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ORIGINAL RESEARCH

Incidence and Risk Factors of Chemotherapy-Induced Nausea and Vomiting Among Adult Cancer Patients at Mbarara Regional Referral Hospital: A Prospective Study

Patrick Kitheka Muasya[1,2], Tadele Mekuriya Yadesa[1,3], John Isiiko[1,4], Julius Kyomya[1], Joel Oenga[1,2], Abubakar Amina[1,2], Godwin Nimusiima[1], Sebisaalu Joel[1], John Martin Tumwebaza[1,5], Kabera Radiana Makuza[1]

[1]Department of Pharmacy, Faculty of Medicine, Mbarara University of Science and Technology, Mbarara City, Uganda; [2]Department of Pharmacy, Kiambu County Health Services, Thika City, Kenya; [3]Department of Clinical Pharmacy and Pharmacy Practice, School of Pharmacy, Kampala International University, Ishaka, Uganda; [4]Department of Pharmacy, Uganda Cancer Institute, Mbarara City, Uganda; [5]Department of Pharmacy, Faculty of Health Sciences, Victoria University, Kampala City, Uganda

Correspondence: Patrick Kitheka Muasya, Email patrikitheka@gmail.com

Background: Chemotherapy-induced nausea and vomiting (CINV) remains a significant and distressing adverse effect of cancer treatment, adversely affecting patients' quality of life. Despite well-established international guidelines for antiemetic prophylaxis, variability in CINV incidence and guideline adherence persists across different regions and healthcare settings, particularly in low- and middle-income countries (LMICs).

Objective: This study determined the incidence and associated factors of chemotherapy-induced nausea and vomiting (CINV) among adult cancer patients at Mbarara Regional Referral Hospital.

Methods: A prospective observational study was conducted among 237 adult cancer patients receiving chemotherapy at the Mbarara Regional Referral Hospital. The MASCC Antiemesis Tool (MAT) was used to assess acute nausea and vomiting (≤24 hours) and delayed nausea and vomiting (>24 hours to 5 days), as well as any chemotherapy-induced nausea and vomiting (CINV; nausea and/or vomiting). A 5-day follow-up using the MAT tool for acute (≤24hours) and delayed (>24hours–5 days) CINV was conducted.

Results: Among 237 participants, 66 (27.8%) and 136 (57.4%) experienced acute and delayed nausea, and 53 (22.4%) and 101 (42.6%) experienced acute and delayed vomiting; 67 (28.3%) and 136 (57.4%) had combined acute and delayed nausea and vomiting. Antiemetic prophylaxis guideline adherence was 73.4%, with 26.6% receiving non-guideline-compliant regimens. Independent associated factors for CINV were female sex (AOR = 2.0, 95% CI: 1.1–3.8; p = 0.026), moderate- (AOR = 21.2, 95% CI: 9.1–49.0; p < 0.001) and high-emetogenic chemotherapy (AOR = 22.6, 95% CI: 8.6–59.2; p < 0.001), and prior CINV (AOR = 6.1, 95% CI: 2.8–12.9; p < 0.001).

Conclusion: Over half of the participants experienced delayed chemotherapy-induced nausea and vomiting, while nearly one-third experienced acute CINV. Adherence to guidelines for antiemetic prophylaxis was high at 73.4%. Key identified associated factors included female gender, moderate to highly emetogenic potential of chemotherapy regimens, and a history of CINV in this study population.

Keywords: chemotherapy, associated factors, nausea, vomiting, incidence, cancer

Introduction

Cancer has become a leading public health burden and a primary cause of death globally, with an estimated 10 million deaths and 20 million new cases reported in 2022.[1] Projections suggest that by 2030, there will be approximately

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21 million new cancer cases annually.[2] In Uganda, Globocan 2022 data indicate 35,968 new cancer cases and 24,629 deaths, underscoring the growing burden of disease in this low- and middle-income country (LMIC) setting.[1]

Chemotherapy remains a cornerstone of cancer treatment, inhibiting cell proliferation and tumor growth and serving as first-line therapy for many malignancies.[3] Chemotherapeutic agents are used alone or in combination to achieve optimal therapeutic outcomes, yet they have narrow therapeutic indices and are associated with a wide spectrum of adverse drug reactions (ADRs), including nephrotoxicity, myelosuppression, oral mucositis, hepatotoxicity, hair loss, neuropathy, and chemotherapy-induced nausea and vomiting (CINV).[4] Among these, CINV is the most common and distressing ADR, affecting up to 40% of patients despite advances in antiemetic therapy.[5]

CINV refers to the occurrence of vomiting and the sensation of nausea following chemotherapy administration and is conventionally divided into acute (within 24 hours) and delayed (24 hours to 5 days) phases.[6] Acute and delayed CINV are commonly associated with highly emetogenic agents such as cisplatin, carboplatin, cyclophosphamide, and doxorubicin.[7] International guidelines recommend multi-drug regimens:-typically a 5-HT_3 receptor antagonist, dexamethasone, an NK1 receptor antagonist, and, more recently, olanzapine for highly emetogenic chemotherapy to prevent both acute and delayed CINV.[8] Effective management of CINV not only improves patients' quality of life but may also enhance treatment adherence and survival.[9]

