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Original Research Article

Drug Utilisation Pattern and Cost Analysis of Anticancer Drugs in a Cancer Care Hospital, Diphu Medical College & Hospital

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Abstract:

Introduction: Evaluating the prescribing patterns of anticancer and supportive care drugs in cancer breast patients is necessary for ensuring effectiveness and patient's quality of life. The present study aimed to evaluate the trends and pattern of prescribing of anticancer drugs. The objectives of the study were to assess the rational use of anticancer drugs, to identify various types of cancer and to estimate the cost distribution of anticancer drugs.

Methods: A prospective observational study was conducted in the Department of Medical Oncology at Assam cancer care Hospital, Diphu center. The study was conducted from January 2021 to June 2023. Cancer patients who are on chemotherapy alongwith supportive care medications were enrolled. Data were analyzed using descriptive statistics. Continuous data were expressed as mean ± standard deviation, and the nominal data were expressed as frequency and percentages.

Results: Among 79 patients, majority of patients were in the age group of 31-45 years. Among a total of 627 encounters single regimen (57%) was the most commonly prescribed chemotherapy followed by multiple drug regimens (43%). Cancer breast was the commonest type of cancer in our study. Most common being tranztuzumab only treatment followed by Adriamycin with cyclophosphamide were seen followed by paclitaxel and Epirubicin with cyclophosphamide combination. Average cost of chemo drugs per encounter in our study was Rs.14186.68 while as a whole per encounter cost was Rs.17242.84 which include the supportive care medicine

Conclusion: Various anticancer drug prescription patterns are being used for treatment of patient with metastatic cancers. The study implies that most of the anticancer drugs were prescribed either single or in combination for improved therapy and arehighly expensive. The complexity in prescribing can be improved by introducing cost controlling policies and new systemic interventions that might increasethe quality of patient care. The prescribing pattern andcost distribution have to be examined from time to time so as to manage the inventory control in hospital pharmacy.

Keywords: Cancer, Chemotherapy, Prescribing Patterns, Cost Analysis.

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Introduction

Cancer has become a major burden and threat to the global society. It is one of the leading causes of death in the world. A survey by World Health Organization (WHO) indicates that 8.2 million people died from cancer in 2012 and it may rise to 19 million by 2025[1]. As per the National Institute of Cancer Prevention and Research, about 2.5 million people are suffering from cancer in India and it is the second most common disease responsible for 5,56,400 deaths per year. This is due to lack of adequate preventive measures, delayed diagnosis and treatment of the disease. The high incidence rate of cancer could be due to genetics, mutation, hormonal changes, food habits and life style [2]. India the country with largest population on earth detects 1324413 new cases every year, 851678 deaths per year and total prevalence is 2720251 cases as per the data from International Agency for Cancer Research (IACR) 2020 data. This certainly puts tremendous economic burden to the country. The high incidence of cancer coupled with the increment in

the cost of treatment and variability in drug prices imparts significant challenge to patients as well. Different treatment modalities for cancer include surgery, chemotherapy, radiation therapy, monoclonal antibody therapy and immunotherapy.

The choice of the treatment depends on the site and grade of the tumor, the stage of the disease and the general state of the patient. A wide range of chemotherapeutic agents are extensively used to treat cancer at different stages.Chemotherapy refers to antineoplastic drugs used to treat cancer or the combination of these drugs as a standardized treatment regimen. Cancer can be treated with a single drug or by combination therapy.

The high incidence of cancer coupled with the increment in the cost of treatment and variability in drug prices imparted a significant challenge to patients [3]. Cancer was found to be the third highest in terms of cost for treatment and a major part of hospital inventory is of cancer drugs. It is observed that around 348 drugs enlisted in the National List of Essential Medicines were used for its treatment. Consequently, drug utilization studies and cost analysis of anticancer drugs became an inevitable tool in the health economics.

Drug use is a complex process since optimal benefits of drug therapy in patient care may not be achieved because of under-use, overuse or misuse of these drugs.Inappropriate drug use may also lead to increased cost of medical care, antimicrobial resistance, adverse effects and patient mortality. Hence, in recent years, DUS have become a potential tool to be used in the evaluation of health care systems [4]. DUS are defined as the study of marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences [5]. DUS provide an insight of the efficacy and pattern of drug use, and the quality and outcome of use [6,7].

