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Research Article

# Exploring Drug Prescription Patterns in the Neurology Department of a Tertiary Care Hospital: A Comprehensive Analysis

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## Abstract

**Objective:** Neurological disorders are a major cause of morbidity, mortality and disability. These adversely affect the quality of life among all age group patients. Majority of neurological disorders include Epilepsy, Headache, Cerebrovascular disorders with hemiparesis, Neuropathic pain, Extrapyramidal syndrome, Cervical myelopathy and Parkinson's disease. This study was done with aim to evaluate the prescription pattern of various drugs in different types of neurological disorders and to use the WHO / INRUD prescribing indicators to assess the rational drug prescribing.

**Materials and Methods:** A Prescription-based, Observational prospective study was carried out in a tertiary care hospital at South India. The prescription data of patients attending the neurology outpatient department was analysed over a period of 2 months. Rational use of drugs was analysed by the INRUD Scale.

**Results:** Out of these, 166 patients were male, whereas 134 patients were female. Most prevalent neurological disorders were Trigeminal neuralgia (25.66%), 9.97% of the patient population received injections, with 4% receiving Inj. Dexamethasone 8mg. Overall drug prescribing performance scoring was 3.55.

**Conclusion:** Our study revealed good Prescribing pattern as shown by WHO scale- IRUD/INRUD. Further such studies with large sample size are needed so as to guide clinicians toward rationale drug.

**Keywords:** Neurological; International Network of Rational Use of Drugs; Drug Utilisation, Rational Use.

## INTRODUCTION:

Prescription patterns play a crucial role in determining the effectiveness and safety of medical treatments, as well as shaping healthcare practices on a global scale. Understanding and analyzing prescription patterns can provide valuable insights into the evolving landscape of healthcare, the prevalence of diseases, and the utilization of medications. This research paper aims to delve deep into the realm of prescription patterns, examining the factors that influence prescribing decisions, exploring the variations across different regions and healthcare systems, and evaluating the potential implications for patient care and public health.

Prescription patterns encompass a wide range of elements, including the choice of medications, dosages, treatment durations, and the use of combination therapies. By studying these patterns, researchers can identify trends, uncover patterns of overprescribing or underutilization, detect potential drug interactions, and ultimately optimize therapeutic outcomes. Furthermore, understanding the factors that drive prescription patterns can lead to more effective interventions, such as educational campaigns, clinical guidelines, and targeted interventions, to enhance prescribing practices and promote evidence-based medicine.

Neurological disorders encompass a wide spectrum of diseases that pose significant challenges for healthcare professionals worldwide. Effective management and treatment of these conditions rely on a deep understanding of the prescribing patterns within neurological outpatient departments[1]. This research paper aims to explore the intricate relationship between the disease spectrum and prescription patterns in the field of neurology.

Identifying the prevalence, characteristics, and treatment approaches for these conditions is crucial for optimizing patient care and ensuring positive outcomes[2]. By analysing the disease spectrum, healthcare practitioners can gain insights into the challenges they face and make informed decisions regarding prescription practices[3].

Understanding the interplay between disease prevalence and prescription practices is essential for evidence-based decision-making. By examining a wide range of neurological conditions and associated prescription practices, researchers can identify patterns and trends that contribute to effective treatment strategies[4]. This knowledge empowers healthcare professionals to optimize prescription choices, improve patient outcomes, and potentially uncover opportunities for advancements in neurologic healthcare.

Collaborative efforts of all health care professionals driven by shared knowledge and experiences can contribute to improving global neurologic healthcare standards[5].

The World Health Organization (WHO) and the International Network of Rational Use of Drugs (INRUD) have created a useful set of indicators to evaluate how doctors prescribe medications in primary care. So far, there have been only a few studies in specialized care that measure the Index of Rationale Use of Drugs (IRUD). These measured values can be used as a way to compare different healthcare facilities and as a starting point for continuously monitoring the quality of prescription practices. Misusing antimicrobial drugs is becoming more common and contributes to the growing problem of drug resistance. This highlights the need to promote better and more thoughtful use of these medications[3].