Globally, the incidence of CINV is estimated at 48.5%, substantially affecting up to 70% of patients' quality of life.[10] Despite guideline-recommended antiemetic prophylaxis, many patients still experience CINV in at least 40% of cases in both the acute and delayed phases, representing an important unmet clinical need.[5] Delayed CINV, in particular, is increasingly recognized as a major challenge because it often persists beyond the first 24 hours, continues to disrupt daily functioning, and is frequently under recognized and undertreated.[11–13] Moreover, risk factors such as female sex, younger age, anxiety, history of CINV, and the emetogenic potential of chemotherapy regimens further compound the burden.[11,12,14]

In low-resource settings, including many oncology units in sub-Saharan Africa, effective CINV control is further constrained by limited access to modern antiemetics. In Uganda, drugs such as neurokinin-1 (NK1) receptor antagonists are often unavailable or inconsistently supplied, forcing clinicians to rely on simpler prophylactic regimens and, in some cases, non-guideline-compliant combinations.[15] This restricted availability affects both guideline adherence and real-world treatment outcomes, potentially contributing to higher rates of delayed CINV and reduced quality of life among patients who would otherwise benefit from optimal antiemetic coverage.[11,12,16]

Recent advances in supportive and adjunctive oncology care highlight the potential of natural bioactive compounds, including secoiridoids such as oleocanthal and oleuropein, which demonstrate chemopreventive and anticancer properties in preclinical models.[17–19] These compounds may offer complementary strategies to mitigate chemotherapy-related toxicity and improve tolerability, aligning with broader global efforts to strengthen supportive cancer care.[18,20] However, in practice, the implementation of such strategies remains constrained by resource limitations, particularly in LMIC settings such as Uganda.

This study aimed to determine the incidence and associated factors for chemotherapy-induced nausea and vomiting, with particular emphasis on delayed CINV, among adult cancer patients at the cancer unit of Mbarara Regional Referral Hospital in southwestern Uganda.

Materials and Methods

Study Design

A prospective-observational study was conducted among adult cancer patients attending the cancer unit of Mbarara Regional Referral Hospital. This prospective design was selected to establish temporality and minimize recall bias versus retrospective chart review, with feasibility consideration for single-center LMIC setting.

Study Setting

The study was conducted at the cancer unit of Mbarara Regional Referral Hospital, which is a government-owned referral hospital located in Mbarara city, approximately 268 km from Kampala, the capital city. The cancer unit of

MRRH consists of the pediatric and adult units. The adult unit has 18 beds, whereas the pediatric unit has about 20 beds. The unit offers both inpatient and outpatient services. The unit has two (2) medical oncologists, one (1) oncology pharmacist, one (1) pharmacist, and five (5) nurses.

Study Period

The study was conducted in the cancer unit of MRRH from December 2024 to February 2025.

Study Participants

All male and female adult patients who visited the cancer unit of MRRH.

The inclusion Criteria.

- Cancer patients aged 18 years and above.
- Patients who are currently receiving cancer chemotherapy.
- Patients with a confirmed cancer diagnosis.

The Exclusion criteria.

- Patients with other known history of Nausea and Vomiting.
- Patients who are unavailable or withdraw from the study within 5 days of monitoring.
- Patients with no contact address (telephone number) for remote monitoring.

Sample Size Calculation

Equation 1: A single population formula was used:

Fisher et al (1998). $n = Z^2P(1-P)/d^2$

where,

n = Minimum sample size required

Z^2= Standard normal variations at 95% confidence interval corresponding to 1.96

P = Estimated incidence = 71%[21] (Incidence of CINV in Ethiopia)

δ = absolute error = 5% = 0.05

The average incidence of Nausea and vomiting is 71%

d= precision is 5%,

$n= 1.96^2\times0.71(1–0.71)/0.05^2$ =316 + 10% Contingency=348 Cancer Patients

N=Total population 70x2x4=560Patients per month

nf = n/[1+ (n/N)]. Nf =348/1+(348/560) =215 +10% contingency.

N=237 Cancer adult patients.

Therefore, the post-hoc power calculation confirmed 87% power for primary outcome at observed prevalence.

A systematic sampling technique was used; on average, 560 patients visit the cancer unit of MRRH per month. Therefore, 560/237=2.36. Every 2nd patient to attend the clinic on clinic days was recruited to the study until the sample size was achieved. A unique identifier was used to avoid repeat recruitment on repeat clinic visits. However, this happened after the first participant was selected randomly between attendees number 1 and number 2.

Data Collection Procedure

The MASCC Antiemesis tool, developed and validated,[21] was adopted for data collection to ascertain the incidence and associated factors of CINV. The MASCC was translated into the local language, and it was administered by an interviewer who understands both the local and the English language. A structured data collection tool (Questionnaire) was developed to capture the patient's demographic details and clinical characteristics. Part 2 consists of a structured form designed to collect factors related to the disease and drug-related information from the patient's treatment file. Additional information and clarifications about some patients' medical details were obtained through interaction with

clinicians and nurses. Following patient enrollment, research assistants previously trained on ethical considerations administered the questionnaire to gather sociodemographic and clinical data, while the patient's chart was reviewed to extract relevant information about the disease and the drug prescribed. The Principal Investigator evaluated possible CINV through a review of the collected data and patient interaction. After obtaining informed consent, data were collected during clinic days, and the patients were followed up every day for five days to check for any actual occurrence of nausea, and vomiting using the MASCC Antiemesis tool.

