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Original Article

Assessment of Drug Utilization Pattern of Chemotherapeutic Agents and its Cost Analysis in a Day Care Unit of a Tertiary Care Hospital: An Observational Study

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Abstract

Background

Cancer remains a leading cause of mortality worldwide, with increasing incidence and significant treatment costs, particularly in developing countries like Nepal. Main objective of this study is to evaluate the utilization pattern and cost assessment of chemotherapeutic agents among cancer patients at Birat Medical College Teaching Hospital, Nepal.

Materials and Methods

A cross-sectional study was conducted from 26 May to 26 Oct 2024, enrolling 153 cancer patients receiving chemotherapy in a tertiary care hospital in Eastern Nepal. Data on demographics, cancer types, prescribed anticancer medications and associated costs were collected. It was analyzed using descriptive statistics and WHO prescribing indicators.

Results

The majority number of patients were female 35 (22.87%) aged between 60-69 years. Breast 26 (16.99%) and lung cancer 25 (16.33%) were the most prevalent. Alkylating agents, antimetabolites and taxanes were the most frequently prescribed drugs. The average number of medications per prescription was 5.29, with chemotherapeutic agents constituting 1.82% and antibiotics 0.01%. Approximately 76.50% of drugs were prescribed by generic name, and 82.86% were from the National Essential Medicine list. The average daily cost of chemotherapy was NPR 927865 (62$).

Conclusion

Breast and lung cancer were most common in the age groups 60–69 years. Chemotherapy predominantly involved alkylating agents, antimetabolites, and taxanes. Monoclonal antibodies were less frequently used but highly expensive. Prescribing practices largely followed rational drug-use indicators.

Keywords: *Cancer, Chemotherapy, Prescription, Nepal*

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Introduction

Cancer is one of the major public health concerns among the leading causes of mortality globally [1]. The estimated incidence of new cancer cases was 14.1 million and will be rising to 19.3 million by 2025, so as in Nepal [2]. It will create serious health and economic challenges. Chemotherapy is one of the main methods used in cancer treatment, and its careful prescribing is essential for improving patient survival and quality of life [3,4].

In Nepal, cancer treatment places a financial burden on patients due to high drug costs and limited government support. There are limited studies regarding assessment of prescribing pattern and treatment costs. The estimated cost of cancer treatment at a government hospital is approximately US$68.22, significantly lower than US$200–250 by private hospitals [5, 6]. Pharmacoeconomic research plays a critical role in guiding healthcare providers toward developing cost-effective treatment protocols [7].

Assessing the use pattern and expensive nature of chemotherapeutic agents is essential to promote rational and cost-effective therapy [6]. Drug utilization studies based on WHO prescription indicators help to find out the irrational drugs use [8]. Therefore, the present study was conducted to evaluate utilization pattern and cost of chemotherapeutic agents in a tertiary care hospital.

Material and Methods

This is an observational, cross-sectional descriptive study conducted in the Oncology Department of Birat Medical College Teaching Hospital (BMCTH), Morang, Nepal. The study was carried out over a period of five months, from 26 May to 26 Oct 2024. Ethical approval for the study was obtained from the Institutional Review Committee of BMCTH (IRC-PA-380/2024). The study included patients aged 18 years and above, both new and follow-up cases, who had completed at least one cycle of chemotherapy, had a confirmed diagnosis of cancer were receiving anticancer therapy in the day-care oncology units of BMCTH. Patients with end-stage cancer, those receiving only radiotherapy or surgery, pregnant women, children below 18 years of age, and repeat visits of the same patient were excluded to avoid duplication of data. Based on a reference proportion of 20.24% prescribing indicator prevalence, confidence level as 95%, 5% margin of error, since we have finite population, also we use sample size for finite population, sample size was 153 [9]. Data were collected using a self-designed, structured questionnaire. The first section recorded socio-demographic details through face-to-face interviews conducted in the local language after obtaining informed consent from each participant. The second section involved reviewing patient medical records to document prescribed medications, dosages form, and other relevant clinical details. The pre-designed proforma also included fields for recording the costs of both anticancer and adjuvant medications, which were obtained from the hospital pharmacy price lists.