## MATERIALS AND METHODS:

This is a prescription-based, Observational study that was conducted among outpatients with neurological disorders. The study was conducted in the neurology outpatient department in an tertiary care hospital for a period of two months. During this period, a total of 346 patients with neurological disorders were identified, out of which 300 were considered for final results. Each interested patient shared his or her disease history and prescriptions. Information about the demographic profile of patient, diseases which they were suffering from, and medicines prescribed to them was collected in a predesigned data collection form. Prior to the study, written informed consent was obtained from each patient. The study protocol was approved by the Ethics Committee of the institute. All categorical variables were expressed as frequency and percentage using Graph Prism 9.0.

### DATA ANALYSIS:

The patient demographic data, WHO prescribing indicators and pharmacological classes of medicines prescribed were analysed.

IRUD: Each of the prescribing indicators has an optimal index of 1(Table 1). The closer to 1 the calculated index is, the more rational prescribing is considered to be.

1. The index of polypharmacy was measured by the percentage of non-polypharmacy prescriptions. In this study, those prescriptions with three or less medicines where considered as non-polypharmacy.
2. The generic name index was measured by the percentage of drugs prescribed by generic name.
3. The index of rational antibiotic prescribing was defined as dividing the optimal level (30%) by the percentage of prescriptions including antibiotic.
4. The index of safety injection was calculated by dividing the optimal level (10%) by the percentage of prescriptions including the injection.
5. Percentage of drugs prescribed from the EDL.

The IRUD, which has a maximum value of 5, can then be calculated by adding the indices.[5]

**Table 1: WHO/ INRUD- Drug Prescribing Indicators**

| Prescribing indicators | Optimal Level (%) | Optimal Index (%) |
|---|---|---|
| Percentage of non-polypharmacy prescriptions | ≤ 3 | 1 |
| Percentage of drugs prescribed by Generics | 100 | 1 |
| Percentage of Prescriptions including antibiotics | 30 | 1 |
| Percentage of Prescriptions including injections | 10 | 1 |
| Percentage of drugs prescribed from the EDL | 100 | 1 |
| Drug prescribing performance scoring = 0 to 5 | | |

## RESULTS:

In our study, we analysed prescription data from 300 patients. Out of these, 166 patients were male, whereas 134 patients were female (see Figure 2). The patients were aged between 61 and 70 years (see Figure 1). A total of 30 different drugs were prescribed across the 300 prescriptions (refer to Table 1).