Data Analysis

The raw data collected from the questionnaire were sorted out and cleaned using Microsoft Excel 19. Data was analyzed using Statistical Package for Social Sciences (SPSS), version 27. The socio-demographic and clinical characteristics of individuals were presented using descriptive statistics such as means and percentages. The incidence of nausea and/or vomiting was presented in percentages. Using a binary outcome for nausea and vomiting, with a yes response referring to experiencing at least one nausea or vomiting episode and a no response referring to having not experienced any nausea or vomiting episode. This was computed by dividing the number of patients who had nausea and /or vomiting by the total number of patients in the study, and then expressing the result as a percentage (%). Binary logistic regression was used to determine the association between independent and dependent variables, and variables with a p-value <0.25 were adopted for multivariate analysis and determined at a 95% level of confidence, and variables with a p-value <0.05 were considered significant in the multivariate analysis.

Results

Socio-Demographic Characteristics of the Study Participants

A total of 237 adult patients with cancer receiving chemotherapy treatment were enrolled in the study and considered for final analysis. The majority were male (143, 60.3%) with a mean age of 57.2 ± 16.2 years. Regarding education, 174 (73.4%) had a primary education at most, while only 29 (12.2%) had completed tertiary education. Most (182, 76.8%) were not employed as shown in (Table 1).

Clinical Characteristics of the Study Participants

The majority of the participants had advanced stages of cancer, with 85 (35.9%) in Stage 3 and 122 (51.5%) in Stage 4. About 82 (34.6%) participants had a comorbid condition alongside their cancer diagnosis as shown in (Table 2).

The most common cancer diagnosis among the study participants was prostate cancer, 51 (21.5%), followed by breast cancer, 37 (15.6%), and esophageal cancer, 26 (11.0%) as shown in Figure 1.

The frequency of the most common comorbid condition among the study participants was HIV, affecting 39 (16.5%) individuals. Hypertension was the second most prevalent condition, reported in 31 (13.1%) participants, followed by diabetes mellitus, reported in 9 (3.8%) participants as shown in (Figure 2).

Medication Information Characteristics of the Study Participants

About 94 (39.7%) participants received moderate emetogenicity agents (30–90% risk of vomiting), while 57 (24.1%) received high emetogenicity agents (>90% risk of vomiting). However, 97 (40.9%) of participants reported the unavailability of prescribed antiemetics at the clinic. Additionally, 118 (49.8%) reported using herbal medications. Taxanes were the most frequently used agents, 96 (21.2%), followed by Platinum analogs, 90 (19.9%) as shown in (Table 3).

Incidence of Chemotherapy-Induced Nausea and Vomiting

About 66 (27.8%, 95% CI: 26.2–39.1) participants experienced nausea within 24 hours after treatment with chemotherapy, and 136 (57.4%, 95% CI: 51.1–63.6) experienced delayed nausea. Additionally, 53 (22.4%, 95% CI: 16.9–28.2) participants experienced vomiting within 24 hours after treatment with chemotherapy, and 101 (42.6%, 95% CI: 36.7–48.7) participants experienced delayed vomiting (after 24 hours) up to 4 days from the time of treatment initiation as shown in (Table 4).

Table 1 Socio-Demographic Characteristics of Adult Patients with Cancer on Chemotherapy at the Oncology Unit of Mbarara Regional Referral Hospital

Variable	Category	Frequency	Percentage (%)
Age Mean ± SD (57.2 ± 16.2)	Young adults (18–39 years)	35	14.8
	Middle-aged adults (40–59 years)	90	38.0
	Older adults (60+ years)	112	47.2
Gender	Male	143	60.3
	Female	94	39.7
Education level	No formal education	74	31.2
	Primary	100	42.2
	Secondary	34	14.2
	Tertiary	29	12.2
Employment status	Employed	55	23.2
	Not employed	182	76.8
Body mass index (BMI)	Underweight	54	22.8
	Normal	122	51.5
	Overweight	43	18.1
	Obese	18	7.6
Body surface area (BSA)	Small	70	29.5
	Normal	155	65.4
	Large	12	5.1

Table 2 Clinical Characteristics of Adult Patients with Cancer on Chemotherapy at the Oncology Unit of Mbarara Regional Referral Hospital

Variable	Category	Frequency	Percentage (%)
Stage of cancer	Stage 1	4	1.7
	Stage 2	26	11.0
	Stage 3	85	35.9
	Stage 4	122	51.5
Presence of a comorbid condition	No	155	65.4
	Yes	82	34.6
History of smoking	No	165	69.6
	Yes	72	30.4
Alcohol consumption	No	98	41.4
	Yes	139	58.6