Drug utilization pattern studies will put forward some idea about the prescribing practice and characterize the early signals of irrational drug use. Analysis of medicines utilization and expenditure can inform healthcare decision maker about the overall medication utilization by gender, co morbidities and age group. It also can inform about which medication were contributing to highest budget spending. Additionally, it can be useful to evaluate whether medicine been over or under prescribe and whether it aligns with the treatment protocol and guideline and also to see the impact of policy change on the use of medicine. Based on this our study aimed at evaluation of the trends and patterns of anticancer drug utilization pattern and also assess the cost analysis of anticancer drug therapy.

Material and Methods

This study was done at Assam cancer care Hospital, Diphu center. This study was done as a retrospective record based, cross sectional study among patients who have diagnosed for Cancer and treated for the same. The study was conducted from January 2021 to June 2023.

Data was collected of all cancer patients admitted during the period of study irrespective of age and sex. Data will be collected from medical records department and telephonic interview wherever required. The cost details were collected from CIMS, Drugs up-to-date, pharmacy bills and hospital formulary.

The data will be collected in regards to age, sex, stage of the disease, family history, any co-morbid condition etc. WHO core prescribing indicators will be used at the end of the study to know the amount of prescriptions with polypharmacy, percent of prescriptions with injectable, antibiotics and percent of drugs prescribed from Essential Drugs list.

Diagnosed cases of Cancer irrespective of age and sex were included in the study while cases with inadequate data were excluded. Data analysis was done by putting in the data in specially designed MS excel sheet and the output was analyzed using statistical software SPSS version 24.0.Ethical approval was taken prior to the study from institutional ethical committee, Diphu Medical College & Hospital.

Data analysis

Prescribing patterns of chemotherapy were analyzed by collecting the details of drug usage including drug name, dose, indication, dosage form, and frequency, and duration, route of administration, chemotherapy cycles, and chemotherapy regimens and were recorded in the data collection form. Similarly, prescribing pattern of supportive drugs used along with cancer chemotherapy was also recorded from the drug treatment chart and convened in the data collection form.

Results

A total of 79 patients with different type of cancer were enrolled in the study. Out of which, all the patients underwent multiple cycles of chemotherapy without any dropouts.

A total of 627 encounters were there in our study population. In the age wise distribution, majority of patients were in 30-45 years (51%) followed by 45 to 60 years (40%) compared to the other age groups. The mean age of the study population was 49.86 ± 11.56 years. In gender wise distribution, majority of the patients were females (67%) when compared to males which is because most common cancer type in our study was cancer

breast. In our study 21 patients had some sort of co morbidities with hypertension being commonest followed by diabetes and was on treatment for that. Only two patients had family history of breast cancer in our study. Majority of the cancer patients was diagnosed with Stage IV, followed by Stage III.

Table 1: General characteristics

Gender	No Of Patients (N=79)
Male	26
Female	53
Age Groups	
<30	2
30-45	30
46-60	26
60-75	19
>75	2
Comorbidities	
Hypertension	13
Diabetes Mellitus	10
Asthma	0
Cld	1
Ihd	1
Thyroid Disorder	3
Ckd	0
No Comorbidities	58
Family History Of Ca Breast	
Present	2
Absent	77

In our study population 44 encounters had palliative therapy,21 encounters had adjuvant therapy 10 was hormonal , 14 was NACT and rest was for maintenance therapy which sometimes had more than one cycle of encounter depending upon clinical presentation. In our study population few had adverse effects Peripheral neuropathy was seen in one patient, Hand and foot syndrome in four patients. Neutropenia in 5 patients, pancytopenia in one patient and drug induced hepatitis in four patients. In spite of administration of antiemetic prophylactically one patient had the episode. Most common type of cancer was cancer breast followed by cancer lung, almost all type of cancer was encountered in our study with breast being most common organ involved in females and lung being more common in males. The organ involved is described in Table 2.

Table 2: Type of cancer

Type of Cancer	Number of Patients
Breast	37
Astrocytoma	1
Rectum	4
Lymphoma	2
Lung	5
Urinary Bladder	1
Oesophagus	3
Gall Bladder	3
Vulva	2
Cervix	4
Colon	3
Prostrate	3
Supraglottic/Oropharynx	2
Multiple Myeloma	1
Pancreas	2
Lower Lip/Cheek	2
AML	1
Penis	1
Stomach	1
Choriocarcinoma	1

Among a total of 627 encounters, Single regimen (57%) was the most commonly prescribed chemotherapy followed by multiple drug regimens (43%). Most common being 120 encounters with

tranztuzumab, followed by Adriamycin with cyclophosphamide, paclitaxel was one another common drug encountered. Among Single drug regimens most commonly used was Paclitaxel and tranztuzumab had maximum encounters followed by capcetabine. The most commonly prescribed chemotherapy regimens among different cancer types are described in Table 3.