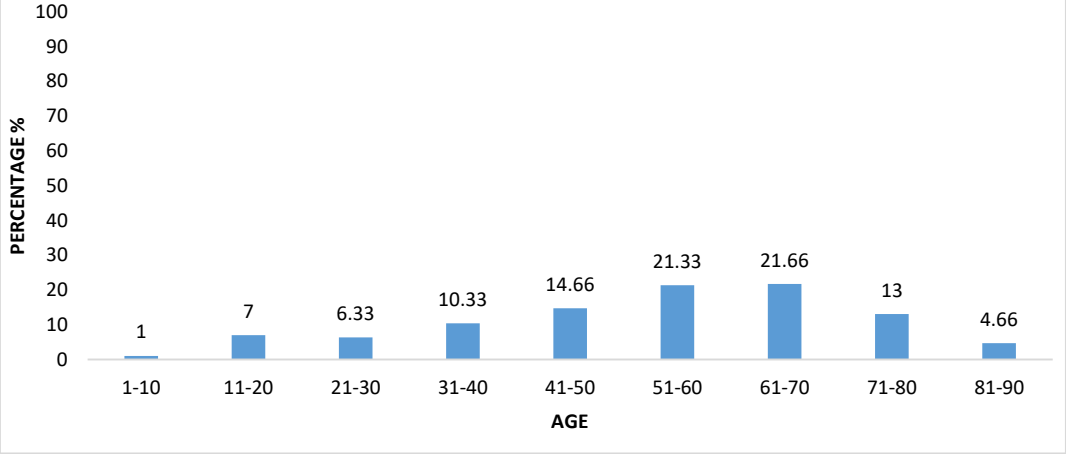


**Figure 1: Age Wise Distribution of Patients in Neurology Outpatient Department**

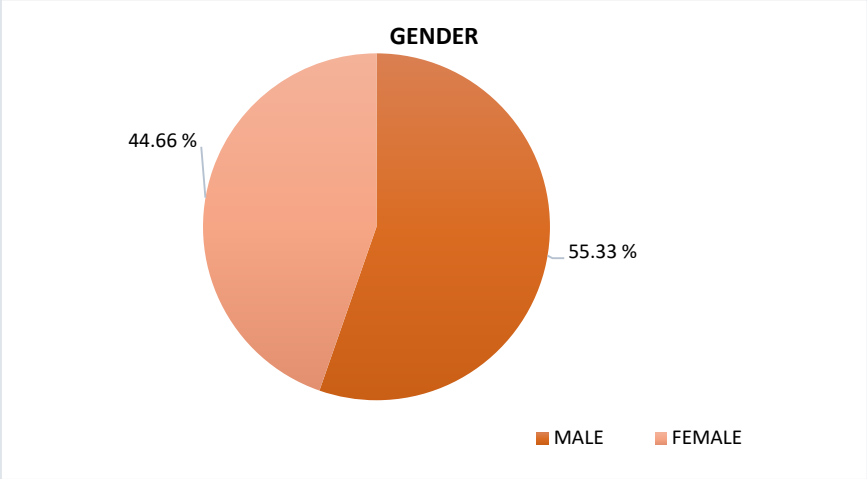


**Figure 2: Gender Wise Distribution of Patients in Neurology Outpatient Department**

Among the total population, 14% had both DM and HTN, while 9% had DM alone and 7.33% had HTN alone (Figure 3).

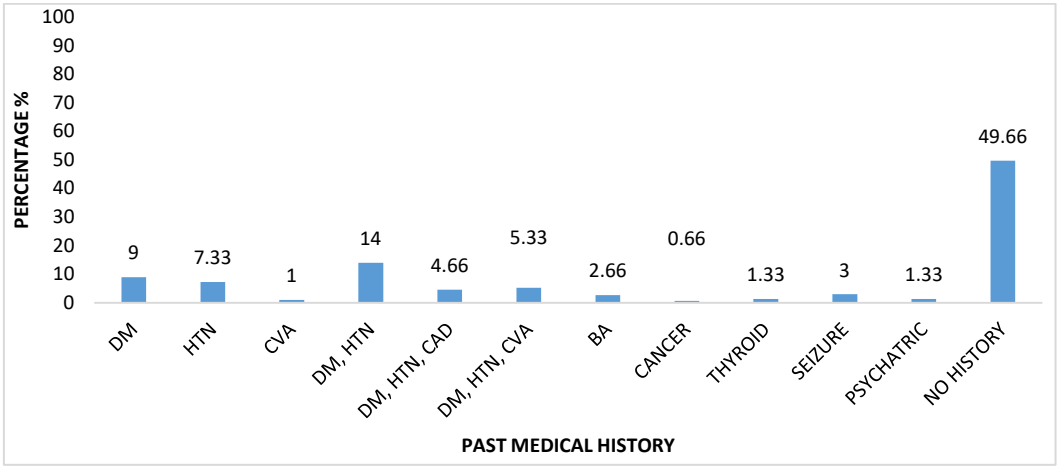


**Figure 3: Past Medical History of Patients in Neurology Outpatient Department**

The most prevalent neurological disorders were Trigeminal neuralgia (25.66%), Cerebrovascular Vascular Accident (23%), and various other conditions such as Headache, Quadriparesis, Seizure, Giddiness, Parkinson's disease, Mental disorder, Head injury, and Anxiety (Figure 4).

