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Assessment of utilization of anticancer drugs in cancer centre at tertiary care hospitals in Telangana region

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ABSTRACT

Cancer is a life-threatening disease and is a major economic burden to families in India. Assessment of the utilization of anticancer drugs promotes rationality in using drugs. The main objective of the study was to identify the prevalence of various types of cancers, analyzing the prescribing patterns of anticancer drugs in cancer centers at the tertiary care hospitals in Telangana. It was a Prospective and observational study carried out in hospitals of Telangana for a period of six months, which includes 300 patients. All the patients with respective to age, sex, diagnosis, and treatment, who were on anticancer prescription and were willing to give consent, were included in the study. Among 300 patients selected in our study, 111 (37 %) were males, and 189 (63 %) were female patients. 170 (56.66 %) cancer cases were evident between 71 to 80 years of age. Hypertension is the major comorbidity observed in 68 cancer patients. 54 drugs were prescribed for different cancers patients in our study. The most commonly used class of anticancer agents was tyrosine kinase inhibitors (10drugs), monoclonal antibodies (10 drugs). 33 female patients were suffering from breast cancer, and Lungs cancer was found in 44 patients. Carboplatin was given to 30 (10%) patients, followed by Chlorambucil to 27 patients (9%). Assessment of utilization of Anticancer Drugs promotes education to a physician for rational drug use and can give better health care and also cost-effective treatment.

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INTRODUCTION

Globally cancer remains a leading cause of death. According to International Agency for Research on Cancer, 7.6 million deaths were due to cancer, and 12.7 million new cases were being reported per year (Jemal *et al.*, 2011; Ferlay *et al.*, 2008). The etiology of cancer is multifactorial, which involves both genetic and environmental factors (Brannon-Peppas and Blanchette, 2004). It is a dreadful disease which brings psychological and social distress to the patients and relatives (Boyle and Ferlay, 2004; Binu *et al.*, 2007). It is one of the leading causes of death in developed and developing countries. According to WHO, 13% of worldwide mortality was

due to cancer in 2005. 10% of total mortality is due to cancer in 2002, and it is expected to rise up to 25-50% by 2020 in India. Hanahan and Weinberg identified six phenotypes of cancer (Hanahan and Weinberg, 2000). If uncontrolled cell growth occurs, it results in the death of the person (Chaffer and Weinberg, 2011). A great progress has been achieved towards early detection, understanding of the hallmarks of cancer, and treatment modalities, which are more curable (Hanahan and Weinberg, 2011; Pollack *et al.*, 2009).

Carcinomas reported in males were lungs, bronchus, trachea, mouth, oropharynx, esophagus, stomach and while in females carcinoma of cervix, breast, mouth, oropharynx and esophagus Chemotherapy is a multimodality approach shown to be curative in cases of head and neck carcinoma, uterine carcinoma, cervix carcinoma, lung carcinoma, breast carcinoma, and colorectal carcinoma (Longo, 2012). Several factors, like Patient-related, tumour related, and treatment-related factors, influences the decision of therapy (Joseph *et al.*, 2014). Considerable ranges of chemotherapeutic agents are used to treat cancer at different stages. Antineoplastic drugs act on rapidly dividing cells, and their action is either specific or non-specific on the cell cycle (Rang *et al.*, 2007). Chemotherapy refers to the treatment of cancer by the use of cytotoxic and other drugs as a standardized treatment regimen (Malhotra and Perry, 2003). It is the only therapy which acts systematically to reduce the disease from the entire body.

Regimens used in Chemotherapy are very complex and are associated with intolerable adverse reactions. Inappropriate use of a drug may lead to the increased cost of medical care, the incidence of adverse drug effects, and may also lead to mortality (Sachdeva and Patel, 2010). Drug utilization of anticancer agents has been changed in recent years due to a better understanding of the pathophysiology of carcinomas and also the introduction of newer drugs. Assessment of utilization of anticancer drugs research promotes the rational use of drugs and decreased adverse drug reactions in the patients (Kumar *et al.*, 2018; Hawkey *et al.*, 1990). It helps in comparing the prescribing pattern with existing standards, and steps can be taken to optimize anticancer therapy with improved efficacy and less toxicity (Pentareddy *et al.*, 2015).