Data were entered into Microsoft Excel (Windows 10; Version 2008) and analyzed using descriptive statistics. Frequencies and percentages were calculated for demographic and clinical variables. WHO prescribing indicators were applied to assess the proportion of prescriptions containing injectables, the proportion containing antibiotics, and the proportion of drugs prescribed from the Essential Drug List. The costs of individual anticancer drugs were compared, and the mean cost of anticancer medications per prescription was calculated.

Results

The majority of cancer cases were observed among individuals aged 40 to 69 years. The mean age of patients was 55.33 ± 13.55 years. The age distribution indicated the highest incidence of cancer in 60–69-year age group was 35(22.87%), followed by the 50–59-year age group 33(21.56%). The lowest incidence was recorded among individuals under 5(3.27%) 30 years of age. (Figure 1). Regarding gender distribution, cancer was more prevalent among females 107 (69.93%) compared to males 45 (29.41%). A total of 13 distinct cancer types were identified during the study period. The highest prevalence of malignancies involved reproductive system, breast cancer 26 (16.99%) and ovary 13.07%. Respiratory system malignancies included lung cancer female:25 (16.33%), male:(6)3.92% followed by nasopharyngeal cancer female:3 (1.94%), male: 5 (3.24%). Less common malignancies in Eastern Nepal included marginal lymphoma, pancreatic cancer, bladder cancer, Non- Hodgkin's lymphoma (NHL) and acute lymphoblastic leukemia (ALL). (Figure 2).

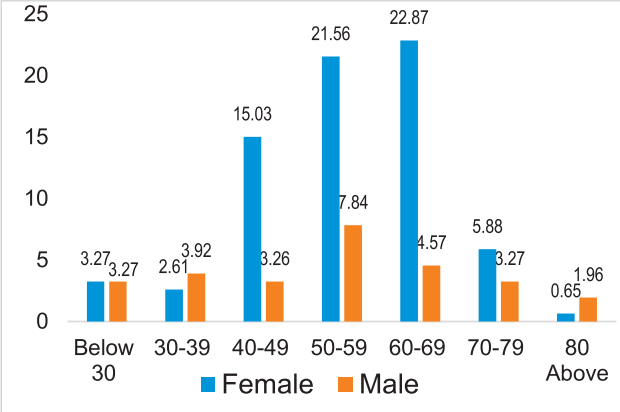
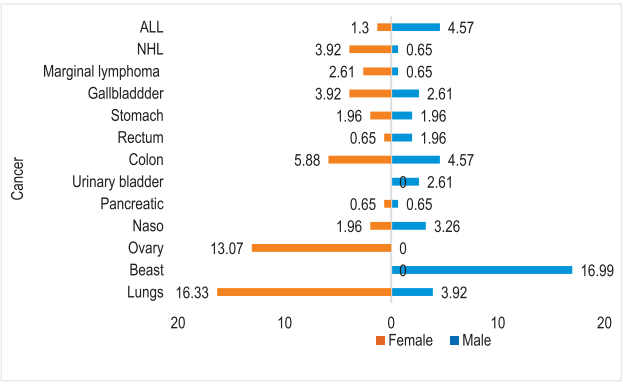


Figure 1: Distribution of cancers according to gender and age. (n=153).

Twenty different chemotherapeutic agents were identified during the study. Figures 3a and 3b presents the prescribing trends, showing that alkylating agents, antimetabolites, and taxanes were the most frequently prescribed, whereas monoclonal antibodies were the least prescribed. The prevalence per prescription was 0.019, which is considerably lower than WHO standards. Adjuvant medications were routinely prescribed to counteract adverse effects of chemotherapy.