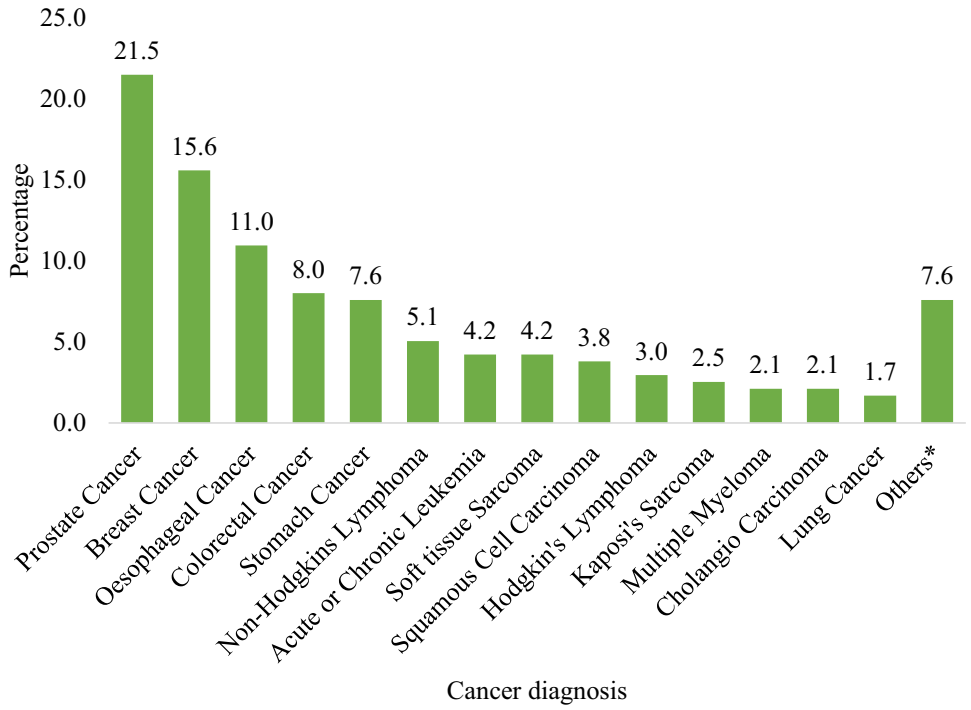

Figure 1 Common Cancer diagnosis among patients receiving chemotherapy at cancer unit of Mbarara Regional Referral Hospital. * Number of cases (n) for each malignancy: Ovarian cancer (2), Urethral neoplasm (2), Thyroid cancer (2), GEJ adenocarcinoma (3), Gall bladder cancer (2), Parotid cancer (1), Gestational Trophoblastic Neoplasia (3), Cancer of the Foot (1), Uterine sarcoma (2).

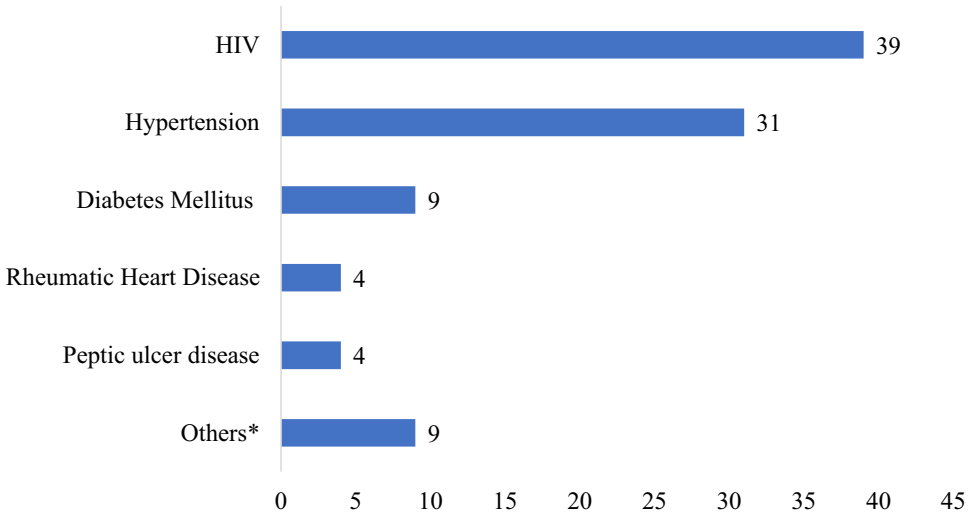

Figure 2 The frequency of the most common comorbid condition among the study participants with cancer attending Cancer unit of Mbarara Regional Referral Hospital. * Number of reported cases (n) for each condition: TB (3), Asthma (2), Hepatitis B (2), Epilepsy (1), Heart failure (1).

Appropriateness of Chemotherapy-Induced Nausea and Vomiting Prophylaxis Regimens

Among the 237 study participants undergoing chemotherapy, 174 (73.4%) patients received antiemetic prescriptions that adhered to established guidelines or protocols. In contrast, a significant number (63, 26.6%) of participants did not receive appropriate antiemetics according to the recommended guidelines, as shown in (Table 5).

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Table 3 Medication Information of the Adult Patients with Cancer at the Oncology Unit of Mbarara Regional Referral Hospital

Variable	Category	Frequency
Level of emetogenicity of chemotherapy agent	Minimal (<10% risk)	14
	Low (10–30% risk)	72
	Moderate (30–90% risk)	94
	High (>90% risk)	57
Availability of prescribed antiemetics at the clinic	No	97
	Yes	140
Current use of herbal medication	No	119
	Yes	118
Class of chemotherapy N=452	Platinum analogs	90
	Taxanes	96
	Antimetabolites	85
	Alkylating agents	50
	Anthracyclines (Antibiotics)	39
	GnRH agonists	43
	Vinca alkaloids	19
	Topoisomerase I and 2 inhibitors	9
	Monoclonal antibodies	18
	Tyrosine kinase inhibitors	3

Table 4 Cumulative Incidence of Chemotherapy-Induced Acute and Delayed Nausea and Vomiting Among Adult Patients with Cancer at the Oncology Unit of Mbarara Regional Referral Hospital

Symptom	Timing	Frequency(n)	Percentage (%)
Nausea	Acute (0–24hours)	66	27.8
Nausea	Delayed (>24-120hours)	136	57.4
Vomiting	Acute ((0–24hours)	53	22.4
Vomiting	Delayed (>24-120hours)	101	42.6

Notes: Data are presented as frequency (n) and percentage (%).