MATERIALS AND METHODS

The study was Prospective and observational study carried out in various hospitals in Telangana region for a period of six months, and the sample size includes 300 patients. All the necessary details for the study were collected from the patient's medical record at the inpatient department, and the medical records were reviewed on a daily basis.

Study criteria

The study was carried out by considering the following inclusion and exclusion criteria

Inclusion criteria

All patients aged between 20-80 years receiving cancer treatment, and patients with or without comorbidities were included in the study.

Exclusion criteria

The patients who were pregnant or lactating, HIV positive patients, patients with psychiatric illness, Patients who are not willing to participate in studies, and Patients whose prescription is not reliable were excluded from the study.

Study procedure

Prescriptions were studied based on inclusion and exclusion criteria. Recognized prescriptions were taken into consideration as per study criteria. Required information is collected from the patient's prescription. Data was filled into the specially designed patient data entry forms.

Data analysis

The prescriptions were analyzed according to the type of cancer, percentage of encounters with the classification of drugs prescribed per patient, percentage of most common anticancer drugs received. This data was analyzed by using Microsoft Excel, and results were presented as percentages.

RESULTS AND DISCUSSION

The main aim of this study is to promote the rational use of drugs to the populations. The present study shows the demographics and most common class of cytotoxic agents prescribed in tertiary care cancer centers.
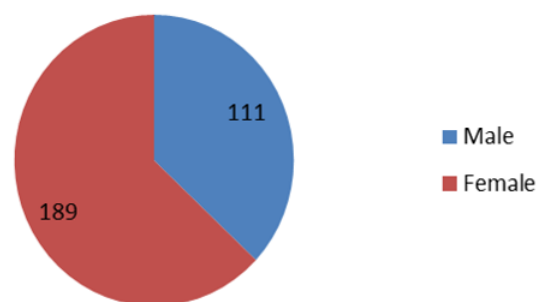

Figure 1: Gender Wise Distribution of Cancer Patients

Table 1: Gender Wise Incidence of Social Drug Users

Gender	Substance abuse		Smokers		Alcoholics	
	Drug users	Percentage	Number	Percentage	Consumers	Percentage
Male	99	61.875	86	67.7	35	38.1
Female	61	38.125	41	32.3	57	61.9
Total	160	100	127	100	92	100

Table 2: Gender Wise Incidence of Various comorbidities

Comorbidities	Male	Percentage	Female	Percentage
Hypertension	32	28.83	36	19.05
Diabetes	24	21.63	58	30.69
CNS	20	18.02	26	13.75
Asthma	11	9.9	35	18.52
Epilepsy	15	13.52	11	5.83
Thyroid	9	8.1	23	12.16
Total	111	100	189	100

Table 3: Gender Wise Incidence of Various Cancer Disorder

Malignancy	Total patients	Male	Percentage	Female	Percentage
Breast cancer	33	——	——-	33	17.46
Lungs cancer	44	23	20.72	21	11.11
Pancreatic cancer	32	8	7.2	24	12.69
Skin cancer	33	13	11.71	20	10.58
GIT cancer	33	15	13.51	18	9.52
Oral cancer	16	6	5.4	10	5.29
Blood cancer	41	13	11.71	28	14.81
Prostate cancer	13	4	3.6	9	4.76
Lymphoma cancer	9	4	3.6	5	2.64
Respiratory cancer	26	14	12.61	12	6.34
Genitourinary cancer	20	11	9.9	9	4.76
Total	300	111	100	189	100

Table 4: Gender Wise Incidence of Various Stages in Cancer

Cancer stage	Total patients	Male	Percentage	Female	Percentage
Stage 1	47	11	9.9	36	19.05
Stage 2	86	35	31.54	51	26.99
Stage 3	103	45	40.55	58	30.68
Stage 4	64	20	18.01	44	23.28
Total	300	111	100	189	100

Table 5: Gender Wise Incidence in Chemotherapy Regimen

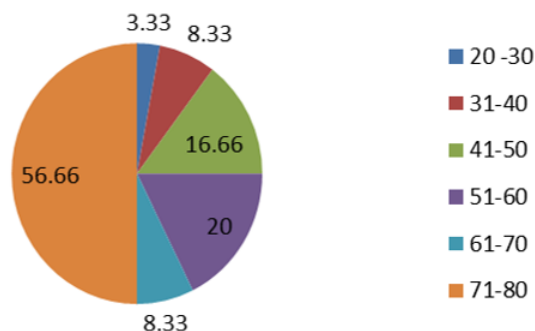| Chemotherapy regimen	Total patients	Male	Percentage	Female	Percentage
Single	62	23	20.72	39	20.63
Double	158	60	54.05	98	51.85
Triple	80	28	25.22	52	27.51
Total	300	111	100	189	100