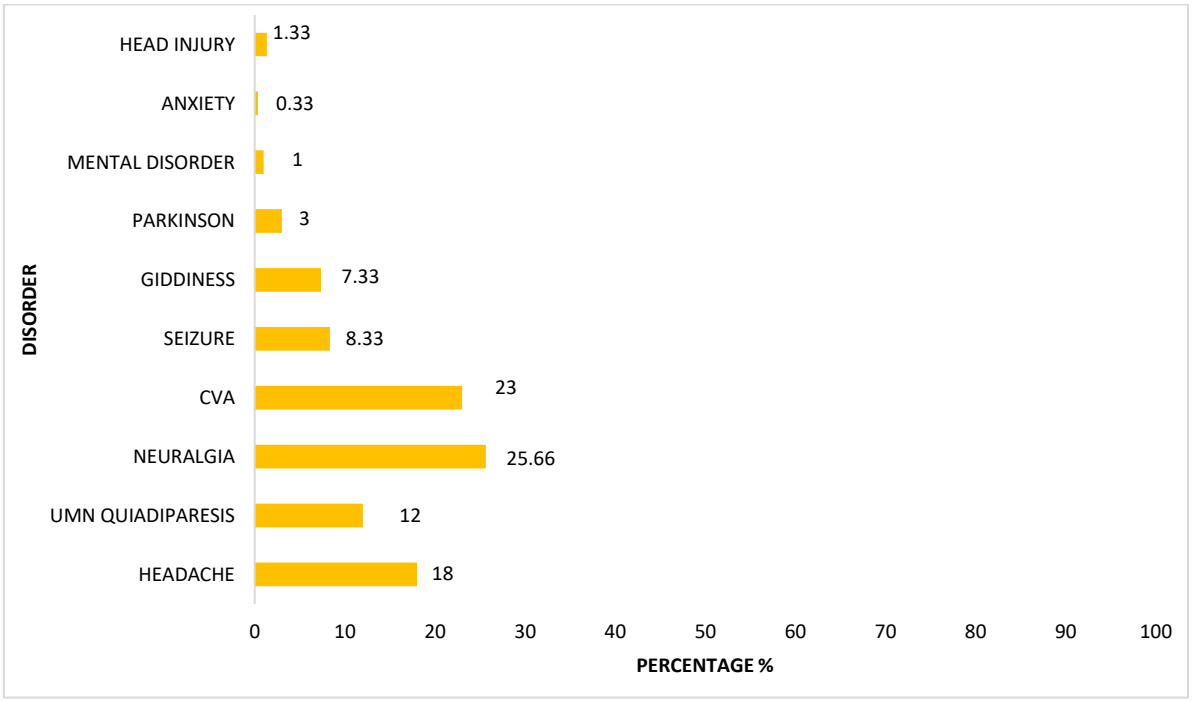


**Figure 4: Present Complaints of Patients in Neurology Outpatient Department.**

Out of the 300 patients, 38.66% received monotherapy, 32.33% received dual therapy, and 28% received polytherapy (Figure 5).

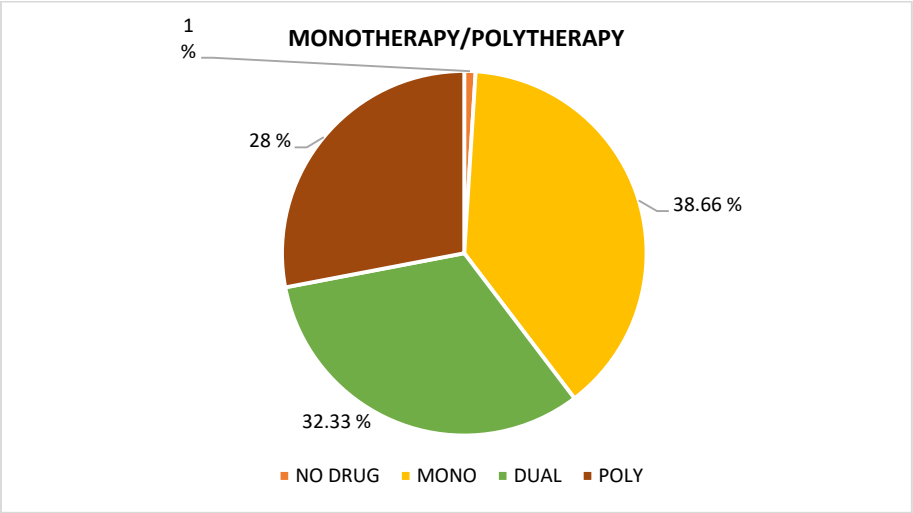


**Figure 5: Monotherapy/Polytherapy Treatment of Patients in Neurology Outpatient Department**

The percentage of generics (25%) was comparatively less than the prescriptions using brand names (75%).