Risk Factors of Acute Chemotherapy- Induced Nausea and/or Vomiting

The association of independent variables with chemotherapy-induced nausea and/or vomiting was investigated using both bivariate and multivariate logistic regression techniques. At bivariate logistic regression analysis, female gender (cOR = 2.9, 95% CI: 1.6–5.2; p-value < 0.001), obesity (cOR = 2.8, 95% CI: 1.0–7.7; p-value = 0.044), receiving a moderately emetogenic chemotherapy (MEC) (cOR = 6.7, 95% CI: 2.8–16.1; p-value < 0.001), receiving a highly emetogenic chemotherapy (HEC) (cOR = 8.8, 95% CI: 3.5–22.4; p-value < 0.001), and a previous history of chemotherapy induced

Table 5 Appropriateness of Chemotherapy-Induced Nausea and Vomiting Prophylaxis Regimens Based on MASCC/ESMO 2023 Guideline (Adapted by Cancer Unit of MRRH)

Appropriateness of CINV Prophylaxis Regimens	Frequency (n)	Percentage (%)
Adherence to MASCC/ESMO guidelines	174	73.4
Non-adherence to MASCC/ESMO	63	26.6

Abbreviations: CINV, Chemotherapy-Induced Nausea and Vomiting; MASCC, Multinational Association of Supportive Care in Cancer; ESMO, European Society for Medical Oncology.

nausea and vomiting (cOR = 2.9, 95% CI: 1.6–5.2; p-value < 0.001) were associated with acute chemotherapy-induced nausea and vomiting (CINV).

At multivariate logistic regression, four factors remained independently significantly associated with acute CINV. Female participants had about 2.0 times higher odds of experiencing acute CINV (aOR = 2.0, 95% CI: 1.1–3.8; p-value = 0.026) compared to males. Patients receiving moderate emetogenic chemotherapy had 5.7 times higher odds of experiencing acute CINV (aOR = 5.7, 95% CI: 2.3–14.0; p-value < 0.001) compared to those receiving minimal or low emetogenic chemotherapy. Similarly, patients receiving highly emetogenic chemotherapy had 6.6 times higher odds of developing acute CINV (aOR = 6.6, 95% CI: 2.5–17.4; p-value < 0.001) compared to those on minimal or low emetogenic chemotherapy. Additionally, participants with a previous history of chemotherapy- induced nausea and vomiting had 2.3 times higher odds of experiencing acute CINV (aOR = 2.3, 95% CI: 1.2–4.4; p-value = 0.009) compared to those without a history of nausea and vomiting as shown in (Table 6).

Risk Factors of Delayed Chemotherapy- Induced Nausea and/or Vomiting

Bivariate logistic regression analysis revealed that middle age (cOR = 1.9, 95% CI: 1.1–3.3; p-value = 0.030), female gender (cOR = 2.7, 95% CI: 1.5–4.6; p-value < 0.001), alcohol consumption (cOR = 1.5, 95% CI: 0.9–2.6; p-value = 0.049), antiemetics prescribed after 24 hours of chemotherapy (cOR = 5.0, 95% CI: 2.1–11.8; p-value < 0.001), moderate emetogenic chemotherapy (cOR = 15.2, 95% CI: 7.3–31.5; p-value < 0.001), highly emetogenic chemotherapy (cOR = 20.5, 95% CI: 8.6–49.2; p-value < 0.001), and a history of chemotherapy induced nausea and vomiting (cOR = 4.4, 95% CI: 2.5–7.7; p-value < 0.001) were significantly associated with delayed CINV.

In the multivariate logistic regression analysis, three factors remained significantly associated with delayed CINV. Patients receiving moderate emetogenic chemotherapy had 21.2 times higher odds of experiencing delayed CINV (aOR = 21.2, 95% CI: 9.1–49.0; p-value < 0.001) compared to those receiving minimal or low emetogenic chemotherapy. Similarly, patients receiving highly emetogenic chemotherapy had 22.6 times higher odds of developing delayed CINV (aOR = 22.6, 95% CI: 8.6–59.2; p-value < 0.001) compared to those on minimal or low emetogenic chemotherapy. Additionally, participants with a previous history of chemotherapy-induced nausea and vomiting had 6.1 times higher odds of experiencing delayed CINV (aOR = 6.1, 95% CI: 2.8–12.9; p-value < 0.001) compared to those without such a history of CINV as shown in (Table 7).