Figure 2: Age-wise Distribution of Cancer Patients

Gender wise distribution of cancer patients

Among 300 patients selected in our study, 111 (37 %) were males, and 189 (63 %) were female patients. Greater prevalence of cancer was observed in females, which occupies the major portion in different forms of cancer in our study. Females are highly prone to cancer due to their weaker immune system and reproductive disturbances majorly breast cancer because their breast cells are exposed to estrogen and progesterone. The results were given in Figure 1.

Age-Wise Distribution of Cancer Patients

The age-wise distribution of the patients showed a higher incidence of cancer in different age groups. The study revealed that 170 (56.66 %) cancer cases were evident in the age groups between 71 to 80 years. The next susceptible age group of a patient prone to cancer was found to be 51 to 60 years, 60 (20 %). Followed by 50 (16.66 %) cases were identified in 41 -50 age group. In the 31-40 age group, 25 (8.33 %) cases were identified. 25 (8.33 %) cases were identified in 61-70 age group. 10 (3.33 %) cases were seen in the 20 – 30 age group. It is observed that 20 -30 age group were less susceptible to cancer in our study. Cancer risk increases after the age of 50 and half of all cancers occur at the age of 60 and above. According to the National Cancer Institute, one-quarter of new cancer diagnoses are in 60 to 75 aged people. The results were presented in Figure 2.

Gender Wise Incidence of Substance abuse, Smokers and alcohol consumers

A total of 160 patients were found to have Substance abuse in the study. Among them, 99 were male patients, and 61 were female patients. A total of 127 patients were found to have a habit of smoking in the study. Among them, 86 were male patients, and 41 were female patients. Males are more susceptible to lung and throat cancer due to smoking and tobacco intake. It was found that 92 patients were alcohol consumers, 35 were male patients, and 57 were female patients. The results were tabluated in Table 1.

Incidence of various comorbidities

Hypertension was present in 68 patients, among them, 32 were male patients, and 36 were females patients. Diabetes was found in 82 patients, 24 were males, and 58 were females. CNS disorders were found in 46 patients, 20 were males, and 26 were females were suffering with CNS disorders. Asthma was found in 46 patients, 11 were males, and 35 were females. Epilepsy was found in 26 patients, 15 were males, and 11 were females. Thyroid was found in 32 patients, 9 were males, and 23 were females. Hypertension, hyperlipidemia, osteoarthritis, hypothyroidism, diabetes mellitus, and coronary artery disease are the most common associated comorbid conditions in cancer survivors. The results were given in Table 2.

Incidence of various cancers

11 different types of cancers were observed in the study. The highest incidence is in lung cancer (14.66%), followed by blood cancer (13.66%). In females, the highest incidence is in breast cancer (17.46%), followed by blood cancer (14.81 %). The cancers were found to be affecting every systems of the body, which reveals the non-specific nature of the disease. Lungs cancer was found in 44 patients, 23 were males, and 21 were females. Pancreatic cancer was observed in 32 patients, 8 were male, and 24 were female. Skin cancer was observed in 33 patients, 13 males, and 20 females. GIT cancer was observed in 33 patients, 15 were males, and 18 were females. The blood cancer was found in 41 patients. Among them, males were 13, and females were 28. The other forms of cancer reported were in Table 3.

Incidence of various stages in cancer

The total patients included in the study were categorized according to the stages of cancer. It was observed that 47 patients were in stage 1 cancer, 11 were males, and 36 were females. 86 patients were in stage 2 cancer, 35 were males, and 51 were females. 103 patients were in stage 3 cancer, 45 were males, and 58 were females. 64 patients were in stage 4 cancer, 20 were males, and 44 were females. It was observed that the highest incidence of cancer in females was in stage 3 (30.68 %), followed by stage 2 (26.98%). Among males, the highest incidence of cancer was in stage 3 (40.54%), followed by stage 2 (31.53%). The results were presented in Table 4.