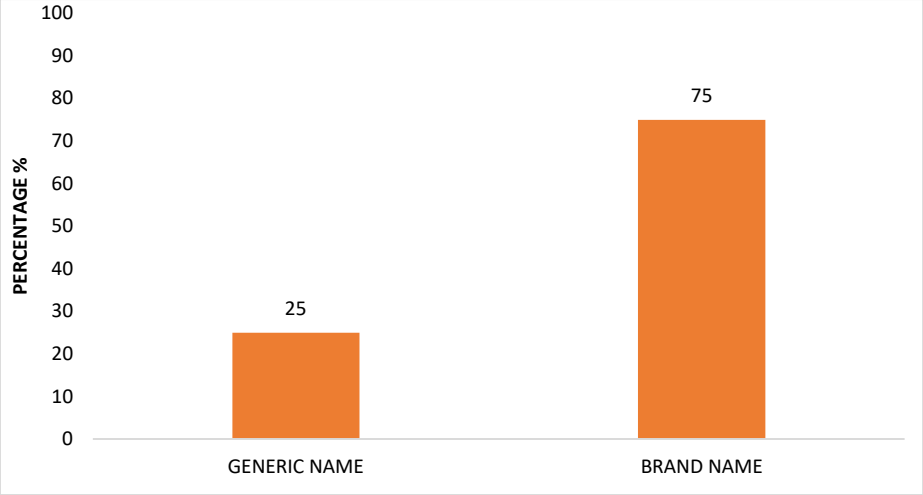


**Figure 6: Percentage of Generic vs Brand Prescriptions in the Treatment of Patients in Neurology Outpatient Department**

Regarding medication, 7.32% of all patients were treated with antibiotics, with 5.66% receiving Tab. Cefixime and 1.66% receiving Amoxicillin 500mg and Potassium Clavulanate 125mg (Figure 7).

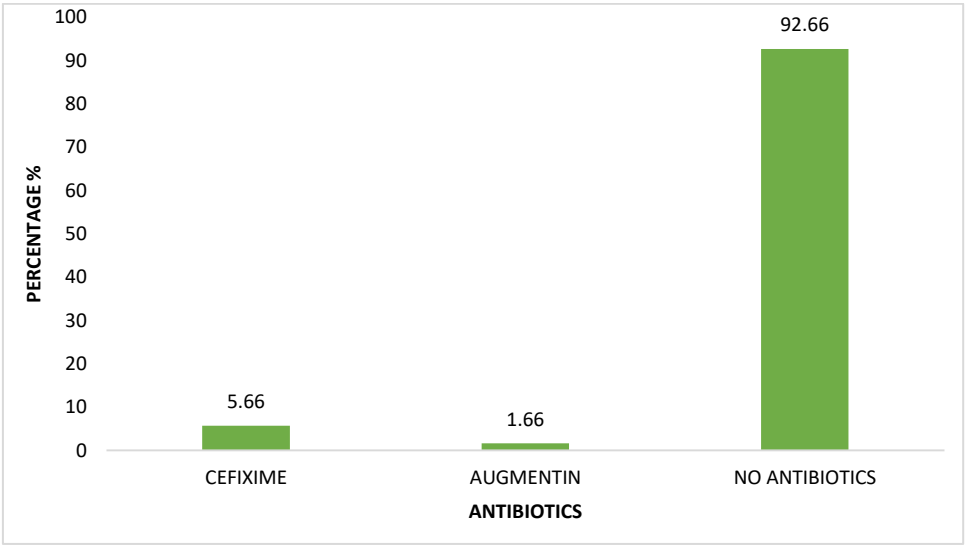


**Figure 7: Antiboitics Prescribed to Patients in Neurology Outpatient Department.**

Additionally, 9.97% of the patient population received injections, with 4% receiving Inj. Dexamethasone 8mg and 2.66% receiving Inj. Methylcobalamin 1500mcg (Figure 8).