Table 3: Type of Chemotherapy regimens

Chemotherapy Regimen	
Docetaxel+Cyclophosphamide	40
Paclitaxel+Carboplatin	15
Gemcitabine + Carboplatin	24
Eribulin Mesylate	17
Epirubicin+Cyclophosphamide	65
Paclitaxel Only	65
Tamoxifen	14
Docataxel Only	18
Docetaxel+Cyclophosphamide+Tranztuzumab	48
Paclitaxel+Tranztuzumab	42
Tranztuzumab Only	120
Anastrazole	18
Capecitabine	45
Lapatinib	5
Adriamycin + Cyclophosphamide	74
Gemcitabine + Docetaxel	3
Gemcitabine	3
Trastuzumab + Letrozole	7
Capecitabine+Lapatinib	4

Almost all patients received dexamethasone and the commonly prescribed antiemetics were palonosetron followed by ondansetron. Out of 627 encounters, almost all the patients had an encounter with ranitidine. Majority of the patients were prescribed with proton pump inhibitors with or without domperidone. Only few patients required analgesics with paracetamol being commonly used. In this study, 371 among 627 encounters were prescribed with granulocyte-colony stimulating factors for prophylaxis and treatment of chemotherapy-induced myelosuppression. Antihistamines were prescribed for majority of the patients in all cycles of chemotherapy. Paracetamol being the commonest NSAID used for cancer pain in our study. The most commonly prescribed supportive care medications are depicted in Table 4.

Table 4: Supportive care medicine

Other Drugs	**Number PF Patients Or Encounters**
Netupitan + Palonosertron/ Aprepetant/ Granisatron/ Ondensatron	448
Dexamethasone	417
Ranitidine	417
Pheniramine	355
Domperidone	234
PPI	322
Paracetamol	256
G-CSF	371
Lactulose	179
Olanzapine	15
Morphine	9
Zoledronic Acid	9
Pregabalin	35
Chlorhexidine M/W	99
Antibiotics	6
Acetaminophen + Tramadol	20

The cost distribution of anticancer drugs has been given in Table 5. The study revealed that trastuzumab contributed to the major cost in drug therapy (Rs.350000), followed by paclitaxel (Rs. 307898), Adriyamycin (Rs.129977), cyclophosphamide (Rs.97570). Tamoxifen,

letrozole were the least expensive anticancer drugs. Average cost of chemo drugs per encounter in our study was Rs.14186.68 while as a whole per encounter cost was Rs.17242.84 which include the supportive care medicine as depicted in Table 5.

Table 5: Cost analysis

Cost Analysis	Amount In Rupees
Total Cost Of Chemo Drugs	8895054
Total Cost For All Drugs	10811265
Cost Of Chemo Drugs Per Encounter	14186.68
Cost Of All drugs Per Concounter	17242.84

Discussion

Cancer is a group of diseases involving abnormal cell growth with potential to invade or spread to any parts of the body [8]. With a million of new cases beingreported every year, cancer seems to be tightening its grip on India. Experts say that the incidence of cancer is expected to rise five-fold by 2025. Ignorance among the public, delayed diagnosis and treatment and high treatment cost has given cancer the distinction of beinga killer disease.

The diverse drug utilization process and the increased cost incurred on drug therapy could put severe burden on patient's treatment and cancer management. These facts need to be viewed as it might create awareness among health care professionals so as to support and manage the therapy. This might also prompt the patients to avoid noncompliance with the therapy. Hence, proper monitoring of cancer treatment and drug therapy are required for the wellbeing of the patient.

The present study was aimed to analyze the drug utilization review and cost analysis of anticancer drugs used in a tertiary care teaching hospital. During the study period, around 79 cancer patients were admitted in oncology departmentand most of them were in chemotherapy ward. This revealed that the majority of the cancers were treated either by chemotherapy or through both chemotherapyand radiotherapy. Certain cases like cancer of vagina and cervix, cancer of buccal cavity, and cancer of tongue were treated by radiotherapy.