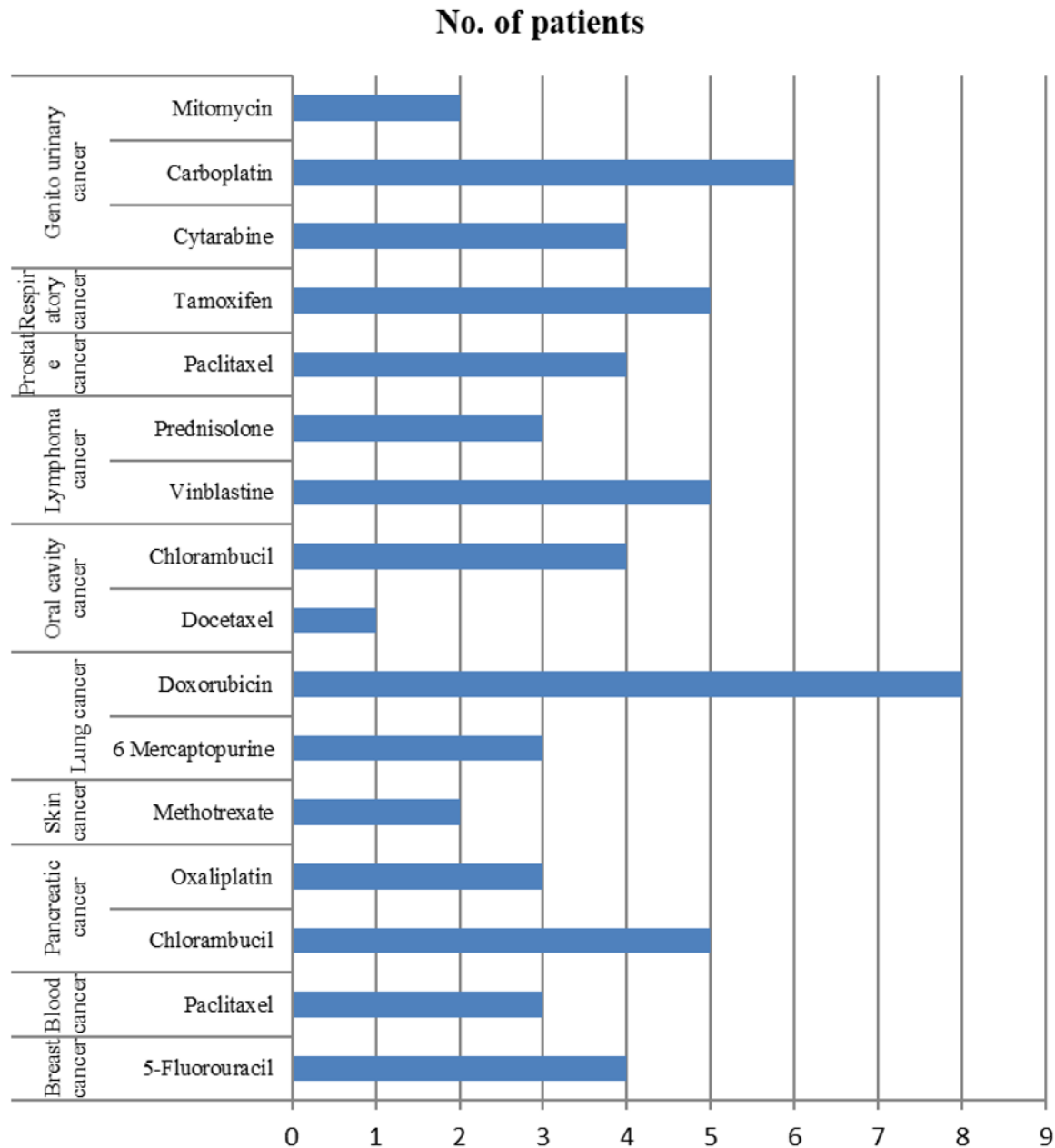**Gender wise incidence in chemotherapy regimen**

Figure 3: Anti Cancer Drug Utilisation in Single Therapy

There are many types of cancer treatment. But most people have a combination of treatments, and triple is mostly used in comparison to single and double drug therapy regimen. In our study, single therapy was given to 23 males and 39 females. Double therapy was given to 60 males and 98 females. Triple therapy was given to 28 males and 52 females. The results were summarized in Table 5.

