI CTCAE version 4.0, GURH, Ethiopia (N=203)

Variable	Patients (%)	No grade 3–5 toxicity (%)	Grades 3–5 toxicity (%)	*p*-value
Sociodemographics				
Age, years				
18–65	172 (84.7)	70 (40.7)	102 (59.3)	
>65	31 (15.3)	5 (16.1)	26 (83.7)	0.001
Tumor/treatment variables				
Cancer stage				
Early (I and II)	51 (37.2)	29 (58.9)	22 (43.1)	
Late (III and IV)	86 (62.8)	19 (22.1)	67 (77.9)	
Dose of chemotherapeutic agents				
Reduced	45 (22.2)	30 (66.7)	15 (33.3)	
Standard	158 (77.8)	9 (5.7)	149 (94.3)	0.015
No of chemotherapeutic agents				
Monochemotherapy	65 (32)	41 (63.1)	24 (36.9)	
Polychemotherapy	138 (68)	26 (18.8)	112 (81.1)	0.031
Laboratory variables				
Hemoglobin, g/dL				
≥10 (female), ≥11 (male)	117 (57.6)	63 (53.8)	54 (46.1)	
<10 (female), <11 (male)	86 (42.4)	39 (45.3)	47 (54.6)	0.675
Albumin, g/dL				
>3.6	140 (69)	76 (54.3)	64 (45.7)	
≤3.6	63 (31)	29 (46)	34 (54)	0.0891

Abbreviations: ADRs, adverse drug reactions; GURH, Gondar University Referral Hospital; NCI CTCAE version 4, National Cancer Institute Common Terminology CTCAE version 4.0.

a central action on the chemoreceptor trigger zone and a peripheral action on the gastrointestinal tract. The central nervous system plays a critical role in the path physiology of CINV, by receiving and processing a variety of emetic stimuli and then generating and sending efferent signals to a number of organs and tissues, which result in nausea and vomiting.[30] The higher incidence of CINV could also be due to the fact that in Ethiopia, the treatment of CINV is largely limited to 5-HT3 antagonists and steroids, as aprepitant and newer antiemetic and other supportive medications like myelopoetic growth factors are not yet available. This may contribute to the presence of prolonged and more severe CINV. The next most common ADRs reported in this study were infection (16.7%) and febrile neutropenia (14.7%). Some other studies also documented febrile neutropenia with or without infection as the most common ADR in cancer patients.[31] Infections in the immune compromised host as a result of cancer chemotherapy are an important problem in the present day-to-day treatment care, as they are associated with an increased incidence of neutropenic infectious complication, which in turn influences the outcome of the chemotherapeutic response, and thereby, morbidity and mortality in these patients.[32] Cytotoxic chemotherapy predictably suppresses the hematopoietic system, impairing the host's protective mechanisms. While destroying cancer cells, chemotherapy can also damage rapidly dividing cells of bone marrow, resulting in myelosuppression, thus affecting white blood cells, platelets, and red blood cells. The degree and duration of the neutropenia determines the risk of infection, and chemotherapy-induced neutropenia is associated with older age, less than five previous chemotherapy cycles, and disseminated disease.[33] Anemia is the next most commonly seen adverse effect (9.3%) in our study, which corroborates with a study done in northern India.[21] The incidence and severity of chemotherapy-related anemia depends on a variety of factors, including the type, schedule, and intensity of therapy administered and whether the patient has received prior myelosuppressive chemotherapy, radiation therapy, or both. Most of the patients who develop anemia are grades 3–5 according to NCI CTCAE version 4.0. Symptom severity depends on the degree of anemia, the type of underlying malignancy, and the patient's pulmonary and cardiovascular function.[34] Platinum compounds (31.41%), nitrogen mustards (28.1%), taxanes (21%), antimetabolites (11%), and antibiotics (3.2%) were the most common drugs causing ADRs, and cisplatin was a single antineoplastic agent causing toxicity. Similar studies also documented the same finding,[22,23] and some of the well-documented ADRs of cisplatin include nausea and vomiting.[35]

Tumor and treatment variables were also identified as risk factors for the development of ADRs. Receipt of polychemotherapy, taking a standard dose of chemotherapy, as well as the age of the patient were associated with

an increased risk of toxicity. Aging is associated with decreased bone marrow reserve and an increased risk of myelosuppressive-associated complications from chemotherapy.[24,25] The receipt of polychemotherapy further increases the risk of myelosuppressive effects from chemotherapy and resource requirements. Assessment of causality by WHO causality assessment scale indicated that 67.9% of the reactions were "probable" and 32% were "possible". According to Naranjo's algorithm, 68.83% of the reactions were "probable" with a score ranging from 5 to 8 and 31.4% were "possible", which is comparable with the study done in India.[36] Most of the reactions were of grades 3–4 severity which warrant stopping or changing of drug, and some of the ADRs even resulted in death (grade 5).

The limitation of the study was the sample size which is 203 that needs further study with huge participants and the medical records of some participant were not fully informative. Hence, there might be chances of under-reporting and incomplete documentation of data regarding ADRs in the patients' case files (medical records).

Conclusion

The present study showed that most of the patients receiving chemotherapy experienced one or more ADRs, and that females were found to be more susceptible to ADRs than males. Nausea and vomiting were the most common ADRs reported. The incidence of ADRs with chemotherapeutic drugs was higher than other medication therapies in Gondar referral hospital. Nevertheless, an early detection of these ADRs may help in minimizing the damage by either modifying the dose or changing the offending agent. Setting up an effective ADR monitoring and reporting system (onco-pharmacovigilance) and making adjunct and supportive therapies available including newer and more effective antiemetic agents is also recommended for the better management of ADRs. Future studies covering more patients from different regions and cancer centers may reveal additional data about risk factors, which will lead to advancement in the identification of patients at risk for ADRs.

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Disclosure

The authors report no conflicts of interest in this work.

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