*NHL-Non-Hodgkin's lymphoma, Naso-Nasopharyngeal Carcinoma, ALL-Acute lymphoblastic leukemia

Figure 2: Types of cancers among males and females. (n=153)

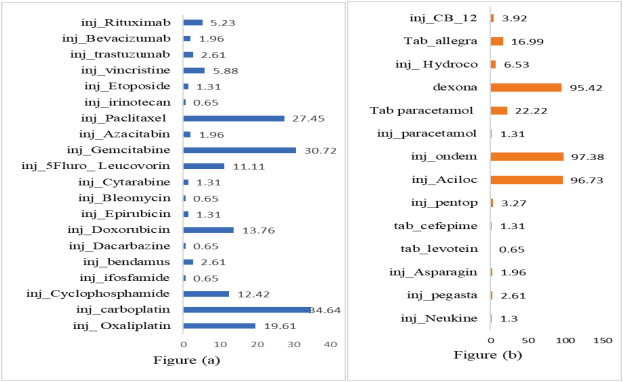


Figure 3a and 3b: Prescribing pattern of chemotherapy and adjuvant drugs

Table 1: Cost of different regimen of chemotherapeutic agents. (n=153)

Carcinoma types (Ca)	Treatment on the basis of different regimens (Regimen a,b,c)	Cost of Regimen per day in NPR ($) per patients
Lungs Ca	a) Gemcitabine1gm+ Pegasta 6mg	6435 (45.51)
	b) Carboplatin 150mg+Paclitaxel,	7793 (55.12)
	c) Gemcitabine1gm +carboplatin 300mg	5836 (41.28)
Breast Ca	a) Cyclophosphamide 1gm+Doxorubicin	459 (3.25)
	b) Carboplatin 150mg+Gemcitabine1gm	3099 (21.92)
	c) Trastuzumab 336mg	32769 (231.78)
Ovary Ca	a) Carboplatin 300mg+Paclitaxel	10530 (74.48)
	b) Gemcitabine200gm +Bevacizumab 100mg	20646 (146.03)
Nasopharyngeal Ca	a) Carboplatin 150mg+Gemcitabine 1gm	7151 (50.58)
	b) Oxaliplatin 50mg+Gemcitabine200mg	5706 (40.36)
Pancreas Ca	a) Oxaliplatin 10mg+Gemcitabine1gm	7258 (51.34)
	b) Gemcitabine 200mg+ Paclitaxel	8106 (57.33)
Bladder Ca	a) Carboplatin 300mg+Gemcitabine 200mg	5836 (41.28)
Colon Ca	a) Oxaliplatin100+5Fluro3500mg+Leucovorin360mg	4350 (30.77)
Rectum Ca	a) Oxaliplatin 100mg+ 5-Fluro+ Leucovorin	2350 (16.62)
Stomach Ca	a) Oxaliplatin150mg+5-Fluro350mg+Leucovorin	6350 (44.91)
	b) Oxaliplatin150mg +Doxorubicin 50mg	5415 (38.30)
Gallbladder Ca	a) Oxaliplatin+ 5-Fluro+ Leucovorin	2350 (16.62)
	b) Carboplatin 300mg+Gemcitabine 100mg	4986 (35.27)
Marginal lymphoma	a) Bendamustin 1oomg+Rituximab 100mg	25300 (178.95)
	b) Rituximab 500mg	42658 (302.87)
NHL	a) Cyclophosphamide+Doxorubicin50mg +Vincristine	1849 (13.12)
	b) Carboplatin300mg+Epirubicin10mg+Cytarabine100mg+Gemcitabine1gm	11104 (78.83)
ALL	a) Azacytidine 250mg	18000 (127.80)
	b) Cyclophosphamide300mg+Doxorubicin10mg+Vincristine1mg	5494 (39.00)
	c) Daunorubicin 50mg+vincristine 1mg	1500 (10.65)

*Ca- Cancer, NHL-Non-Hodgkin's Lymphoma, Naso-Nasopharyngeal carcinoma, ALL-Acute Lymphoblastic leukemia