Discussion

The study found that 28.3% of patients experienced acute CINV within 24hours after chemotherapy. This incidence is comparable to or slightly lower than rates reported in several high-income and middle-income countries, such as Brazil (29.2%) and the United States (35%), suggesting that, for the acute phase, our practice closely approximates international norms where guideline-based prophylaxis is more consistently implemented.[22–25] However, our acute CINV rate is lower than those described in India (42.7%), China (55.3%), Ethiopia (50.5%), and Jordan (57.8%), where real-world adherence to modern antiemetic guidelines can be variable and local formularies may differ.[26–29] Conversely, acute CINV in our setting was higher than in some European and East Asian countries (Spain, 9.4%; Japan, 6.8%), where triple-drug prophylaxis (including NK1 antagonists and olanzapine) is more routinely used for highly and moderately

Table 6 Bivariate and Multivariate Logistic Regression of the Factors Associated with Acute Chemotherapy-Induced Nausea and Vomiting Among Adult Patients with Cancer at Mbarara Regional Referral Hospital

Exposure variable		**Acute CINV n (%)**		**COR (95% C.I)**	***p*-value**	**AOR (95% C.I)**	***p*-value**
Variable	**Category**	**No**	**Yes**				
Age	Young adults	24 (68.6)	11 (31.4)	1			
	Middle age	59 (65.6)	31 (34.4)	1.1 (0.5–2.6)	0.749		
	Older age	87 (77.7)	25 (22.3)	0.6 (0.3–1.5)	0.277		
Gender	Male	115 (80.4)	28 (19.6)	1		1	
	Female	55 (58.5)	39 (41.5)	2.9 (1.6–5.2)	<0.001*	2.0 (1.1–3.8)	**0.026**
Body mass index (BMI)	Normal	90 (73.8)	32 (26.2)	1		1	
	Underweight	37 (68.5)	17 (31.5)	1.3 (0.6–2.6)	0.474	1.2 (0.6–2.6)	0.657
	Overweight	34 (79.1)	9 (20.9)	0.7 (0.3–1.7)	0.490	0.5 (0.2–1.4)	0.206
	Obesity	9 (50.0)	9 (50.0)	2.8 (1.0–7.7)	0.044*	2.9 (0.8–10.1)	0.102
Education level	No formal education	58 (78.4)	16 (21.6)	1		1	
	Primary	70 (70.0)	30 (30.0)	1.6 (0.8–3.1)	0.217*	1.8 (0.8–4.0)	0.158
	Secondary	21 (61.8)	13 (38.2)	2.2 (0.9–5.4)	0.074*	1.9 (0.7–5.2)	0.221
	Tertiary	21 (72.4)	8 (27.6)	1.4 (0.5–3.7)	0.521	1.2 (0.4–3.7)	0.727
Employment	No	130 (71.4)	52 (28.6)	1.1 (0.5–2.1)	0.851		
	Yes	40 (72.7)	15 (27.3)	1			
Smoking	No	117 (70.9)	48 (29.1)	1.1 (0.6–2.1)	0.671		
	Yes	53 (73.6)	19 (26.4)	1			
Alcohol consumption	No	67 (68.4)	31 (31.6)	1.2 (0.7–2.1)	0.335		
	Yes	103 (74.1)	36 (25.9)	1			
Herbal medicine use	No	83 (69.7)	36 (30.3)	1.2 (0.7–2.1)	0.496		
	Yes	87 (73.7)	31 (26.3)	1			
Comorbid conditions	No	112 (72.3)	43 (27.7)	1			
	Yes	58 (70.7)	24 (29.3)	1.1 (0.6–1.9)	0.804		
Availability of antiemetics	No	65 (67.0)	32 (33.0)	1.5 (0.8–2.6)	0.180*	1.3 (0.6–2.5)	0.508
	Yes	105 (75.0)	35 (25.0)	1		1	
Level of emetogenicity	Minimal/LEC	79 (91.9)	7 (8.1)	1		1	
	MEC	59 (62.8)	35 (37.2)	6.7 (2.8–16.1)	<0.001*	5.7 (2.3–14.0)	**<0.001**
	HEC	32 (56.1)	25 (43.9)	8.8 (3.5–22.4)	<0.001*	6.6 (2.5–17.4)	**<0.001**
History of CINV	No	105 (81.4)	24 (18.6)	1		1	
	Yes	65 (60.2)	43 (39.8)	2.9 (1.6–5.2)	<0.001*	2.3 (1.2–4.4)	**0.009**

Notes: *Variables included in multivariate regression analysis; Bold, variables that remained statistically significant at multivariate regression.
Abbreviations: HEC, Highly Emetogenic Chemotherapy; MEC, Moderately Emetogenic Chemotherapy; LEC, Low Emetogenic Chemotherapy; COR, Crude odds ratio; AOR, adjusted odds ratio; CI, Confidence interval.

Table 7 Bivariate and Multivariate Logistic Regression of the Factors Associated with Delayed Chemotherapy-Induced Nausea and Vomiting Among Adult Patients with Cancer at Mbarara Regional Referral Hospital