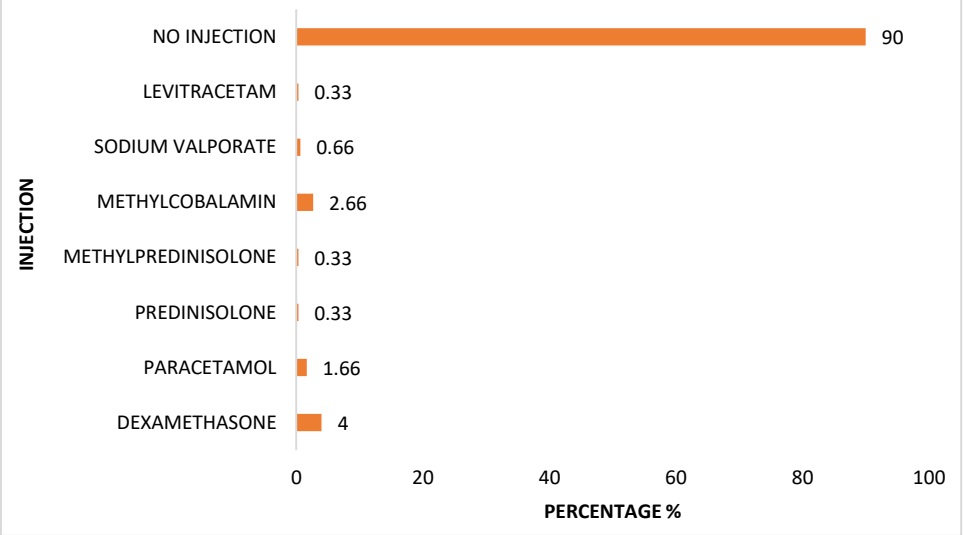


**Figure 8: Injection Administered to Patients in Neurology Outpatient Department.**

The most commonly prescribed drug was a combination of Pregabalin 75mg + Nortriptyline 10mg +Methylcobalamin 1500mcg, which was prescribed to 50 patients. This was followed by Amitriptyline, Acetaminophen, and Propranolol, which were prescribed to 34 patients (Table 2).

**Table 2: Catergories of Drugs Prescribed to Patients in Neurology Outpatient Department.**

| Treatment | No of Patient | Percentage(%) |
|---|---|---|
| Amitriptyline | 3 | 1 |
| Baclofen, Predinisolone, Nevirin NT | 2 | 0.66 |
| Nevirin NT | 50 | 16.66 |
| Amitriptyline, Acetaminophen, Propanalol | 34 | 11.33 |
| Syndopa, Trihexyphendyl | 5 | 1.66 |
| Aspirin, Atorvastatin, Methylcobalamin | 19 | 6.33 |
| Nevirin Nt, Acetaminophen | 2 | 0.66 |
| Escitalopram+Clonazepam, Cinnarazine | 6 | 2 |
| Aspirin, Atorvastatin, Methylcobalamin, Escitalopram+Clonazepam | 1 | 0.33 |
| Predinisolone | 14 | 4.66 |
| Aspirin, Atorvastatin, Methylcobalamin, Thiamine | 2 | 0.66 |
| Predinisolone, Nevirin Nt | 27 | 9 |
| Gabapentin, Nevirin Nt | 11 | 3.66 |
| Levitracetam | 21 | 7 |
| Acetaminophen | 11 | 3.66 |
| Methylcobalamin | 7 | 2.33 |
| Pregadoc | 7 | 2.33 |
| Syndopa, Trihexyphendyl, Ropinirole | 4 | 1.33 |
| Carbamazepine | 3 | 1 |
| Aspirin, Atorvastatin | 15 | 5 |
| Predinisolone, Pregadoc | 5 | 1.66 |
| Aspirin, Atorvastatin, Nevirin Nt | 8 | 2.66 |
| Aspirin, Atorvastatin, Acetaminophen | 4 | 1.33 |
| Atorvastatin | 1 | 0.33 |
| Atorvastatin, Nevirin Nt | 8 | 2.66 |
| Aspirin+Atorvastatin+Clopidogrel, Atorvastatin, Methylpredinisolone | 11 | 3.66 |
| Aspirin+Atorvastatin+Clopidogrel, Predinisolone | 6 | 2 |
| Sodium Valporate | 7 | 2.33 |
| Aspirin+Atorvastatin, Predinisolone | 3 | 1 |
| No Drugs | 2 | 1 |

Nevirin NT –Pregabalin + Methylcobalamin + Nortriptyline, Pregadoc- Nortriptyline + Pregabalin

The results of the present study revealed that Drug prescribing performance scoring was 3.51 (Table 3) which was considered to be good as per rational drug prescribing. Good prescribing is advocated to avoid wastage of medicines and to avoid possible adverse effects. Also, prescribing unnecessary medications to patients increases cost of overall treatment.

**Table 3: WHO/ INRUD- Drug Prescribing Indicators**

| Prescribing Indicators | Optimal Level (%) | Optimal Index (%) |
|---|---|---|
| Percentage of non-polypharmacy prescriptions | ≤ 3 | 1327/300 = 0.44 |
| Percentage of drugs prescribed by Generics | 100 | 25% = 0.25 |
| Percentage of Prescriptions including antibiotics | 30 | 21% = 1.42 |
| Percentage of Prescriptions including injections | 10 | 30% = 0.5 |
| Percentage of drugs prescribed from the EDL | 100 | 100% = 1 |
| Drug prescribing performance scoring = 3.51 | | |

## DISCUSSION:

Prescription pattern evaluation in the outpatient setting is considered a multifaceted approach of the prescriber, the patient, and the pharmacist.