Table 2: WHO Core Drug Prescribing Indicators [10]. (n=153)

Prescribing indicators	Mean
Average number of drugs per encounter	5.29
Average number of anticancer drugs per prescription	1.82
Average number of antibiotics per prescription	0.019
Percentage of drugs prescribed by generic name	117(76.50%)
Percentage of encounters with an antibiotic	3(1.9%)
Percentage of encounters with an injection	153(100%)
Percentage of drugs from essential medicine list	125.46 (82.86%)
Average cost of anticancer drugs per prescription	Rs. 9278 (NPR), 65.62($)

The average number of drugs per prescription was 5.29, and 76.5% of drugs were prescribed by their generic names. Injectable formulations were prescribed for all patients, and 82.86% of drugs were from the 2021 National Essential Medicines List. The average number of chemo-

therapeutic agents per prescription was 1.82, while the proportion of prescriptions containing antibiotics was 0.019. The mean cost per prescription was Rs 9,278 (65.62$) Table 2.

Discussion

In our observation, number of female patients was 35 (22.87%) and between 60–69 years of age representing the major group. This is in contrast with a study from South India, where 59.5% of all are female patients and in between 40–60 years of age. Whereas in another survey reported maximum rate in the 56–65 years (31.8%) of age groups [9, 11]. Breast cancer was the most common malignancy (16.88%), followed by lung cancer (16.23%) in our study. Comparable findings were reported in the Global Cancer Statistics 2022, where breast and lung cancers accounted for 11.6% and 12.4% of cases, respectively [12]. Additional studies reported that breast cancer prevalence rate to be 18.5% and 32.96%, whereas lung cancer at 17.9% and 22.81% [9,13]. The predominance of elderly females (60–69 years) in our study may be attributed to the demographic structure reflecting a higher proportion of patients belong to this age group. Furthermore, elderly women are more susceptible to cancer due to hormonal disturbance, increase in number of loci of chronic proliferation, and the decline in the immune surveillance [14,15]. In contrast, the South Indian study reporting a higher frequency among 40–60 years could reflect differences in health-seeking behaviour and population characteristics. For instance, middle-aged women in South India may seek medical attention earlier, whereas in our setting, women often present at an advanced age [16].

The most frequently used anticancer drug in our study was alkylating agent carboplatin 53(34.64%) followed by gemcitabine 47(30.72%), paclitaxel (27.45%), and oxaliplatin 30(19.61%). This pattern mirrors observations by kulkarni et al, who noted widespread use of cisplatin-based regimens in India [17]. Similar distribution trends emerge in other reports: platinum coordination complexes made up 24.46% followed by carboplatin 20.65% and oxaliplatin 5.43% [11]. But in the studies by Pentareddy et al. Carboplatin-74(37.56%) followed by Paclitaxel 57 (28.9%) were highly prescribed similar to our study [18]. These variations likely reflect differences in institutional treatment protocols, drug accessibility, toxicity consideration (favouring carboplatin over cisplatin), and resource availability.

In our cohort study, nearly all patients received regimen-based chemotherapy like gemcitabine + pegasta, carboplatin + paclitaxel and gemcitabine + carboplatin for lung cancers. Other Indian study shows higher use of Pemetrexed + carboplatin in lung cancer and Paclitaxel + carboplatin in breast cancer unlike Carboplatin + Gemcitabine used in our setup [18]. However, we have also documented frequent use of cyclophosphamide + doxorubicin and trastuzumab-containing regimens, particularly in HER2-positive breast cancer patients. These discrepancies may be attributed to differences in institutional treatment protocols following NCCN & ESMO guideline, type of cancer, population profiles, and the availability of agents [19,20].