List of anticancer drugs observed in our study

It was observed that 54 drugs were prescribed for different cancers patients in our study. The most commonly used class of anticancer agents was tyrosine kinase inhibitors (10 drugs) and monoclonal antibodies (10 drugs). 6 drugs were pre-scribed from antibiotics, 4 drugs were prescribed from Alkylating agents, plant alkaloids, and steroid hormones category. 3 drugs from Antimetabolites category and 1 drug was prescribed form Pyrimidine antagonist, Purine Antagonist, Nitrogen Mustards category, Bisphosphonates, Vaccine, Pyrimidine Analogs, Folic Acid Analogs, and Pyramidine Analogs, Topoisomerase Inhibitor, enzymes.

Prescription pattern of each anticancer drug

Cancer treatment has various options such as chemotherapy, surgery, radiation therapy, immunotherapy and monoclonal antibody therapy. The choice of therapy depends on the location of the tumor, stage of disease, physical and mental
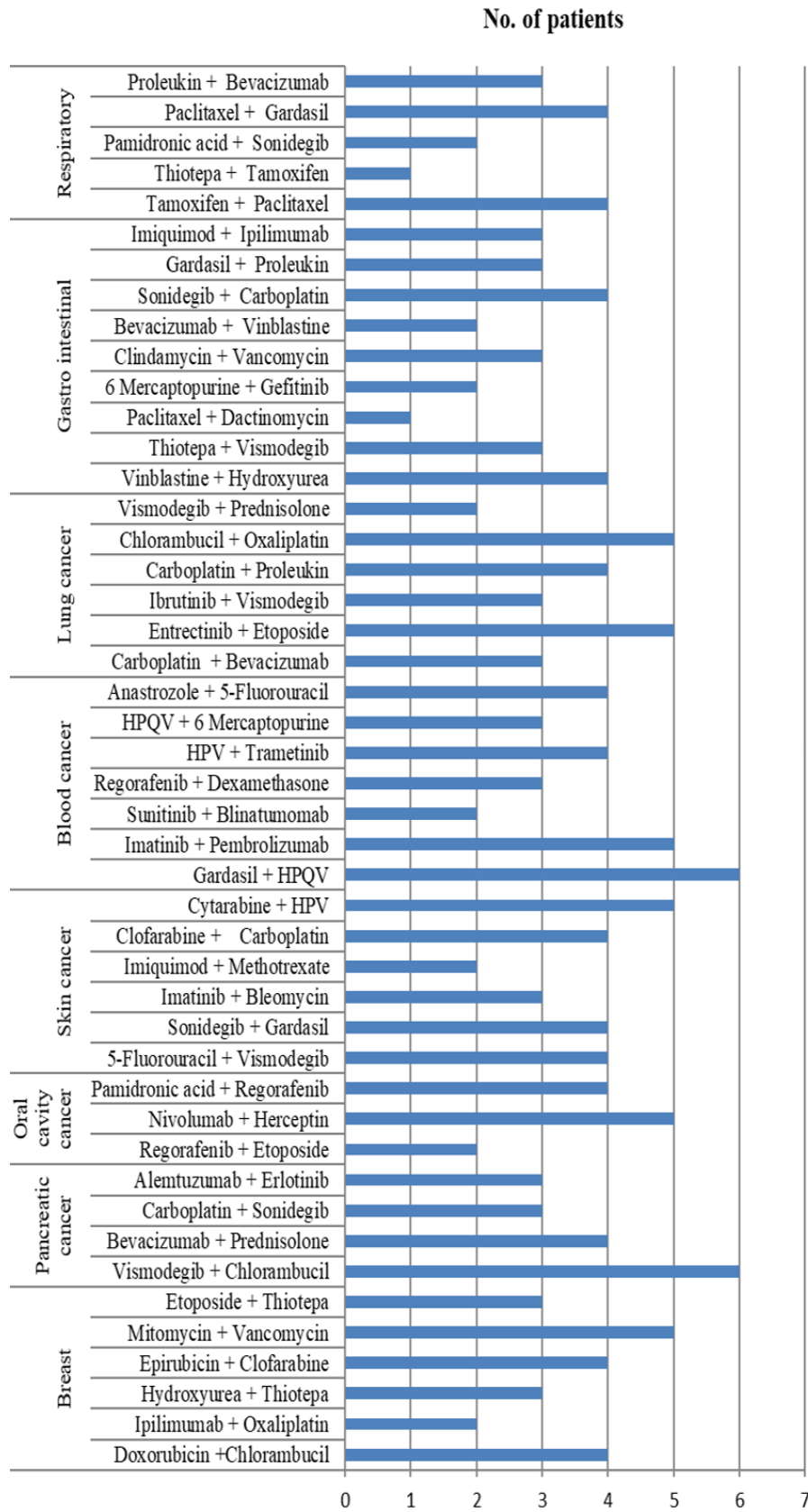
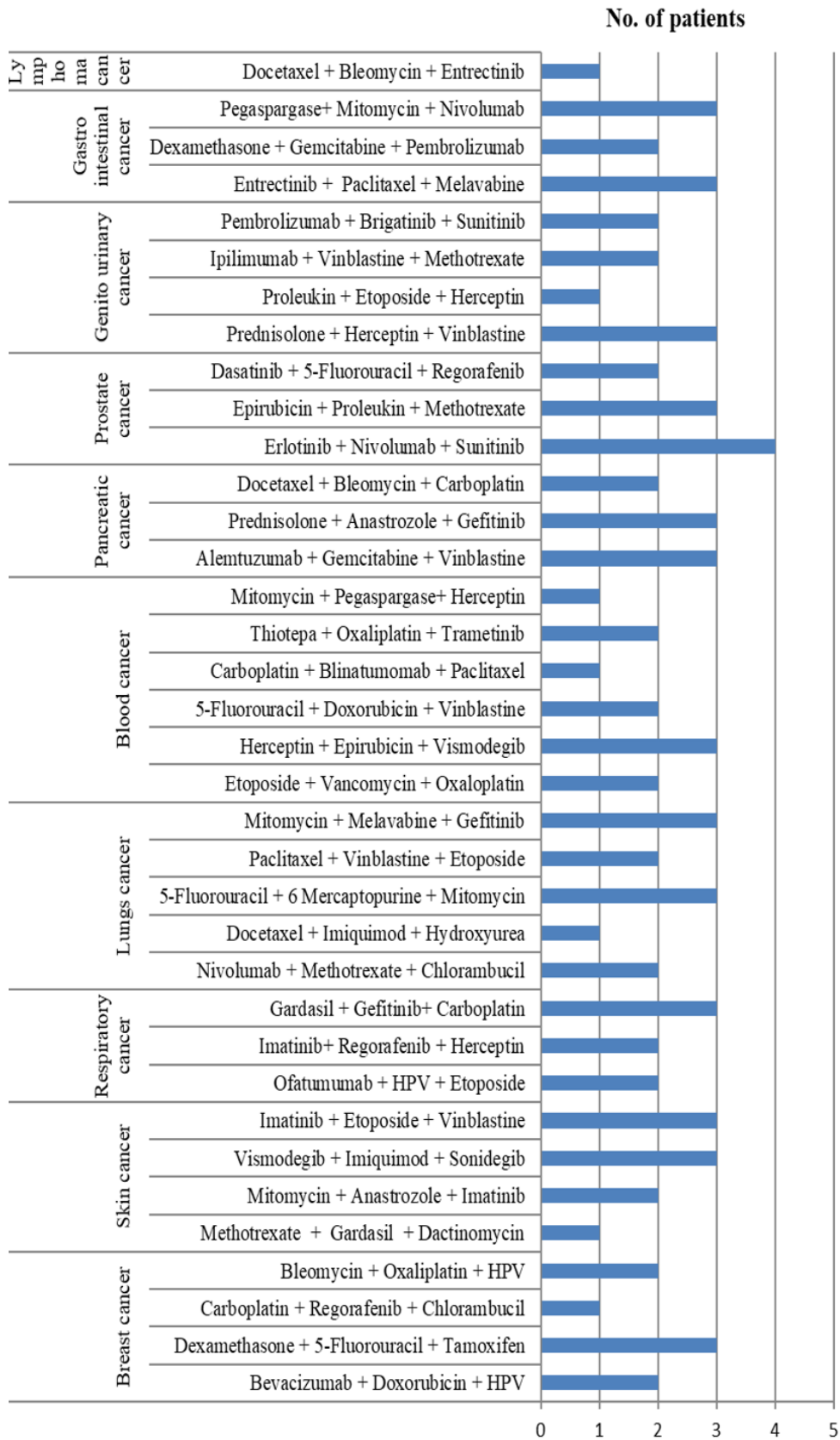**Figure 4: Anti-cancer drug utilization in double therapy**