Firstly, in our study population of 300 patients, there was a slightly higher proportion of males (55.33%) compared to females (44.67%). This distribution aligns with similar studies conducted by Sahab uddin et al, reflecting that neurological disorders were more prevalent among the male (57.19%) than females [6] due to social habit and their lifestyles like stress, emotional or physical trauma.

Regarding age distribution, the patients in our study were primarily in the 61 to 70 years age group. This finding is consistent with the study conducted by Janine et al, showing prevalence of neurological disorders in the age group 51–70 years old (46.91%) which focused on a similar age range and observed comparable results.[7] In accordance with WHO, more than 20% of adults aged 60 and above 60 are found to be with neurological disorders.[8] Since the physiological function of nerve get altered due to the deposition of waste products, brown fatty pigment and chemicals like beta amyloid which get accumulated and cause plaques and tangles.

The coexistence of diabetes mellitus (DM) and hypertension (HTN) was prevalent in our study, with 14% of the patients having both conditions. This comorbidity has been extensively studied and documented in the literature. Research by David et al. supports our study reporting similar rates of DM and HTN (16% and 18% respectively) co-occurrence.[9] brain is dependent on glucose for optimal physiological function. But, in Diabetes Mellitus due to increased glucose level it act in regulation of oxidative stress, cell death which contribute to neurological disorder and with hypertension, increased blood pressure affect the myelinated fibres of nerve by decreasing the density which alter the motor and sensory nerve conduction velocity.

Stroke is considered a major killer and cause of disability in the developing world. The average annual incidence rate of stroke in India was 145 per 100,000 populations, which is higher than the western nations[10]. Neuralgia was the most prevalent condition in our study, affecting 25.66% of the patients. This study was co related with the findings of Kiran et al., who reported a similar prevalence of neuralgia (27.90%) in their patient population[11]. This condition is due to axonal damage, demyelination, damage in large to small nerve fibres also cause impairment of proprioception, balance.

This was in contrast with the study conducted by Mateen et al, in this study headache, migraine, stroke, and seizure were the foremost neurological disorders. As stated by the study of Mateen et al, the majority of people with primary headache disorders lived in the developing world[12]. In the study of prevalence and characteristics of the headache by Siddiqi et al, study suggested that epilepsy affects 2.9 million people in the United States and 65 million people worldwide[13].

The most commonly prescribed drug combination in our study was Pregabalin 75mg + Nortriptyline 10mg + Methylcobalamin 1500mcg, which is a combination of multivitamin, antidepressant and neuroprotective drugs, administered to 50 patients being the most commonly prescribed drug. As Pregabalin - alpha 2 delta ligand which decreases the pain by altering the calcium channel activity of the nerve cells and Nortriptyline - tricyclic antidepressant which increases the levels of serotonin and noradrenaline which inhibit the movement of pain signals in the brain. These findings are comparable to the study by Cory tooth et al. which reported similar prescription rates for managing neuropathic pain[14]. The existing prescribing trends revealed that commonly prescribed medicines for neurological disorders were multivitamins and multiminerals, NSAIDs and other analgesics, antiulcerants, anticoagulants, antihyperlipidemic, antiepileptic, antihypertensive, and antimigrane medicines. The study of Kuriakose et al, showed that antihypertensive drugs (32%) followed by antiplatelet (14%), neuroprotective (10%), and nootropics (8%) were prescribed drug for stroke in India[15]. Carbamazepine (13.3%) was the first-line drug prescribed for simple partial seizures and complex partial seizures, according to the study of Murthy et al, in India[16].

In terms of medication, monotherapy was the most common treatment approach, with 38.66% of patients receiving a monotherapy. This finding is consistent with the study conducted by Haimei et al., where monotherapy (45.82%) was the primary treatment modality[17].Monotherapy was preferred over polytherapy because of minimal occurance of drug – drug interaction, adverse drug reaction, improved medication adherence also financially affordable for all patients

Furthermore, 9.97% of the patient population received injections, with Inj. Dexamethasone 8mg (4%) and Inj. Methylcobalamin 1500mcg (2.66%) being the most frequently administered injections. These results are consistent with the study conducted by Han et al. which reported comparable injection usage in their patient cohort[18]. A critical appraisal of prescriptions is required to curtail irrational prescribing in the country. The assessment of the prescription pattern of drugs

as per WHO criteria could encourage rational use of drugs. A study in Nigeria had shown overuse of antibiotics and injectables in public sector health facilities, including polypharmacy of the remaining medicines[19]. However, in the present study, only 9.97% of the prescriptions had injectables. It is assumed that most of the injectables are administered for indoor patient departments except insulin, penicillin, etc. As the prescriptions in the present study were collected from outpatients departments of the hospital, the number of prescriptions containing injectables was found to be less as compared to other studies.