Exposure Variable		Delayed CINV n (%)		COR (95% C.I)	*p*-value	AOR (95% C.I)	*p*-value
Variable	**Category**	**No**	**Yes**				
Age	Young adults	12 (34.3)	23 (65.7)	2.0 (0.9–4.4)	0.089*	1.7 (0.5–6.1)	0.408
	Middle age	32 (35.6)	58 (64.4)	1.9 (1.1–3.3)	0.030*	0.478	0.842
	Older age	57 (50.9)	55 (49.1)	1		1	
Gender	Male	74 (51.7)	69 (48.3)	1		1	
	Female	27 (28.7)	67 (71.3)	2.7 (1.5–4.6)	<0.001*	1.1 (0.5–2.7)	0.777
BMI	Normal	58 (47.5)	64 (52.5)	1		1	
	Underweight	19 (35.2)	35 (64.8)	1.7 (0.9–3.2)	0.129*	1.3 (0.6–3.1)	0.492
	Overweight	15 (34.9)	28 (65.1)	1.7 (0.8–3.4)	0.153*	1.8 (0.7–4.7)	0.250
	Obesity	9 (50.0)	9 (50.0)	0.9 (0.3–2.4)	0.845	0.6 (0.1–2.8)	0.550
Education level	No formal education	35 (47.3)	39 (52.7)	1		1	
	Primary	46 (46.0)	54 (54.0)	1.1 (0.6–1.9)	0.865	1.1 (0.5–2.5)	0.831
	Secondary	10 (29.4)	24 (70.6)	2.2 (0.9–5.1)	0.083*	2.0 (0.6–7.0)	0.289
	Tertiary	10 (34.5)	19 (65.5)	1.7 (0.7–4.2)	0.241*	0.8 (0.2–2.6)	0.732
Employment	No	80 (44.0)	102 (56.0)	1			
	Yes	21 (38.2)	34 (61.8)	1.3 (0.7–2.4)	0.448		
Smoking	No	70 (42.4)	95 (57.6)	1.0 (0.6–1.8)	0.928		
	Yes	31 (43.1)	41 (56.9)	1			
Alcohol consumption	No	36 (36.7)	62 (63.3)	1.5 (0.9–2.6)	0.125*	2.0 (1.0–4.2)	0.05
	Yes	65 (46.8)	74 (53.2)	1		1	
Herbal medicine use	No	54 (45.4)	65 (54.6)	1			
	Yes	47 (39.8)	71 (60.2)	1.3 (0.7–2.1)	0.388		
Comorbid conditions	No	68 (43.9)	87 (56.1)	1			
	Yes	33 (40.2)	49 (59.8)	1.2 (0.7–2.0)	0.591		
Antiemetics prescribed after 24 hours	No	94 (48.7)	99 (51.3)	1		1	
	Yes	7 (15.9)	37 (84.1)	5.0 (2.1–11.8)	<0.001*	1.3 (0.4–3.8)	0.669
Availability of antiemetics	No	37 (38.1)	60 (61.9)	1.4 (0.8–2.3)	0.247		
	Yes	64 (45.7)	76 (54.3)	1			
Level of emetogenicity	Minimal/LEC	70 (81.4)	16 (18.6)	1		1	
	MEC	21 (22.3)	73 (77.7)	15.2 (7.3–31.5)	<0.001*	21.2 (9.1–49.0)	**<0.001**
	HEC	10 (17.5)	47 (82.5)	20.5 (8.6–49.2)	<0.001*	22.6 (8.6–59.2)	**<0.001**
History of CINV	No	75 (58.1)	54 (41.9)	1		1	
	Yes	26 (24.1)	82 (75.9)	4.4 (2.5–7.7)	<0.001*	6.1 (2.8–12.9)	**<0.001**

Notes: *Variables included in multivariate regression analysis; Bold, variables that remained statistically significant at multivariate regression.

Abbreviations: HEC, Highly Emetogenic Chemotherapy; MEC, Moderately Emetogenic Chemotherapy; LEC, Low Emetogenic Chemotherapy; COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval.

emetogenic regimens.[11,17,18] These differences likely reflect context-specific factors such as patient characteristics, chemotherapy emetogenicity, and differences in guideline adherence and drug availability.

More striking was the finding that (57.4%) of patients experienced delayed CINV occurring more than 24 hours up to 5 days after chemotherapy. This is broadly consistent with reports from China (62.3%) and Japan (57.9%), which also describe high delayed CINV burdens despite guideline-recommended prophylaxis.[20,28,30] However, our rate is lower than India (76.4%), Ethiopia (65.5%), and Jordan (71.4%), where real-time monitoring of CINV and antiemetic optimization may be limited.[27,29,31,32] In contrast, delayed CINV in our cohort was higher than that reported in Spain (21.7%) and Japan (37.4%), where NK1 antagonists and other advanced antiemetic regimens are more widely available.[16,18,20] In our setting, delayed CINV was likely driven by interrelated factors such as the frequent use of moderately and highly emetogenic chemotherapy (eg., cisplatin, carboplatin, doxorubicin), partial or inconsistent implementation of delayed-phase antiemetic prophylaxis, and limited access to NK1 receptor antagonists for high-risk regimens.[32,33] These structural constraints help explain why delayed CINV remains a major unmet clinical need in our unit, even when acute CINV rates appear relatively moderate.

Adherence to MASCC/ESMO 2023 guideline was (73.4%) which is comparable to rates reported in Iran (71.2%) and Korea (74.3%), suggesting that guideline-informed antiemetic practice in well-structured oncology units can converge within a similar range globally.[13,19] However, our adherence rate was considerably higher than those in Yemen (23.9%), Nigeria (17.6%), and parts of China (21.5%), where international antiemetic guidelines may not be systematically adopted or enforced.[28,34,35] In our cohort, (26.6%) of patients received non-guideline-compliant antiemetic prophylaxis mainly due to: antiemetic prophylaxis not being given at all (9.5%), incorrect dosing frequency (11.1%), initiation beyond the recommended 24-hour window (34.9%), and unnecessary antiemetic prescriptions (44.4%). Compared with other settings—such as South Africa (90% non-adherence) and Brazil (78%)—our non-adherence was lower, but still clinically significant.[36,37] Local non-adherence appeared to reflect both under-use (eg., omission of corticosteroids or delayed-phase coverage) and over-use (eg., unnecessary NK1-like or corticosteroid prescriptions when not indicated), echoing patterns described in European oncology practices where guideline deviations involved misplaced confidence in single antiemetic agents and inappropriate duplication of corticosteroids.[8,36,38] In our resource-limited environment, this suggests that improving adherence will require not only drug availability but also clinicians to be trained on both guideline-based and guideline-adapted protocols.