Figure 5: Anti-cancer drug utilization in triple therapy

state of the patient. The principle in a combination of chemotherapy is to use different drugs that act by different cytotoxic mechanisms. Cytotoxic drug actions are not specific to tumor cells and can damage normal cells; also, as a result, they cause several side effects in patients. Most of the cytotoxic drugs are potentially hazardous substances which cause mutagenic, teratogenic, or carcinogenic effects in individuals. These substances may also cause secondary neoplasm in patients who were taking the treatment. So extreme care must be taken in handling and administrating of anticancer drugs.

Out of 300 prescriptions analyzed, 62 patients were prescribed with single-drug therapy. The results were summarized in Figure 3.

It was observed that 158 patients were prescribed with double drug therapy. The results were summarized in Figure 4.

In our study, it was observed that 80 cancer patients were prescribed with three drugs. The results were summarized in Figure 5.

It was observed that 17 drugs were prescribed in skin cancer. 18 drugs in Breast cancer, 25 drugs in Gastro-Intestinal Cancer, 26 drugs in Lung Cancer, 29 drugs in Blood Cancer, 5 drugs in Lymphoma cancer, 7 drugs in oral Cancer, 9 drugs in Prostate cancer, 12 drugs in pancreatic cancer and 13 drugs in Genito Urinary Cancer.

Out of 300 cancer patients, 54 drugs were given in single, double, and triple therapy.

About 54 drugs were prescribed to 300 patients.

Among Antimetabolites Clofarabine and Hydroxyurea were given in the highest number of patients 8 (2.66%) followed by Melavabine 6 patients (2%).

Among plant alkaloids, Vinblastine was highly used in 26 patients (8.6%), followed by Paclitaxel in 22 patients (44.4%).

Among Alkylating agents, Carboplatin was used in 30 patients (10%) followed by Oxaliplatin in 14 patients (4.6%).

Among steroid hormones, Prednisolone was given to 15 patients (5%), and Tamoxifen was given to 13 patients (4.3%).

Among Antibiotics, Doxorubicin was given to 16 patients (5.3%), and Mitomycin was given to 14 patients (4.6%).

Among Monoclonal antibodies, Herceptin and HPV was given to 15 patients (5%), and Bevacizumab was given to 14 patients (4.6%).

Among the tyrosine kinase inhibitor, Imatinib was given to 15 patients (5%), and Gefitinib was given to

11 patients (3.66%).

It was observed that Carboplatin was given to 30 (10%) patients followed by Chlorambucil to 27 patients (9%) followed by Vinblastine 26 patients (8.6%), Vismodegib 24 patients (8%), 5-Fluorouracil 22 patients (7.3%), Paclitaxel 22 patients (7.3%), Gardasil 21 patients (7%). Etoposide to 20 patients (6.6%), Doxorubicin 16 patients (5.3%), Sonidegib 16 patients (5.3%), Prednisolone 15 patients (5%). Nausea and vomiting were the most common adverse effects reported in our study. The least commonly used drugs were Ofatumumab, Brigatinib, Dasatinib, Dactinomycin was given to 2 patients (0.66%)

CONCLUSION

From the present study, we can conclude that the prevalence of cancer is more in females than males. Lung cancer, followed by blood cancer, was observed in major cases. Double and triple therapy was given widely to the patients. Most of the cases were in stage 3 and stage 2. Carboplatin is a commonly used anticancer drug. It was observed that Carboplatin was given to 30 (10%) patients followed by Chlorambucil to 27 patients (9%) and Vinblastine 26 patients (8.6%). Drug use evaluation studies are helpful for systematic quality improvement. All these observations improves prescribing practice by the implementation of standard guidelines, which results in providing cost-saving and better quality of life. We conclude that the use of anti-cancer drugs was found to be rational.

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