Additionally, our study found that 7.32% of patients received antibiotics, with Tab. Cefixime (5.66%) and Amoxicillin 500mg + Potassium Clavulanate 125mg (1.66%) being the most commonly prescribed antibiotics. This study was found similar to the study conducted by Magdalene et al. which reported similar antibiotic prescription rates[20]. In the present study, 7.32% of the patients were prescribed antimicrobials which are below the recommendations of the WHO (20%–26.8%). Even the average number of antibiotics per prescription is < 1 which is relatively lower than the recommended range (1.6–1.8) by the WHO[21].

The process of drug utilization in the outpatient setting is considered a multifaceted approach of the prescriber, the patient, and the pharmacist. The WHO has designed a battery of indicators to evaluate the prescription pattern/drug utilization according to the facilities available. The WHO has divided the drug use indicators into three categories: prescription indicators, patient care indicators, and health facility indicators. Inappropriate prescribing has affected the rational use of drugs, especially in developing countries[22].

The results of the present study revealed that Drug prescribing performance scoring was 3.51 (Table 3) which was considered to be good as per rational drug prescribing. Good prescribing is advocated to avoid wastage of medicines and to avoid possible adverse effects. Also, prescribing unnecessary medications to patients increases cost of overall treatment. This was less than the data of 3.11 drugs per prescription reported by a single-centric study conducted in India in the year 2014 in a tertiary care center which is comparable to the present multicentric study[23]. All these studies observed a much higher "drugs prescribed per prescription rate" than the WHO recommended range of 1.6–1.8. The high rate of polypharmacy in the present study can lead to the increased likelihood of drug-drug interactions, augmented side effects, chances of noncompliance, high cost, etc. The collection of prescriptions of patients attending tertiary care centers with co-morbid conditions can be one of the contributing factors to the higher average number of drugs per prescription in the current study.

According to the WHO, the prescription should be in a generic name[24]. However, the results of this study had shown only 25% of prescriptions used generic names, which is much lesser than the prescription pattern in other Asian countries such as Pakistan (71.6%), Nepal (59.02%), and Jordan (57.6%).[15-17] It must also be noted that 96.88% of generic prescribing was reported in India[25].

In our study the drug prescribing performance scoring was 3.51 which was considered good and it aligned with the studies conducted by Vivek Sharma et al, and Pal A et al, which revealed the prescribing score of 3.55 and 2.68 respectively.

| **WHO prescribing indicators** | **In this study (%)** | **Vivek Sharma et al, [26] (%)** | **Pal A et al, [27] (%)** |
|---|---|---|---|
| Percentage of non-polypharmacy prescriptions | 0.44 | 0.4 | 1.32 |
| Percentage of drugs prescribed by Generics | 0.25 | 0.25 | 0.80 |
| Percentage of Prescriptions including antibiotics | 1.42 | 1 | 0 |
| Percentage of Prescriptions including injections | 0.5 | 1 | 0 |
| Percentage of drugs prescribed from the EDL | 1 | 0.9 | 0.56 |
| **Drug prescribing performance scoring** | **3.51** | **3.55** | **2.68** |

As there are many new drugs entering the market, periodic surveys of the prescription pattern would facilitate the understanding of the prescription trends which can subsequently be used in the improvement of rational and appropriate use. All these can together promote the appropriate use of medicine, which means that the patients receive medications appropriate to their clinical needs, in doses that meet their own individual.

## CONCLUSION:

Neuralgia was the commonest type of neurological disorder noticed in our study and a combination of Methylcobalamin + Nortryptaline + Pregabalin was the commonest prescribed drug. Our study also showed that there were more trends towards writing brand name of drugs rather than writing the generic name (NPN) of the drugs but this can only increase cost of treatment. Our study also revealed good prescribing pattern as per IRUD/INRUD which is a WHO scale of assessing the prescribing pattern of drugs. Further studies with large sample size are warranted so as to guide clinician towards rationale drug prescribing.

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## CONFLICTS OF INTEREST:

There are no conflicts of interest

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