Multivariate analysis showed that acute CINV was independently associated with female sex (AOR = 2.0, 95% CI: 1.1–3.8; p = 0.026). This aligns with wider literature indicating that women are more susceptible to chemotherapy-induced nausea and vomiting, possibly due to hormonal and pharmacokinetic factors, though the association was statistically significant only for acute CINV in this model and not for delayed CINV.[1,39,40] The emetogenic potential of chemotherapy was even more strongly associated with both acute and delayed CINV. Patients receiving moderate or highly emetogenic chemotherapy had substantially higher odds of acute CINV (AOR = 5.7 and 6.6, respectively) and dramatically higher odds of delayed CINV (AOR = 21.2 and 21.6, respectively compared with those on minimal or low-emetogenic regimens.[41–43] This near-equivalent magnitude for moderate and high emetogenic agents suggests that current prophylaxis for moderate-risk regimens may be suboptimal, supporting calls for more aggressive guideline-based regimens in such cases.[30,38]

The finding that prior CINV history was strongly associated with delayed CINV (AOR = 6.1, 95% CI: 2.8–12.9; $p < 0.001$) has important clinical implications: patients who previously experienced CINV should be considered high-risk and offered intensified, multi-drug prophylaxis, including adequate delayed-phase coverage if available. At the neuro-pharmacological level, acute CINV is primarily driven by 5-HT_3 receptor activation via serotonin released from gut enterochromaffin cells, which explains the effectiveness of 5-HT_3 receptor antagonists (eg., ondansetron, palonosetron) in acute prophylaxis.[42,44] In our setting, where NK1 antagonists are often unavailable, this biological framework helps explain the high delayed CINV burden and underscores the need for alternative strategies such as ensuring proper corticosteroid sequences, better dosing of 5-HT_3 drugs, and advocacy for access to NK1-based or NEPA-type combinations in high-risk patients.[43]

Limitations of the Study

The study was conducted at a single center which may limit generalizability to other regions of Uganda or low middle-income countries with different drug availability. Some important confounders such as chemotherapy cycle number, specific agents, and some patient-level factors were not fully captured.

Strengths of the Study

The strength of the study is the first systematic assessment of CINV incidence, risk factors, and guideline adherence among adult cancer patients at Mbarara Regional Referral Hospital, providing locally relevant evidence in a resource-limited Ugandan oncology setting. The prospective observational design and use of a validated tool (MASCC Antiemesis Tool) also enhance the reliability of CINV ascertainment. This study fills critical gap (no prior Uganda CINV data).

Conclusion

Over half of the participants receiving chemotherapy at the MRRHCU experienced delayed chemotherapy-induced nausea and vomiting, while nearly one-third experienced acute CINV. Adherence to guidelines for antiemetic prophylaxis was high at 73.4%, but significant gaps persist, with 26.6% of patients not receiving guideline-compliant therapy. Key identified associated factors included female gender, moderate to highly emetogenic potential of chemotherapy regimens, and a history of CINV. Differences in CINV incidence and guideline adherence between this and other settings reflect variability in clinical practice. Improve access to recommended antiemetics, particularly NK1 receptor antagonists, and strengthen prescribing audits to assess compliance with guidelines. These first Uganda CINV data reveal persistent delayed -phase failure (57.4%) despite moderate adherence (73.4%), primarily due to NK1 antagonist absence which is a modifiable LMIC barrier.

Abbreviations

ADR, Adverse Drug Reactions, CINV-Chemotherapy Induced Nausea and Vomiting, ESMO-European Society of Medical Oncology, HEC- Highly Emetogenic Chemotherapy, HIV-Human Immunodeficiency Virus, MASCC-Multinational Association of Supportive Care in Cancer, MEC-Moderately Emetogenic Chemotherapy, MRRH-Mbarara Regional Referral Hospital, NK1-Neurokinin 1.

Data Sharing Statement

The dataset is available for sharing upon reasonable request to the corresponding author.

Ethical Approval and Consent to Participate

This study was carried out in accordance with the Helsinki Declaration. Research approval was obtained from the Mbarara University faculty research ethics committee before commencing the study. Ethical approval was obtained from the MUST Research and Ethics Committee Institutional Review Board (IRB) approval number (MUST-2024-1800). The request and approval of the study facility were obtained from relevant authorities at Mbarara Regional Referential Hospital. Full consent was obtained from the participants prior to the study on a voluntary basis and with the right to withdraw any time during the study. For data confidentiality, unique patient identifiers, rather than patient names were used, and the data were accessible only to the principal researcher and research assistants. With softcopies being password protected and hard copies kept under lock and in key in a secured cupboard.

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Author Contributions

All authors made a significant contribution to the work reported, whether in the conception, study design, execution, acquisition of data, analysis and interpretation or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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