In our study, it was observed that more females were admitted with cancer. The reason could be unknown or may be variable as discussed by cancer breast and cancer of cervix. Cancer of the genitourinary tract was also seen, with most of the patients treated for cervical cancer and vulval cancer. The distribution of cancer in tissue site and organs show female predominant. Dave *et al*. suggesting causes due to hormonal changes during menopause, use of oral contraceptives, hormone replacement therapy and life style [11]. The incidence of cancer rate (both males and females) was more in the age group of 31-60 years. This could be due to change in life style, habits or ageing. Aging is the major cause of cancer due to decreased immunity, the hormonal, other physiological and functional changes that occur in the body, which might lead to activation of pro-oncogenes [9]. In a similar study conducted by Kulkarni *et al*.[7] the average age group was between 30-70 years. The result clearly revealed that age is th.0e major factor responsible for cancer. With age the organs become susceptible to cancer due to hormonal imbalance, increase in number of loci of chronic proliferation and the decline in immune surveillance. This also specifies that at young age the incidence of cancer is lower.

Different treatment modalities have been available for cancer and these include surgery, chemotherapy, radiation, immunotherapy, biologic therapy and cryosurgery. Most of the cancers were treated by chemotherapy. In our observation more drugs were prescribed in chemotherapy ward compared to radiotherapy ward.

There are more than 200 different types of cancers detected and the incidences of different cancer depended upon various socioeconomic and ethnic concerns [10]. Cancer was found to affect every systems of the body without revealing the specific nature of the disease. In our observation, out of 20 types of cancer detected, breast cancer was most prevalent followed by lung cancer. Lung cancer was more prevalent in males, while breast cancer was higher in females. In a study conducted by Siddiqua et al. [9], 58 types of cancer were observed and the major incidence was lung cancer (17.9 %), followed by breast (13 %). Same were also higher in a related study conducted by Dave et al. [11].

The major therapeutic class of drug prescribed for cancer was cytotoxic drugs. These drugs are known to cause severe side effects. Chemotherapeutic agents have a narrow therapeutic index and the dosage needed to achieve the therapeutic effect would also cause severe toxic effects [11]. Consequently, a proper therapeutic drug monitoring process is necessary for chemotherapeutic agents.

The toxic effects could be managed effectively by individualizing the drug therapy. Many of the side effects of the cancer therapy can managed with adjuvant drugs like antidiarrheals, laxatives,

antihistamines, immunosuppressants and gastroprotectives.

Cost analysis studies provide an estimation of the finances that may be included in drug therapy. The data showed that trastuzumab contributed more in cost. This emphasized the necessity of inventory control in hospital pharmacy. The average cost of anticancer drugs per prescription was Rs 14186. In a particular study conducted by Wani *et al*.[3] the unit cost of in- patient chemotherapy on an average was calculated to be Rs.5725.12 per patient per bed day. The cost distribution per class of therapeutic agents showed cytotoxic agents accounted for the major cost, followed by targeted drug systems and others drugs. The minimal cost distribution was for hormonal drugs.

Cost difference of drugs among hospitals may exist and it may depend upon the product type and service rendered by the organization. This study revealed that the average cost of anticancer therapy is very high. The high cost of chemotherapeutic agents made it unaffordable to common people in a country like India. Cost analysis is particularly relevant in chronic diseases like cancer that weigh heavily on healthexpenditures.

In case of cancer, most of the health care cost is imparted by the drugs. The increasing prevalence of cancer and the continuously rising expense of its treatment influence the prescribing patterns among physicians and compliance by the patients. Therefore, use of anticancer drugs has to be regularly monitored and controlled.[12]

Analysis of cost of anticancer therapy will be useful for educating and informing the healthcare policy makers in planning a cost-effective drug therapy. Drug utilization review and cost distribution analysis for anticancer drugs are essential among health care professionals as it highlights the importance of assessing optimal drug use with cost effectiveness. The scope is possible only through regular update of medical knowledge, by frequently attending continuing medical education programs by the physicians.[13]

Conclusion:

The study implies that most of the anticancer drugs were prescribed either single or in combination for improved therapy and are highly expensive. The complexity in prescribing can be improved by introducing cost controlling policies and new systemic interventions that might increase the quality of patient care. The prescribing pattern and cost distribution have to be examined from time to time so as to manage the inventory control in hospital pharmacy.

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