In our study, the mean number of drugs per prescription was 5.29, with chemotherapeutics comprising 1.82%, antibiotics 0.019%, and the remainder being adjuvants. Comparable figures have been reported in other Indian studies, such as 6.01 drugs per prescription in Bepari et al., 8.77 in Damor et al. from Rajasthan and 8.16 in another tertiary-care study [11,21,22]. Although this reflects a trend toward polypharmacy, but such prescribing patterns are clinically justified in oncology practice. Cancer patients often require multiple supportive medications (antiemetics, corticosteroids, H_2-blockers, growth factors) to prevent chemotherapy-induced toxicities and to maintain treatment adherence. Without such adjuvant use, adverse effects like hemopoietic, nausea, vomiting, infections, and gastric complications would compromise both patient safety and treatment efficacy [23].

The study by Beedimani et al. showed that the most routinely prescribed adjuvant drugs were ondansetron 97%, ranitidine 93% and dexamethasone 97% which match with our study [24]. Bepari et al. showed that the most commonly used adjuvant drugs were ondansetron 20.96% and dexamethasone 19.2% [11]. However, the most commonly used adjuvant drugs in the study by Pentareddy et al reported to be ranitidine, and dexamethasone [18]. Furthermore, in our study generic prescription accounted for 76.5%, which is comparable to the 76.7% reported by Bepari et al [11]. But this is lower than the very high rates documented in other Indian studies (96.84% and 100%) [22,24]. However, greater promotion of generic prescribing has been strongly recommended by the World Health Organization (WHO) and other public health authorities, as it can significantly reduce healthcare costs without compromising therapeutic efficacy [25].

All patients received chemotherapy via the injectable route 100%, which is consistent with findings from Rahul Damor et al. but 75.5% in other studies [21,22]. Most of our prescribed medications 82.86% were from the 2021 National Essential Medicines List (NEML), which is in line with previous Indian studies reporting 82.2% to 88.4% compliance. High adherences to the NEML demonstrates rational prescribing practices and alignment with WHO recommendations, ensuring accessibility and affordability of cancer drugs [19, 25]. In our setting, the mean daily cost of chemotherapy was NPR 9,278, (65.62) much lower than the INR 11,135.31 (78.76) reported in 2018 but higher than INR 4959.81(35.08) per patient bed-day in 2024 Indian study [11,24]. The cost was much decreased compared to previous generation but still was much costlier to our Nepalese people income [8]. In our setting, daily prescription costs ranging from NPR 459 (3.25) to NRs 42,658 (301.72). Monoclonal antibodies comprise the most expensive targeted therapies costing NRs 42,658, whereas carboplatin was priced at NRs 4,130 (24, 22). Trastuzumab was the largest cost contributor NRs 4,50,000 (3182.86), followed by paclitaxel NRs 4,07,898 (2885.08) [9]. This cost disparity between conventional chemotherapy and targeted therapies can be overcome by cost-containment strategies, generic alternatives, and government-supported subsidy programs in low- and middle-income countries.

The prescribing pattern of anticancer drugs was rational, with a high proportion of medicines drawn from the National Essential Medicines List (NEML) and adherent to established oncology protocols. Such findings align with previous Indian studies where rational prescribing was observed across chemotherapy and adjuvant use [11, 17, 22]. This study therefore provides baseline data on prescribing practices in cancer patients, which can be useful for institutional audits and policy formulation.

However, the major limitation of our research is that it was conducted in a single centre, with a small sample size and over a short study period, which may influence the final outcome consisted with other drug utilization studies. Future multi-institutional studies in Nepal would help to strengthen evidence and guide more cost-effective cancer care policies.

Conclusion

Overall, in our study most patients were females aged 60–69 years, with breast and lung cancers being the most common malignancies. Chemotherapy was predominantly regimen-based, mainly involving alkylating agents, antimetabolites, and taxanes, while monoclonal antibodies were used less frequently but in highest costs. Prescribing practices largely aligned with rational drug-use indicators, including high generic use, essential medicine prescribing, universal injectable use, and minimal antibiotic exposure.

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Conflict of interest: None

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